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Relative Performance of SMEs: A Case Study of
Software Firms in Islamabad/Rawalpindi Regions

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Submitted in fulfilment of the requirement for the
Degree of Doctor of Philosophy

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Abstract

The resource based view of firms suggests that they should invest into intangible assets such as absorptive capacity, R&D, networks, human capital and internationalisation. In particular, SMEs require more investment in knowledge based assets (*e.g.*, R&D, networks) for higher labour productivity growth. The aim of this study is to identify and analyse the drivers of firm growth and their impact on firm labour productivity growth.

Previous studies were limited in scope in terms of analysis (*i.e.*, at firm level) of the software industry. For data collection, owner-managers of software firms were face-to-face interviewed using a structured questionnaire. The data were collected from two regions of Pakistan, Islamabad and Rawalpindi. Information was gathered on variables such as firm size, age, firm innovation activities, business and management factors, exporting, inward/outward FDI and so forth. Prior estimation factor analysis is used to extract core information from Likert scale variables. Lastly, stepwise multiple regression analysis is used to examine the relationship between drivers of firm growth and labour productivity growth.

The regression analysis examined firm size, access to finance, internationalisation (exporting and outward FDI), business improvement methods and knowledge management have a positive impact on firm labour productivity growth. In comparison, R&D, absorptive capacity, shortage of skills generally have negative relationship to firm labour productivity growth. In summary, empirical findings emphasise the importance of knowledge based assets for higher firm labour productivity growth as a low level of R&D, lack of access to finance, poor absorptive capacity, high sunk costs (non recoverable) and skills shortage reduced the labour productivity growth of software firms.

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Declaration

I declare that this research is the result of my own work and has not been submitted for any other degree at the University of Glasgow or any other institution. I acknowledge the work of others in explicit references at the end of the thesis.

The copyright of this thesis rests with the author. Use of any material contained in, or derived from this thesis must be acknowledged appropriately.

Signature: _____

Name: Naqeeb Ur Rehman

Abbreviations

| | |
|-------|--|
| BIM | Business Improvement Methods |
| FDI | Foreign Direct investment |
| FOB | Family Owned Business |
| FY | Fiscal Year |
| GDP | Gross Domestic Product |
| HRM | Human Resource Management |
| IBM | International Business Machine |
| ICT | Information and Communication Technology |
| IPR | Intellectual Property Rights |
| IT | Information Technology |
| IV | Instrumental Variable |
| KMO | Kaiser-Meyer-Olkin test |
| LP | Labour Productivity |
| MNE | Multinational Enterprises |
| OECD | Organisation of Economic Cooperation & Development |
| OLS | Ordinary Least Square |
| P@SHA | Pakistan Software House Association |
| PSEB | Pakistan Software Export Board |
| RBV | Resource Based View |
| ROA | Return on Assets |
| R&D | Research and Development |
| SME | Small and Medium-sized Enterprises |
| SPSS | Statistical Package for the Social Science |
| TFP | Total Factor Productivity |
| UK | United Kingdom |
| USA | United States of America |

1. Introduction

1.1. Introduction

Small and medium-sized enterprises play a vital role in the economic development of a country. In particular, in the developing countries where poverty, unemployment, low income per capita, low literacy, high inflation and interest rates can hinder the economic growth of such countries; SMEs contribute significantly to the national income and provide employment opportunities (Ghoneim, 2003; Moktan, 2007). On the other hand, SMEs have lower survival rates than large firms because of resource constraints (Beck *et al.* 2005). In order to make SMEs more productive and efficient, the role of knowledge based assets (*e.g.*, R&D, networks, human capital) are important to the firm's sustained competitive advantage (Barney, 1991). The literature investigates the long-term drivers of firm growth which are linked with a firm's knowledge based assets and their association with labour productivity growth (*i.e.*, firm's sales per employee). A literature review indentified the drivers of firm growth such as including absorptive capacity, firm R&D undertaking, knowledge management, networking, access to finance, and internationalisation and that these had a positive relationship to firm labour productivity.

In contrast, some developing countries have seen substantial growth in the IT sector. In recent years countries such as China, India, Malaysia, Brazil and others have made significant progress in the IT and telecom industries. Most of these software firms are comprised of SMEs and are more skill-intensive than manufacturing industries as is the Pakistan software industry, which is relatively new and small compared to that in neighbouring countries such as China and India. Pakistan has attracted significant foreign direct investment in recent years in the IT/telecom industries. Pakistan is currently home to the giant multinational IT companies such as IBM, Microsoft, Cisco, Oracle, Siemens and others. These foreign firms are superior in technology and have competitive products and

services. However, local software firms are facing many challenges such as meeting demands for innovative products, insufficient capital, and a general shortage of skills.

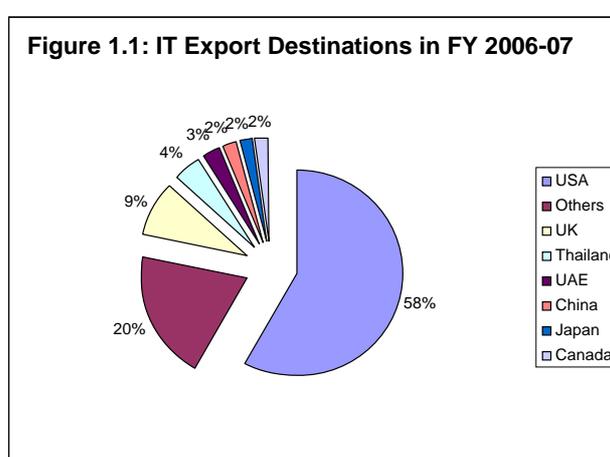
This Chapter provides an introduction to the thesis and discusses the motivation, aims and objectives of the study. It also gives a summary of all chapters and then reports the principal findings from empirical Chapters. Lastly, the contribution to the literature is discussed.

1.2. Motivation

In the literature, researchers have investigated two different views on the role of SMEs in developing countries. First, there is the view that SMEs have a positive impact on an economy; for example, SMEs provide jobs, reduce the poverty level and make a significant contribution to the national income (GDP). In comparison, some researchers (*e.g.*, Beck and Kunt *et al.* 2005) state that SMEs provides poor quality jobs, are not innovative and that their financial constraints may affect their performance. These two arguments from the literature motivated this study to investigate the following research questions: Why are SMEs less productive? What are the drivers of firm growth? What type of firm resources can make SMEs more productive? To answer these questions this research is informed by an extensive literature survey and an empirical analysis.

Furthermore, the survey of the literature revealed a research gap related to the IT sector in developing countries. Previous empirical studies (Harris and Trainor, 1995; Harhoff, 1998; Saleh and Ndubisi, 2006) analysed the manufacturing industry compared to the knowledge intensive industry (software firms). This motivated this researcher to focus on the software industry by conducting a case study on the Pakistani software industry. Overall revenues from the Pakistani software industry are over US\$ 2.5 billion and a significant portion (over US\$ 1.5 billion) of total revenues comes from exports. Figure 1.1 shows that most

software firms are exporting (58%) to the USA. Of the total export sales, 20 % sell their products and services to other countries such as Australia, Singapore, and Germany. These local software firms provide services to different sectors of the economy such as telecommunication, government, retail, aerospace and defence and financial services. To encourage the software industry in the country, the government has provided tax exemption to IT companies till 2016 and foreign companies are allowed 100% ownership of equity.



Source: PSEB IT Industry yearbook 2007-08

Past empirical studies (*e.g.*, Barri, 2005 and Mathew, 2007) showed research gap related to Pakistani software industry in terms of firm-level analysis. These brief facts and figures related to the Pakistani software industry and the lack of research on the IT industry in general motivated this researcher to analyse this new sector of economy through an empirical analysis.

1.3. Aims and Objectives

The aim of this study is to investigate the relationship between drivers of firm growth (independent variables) and labour productivity (dependent variable). A review of the literature identifies the drivers of firm growth such as a firm's R&D undertaking, absorptive capacity (*i.e.* a firm's ability to internalise external knowledge), access to

finance, internationalisation (exporting and outward FDI), lifecycle, firm strategic focus, leadership, business improvement methods, and knowledge management and the positive association on these with a firm's labour productivity growth. In comparison, the literature survey also examined the long-term obstacles to the success of their business such as economy, obtaining finance, recruitment, regulations, general skills shortage and shortage of managerial skills which have a negative impact on a firm's labour productivity growth.

For empirical analysis, the primary data were collected from the two regions of Pakistan Islamabad and Rawalpindi. Owners and senior managers were face-to-face interviewed using a structured questionnaire. Of the 150 randomly selected software firms, a total of 69 (46%) have responded to the interviews. Of these 69 firms, only 8 firms refused to provide financial information. The Likert scale variables are measured through factor analysis before estimation. For regression analysis (stepwise multiple regression analysis) two models are developed to examine the determinants of labour productivity growth. Two software packages used for empirical analysis such as: SPSS 18 & Stata 12.

1.4. Chapter Summaries

There are total of five Chapters in addition to this introduction. Chapter 2 comprise the literature survey, looking into drivers of firm growth and their association with firm productivity and innovation performance. A conceptual framework is developed which shows the important drivers of firm growth. Section 1 introduces the resource based view of the firm which suggest that a firm's investment in knowledge based assets (i.e., intangibles) would improve the firm's productivity and innovation performance (i.e. product/process innovation). Section 2 of the literature survey investigates intangibles assets such as 'R&D', 'knowledge', 'employees skills', 'organisational culture', 'IPRs', 'networks' and others. Researchers argue that small and medium-sized firms have resource constraints compared to large firms because SMEs undertake less R&D, are less innovative

and have lower production and market management capabilities (Rangone, 1999). In the literature, researchers have combined intangible assets into one variable called 'absorptive capacity' meaning a firm's ability to internalise the external knowledge (Cohen and Levinthal, 1979; Harris, 2008). The antecedents of absorptive capacity such as human capital, the firm's R&D undertaking, HRM activities, inter and intra-firm collaborations, university-industry linkages and knowledge management improve the firm's labour productivity growth and innovation performance. Additionally, Figure 2 shows the proxies of absorptive capacity and their link to firm labour productivity growth and innovation performance.

A firm investment in knowledge based assets such as i) R&D; ii) networks; iii) entrepreneurship; iv) organisational culture; and v) leadership have a positive impact on the firm's labour productivity growth. A number of researchers such as Schumpeter (1942), Wiklund and Shepherd, 2003 and Lumpkin and Dess (1996), discussed the positive role of entrepreneurship abilities (risk taking, proactive, innovative) on firm performance. Some researchers (e.g. Marcati *et al.* 2008; Capaldo *et al.* 2003) used education, experience, marketing and management capabilities of entrepreneurship and stated their important role in a firm's innovation activities. On the other hand, businesses being family owned may have a positive or negative effect on firm labour productivity growth. The positive aspect of family owned business is when family members remain in jobs for the long term as this may help the business to establish better contacts with other firms. The negative effects are lack of strategic planning, and a preference for family members to keep their job which may be damaging for firm growth. Research (e.g. Abor and Biekpe, 2007 and Barri *et al.* 2005) on small firms has found that they have more financial constraints than large firms due to lack of securities and rely on internal sources of financing. Access to credit is an important resource for firm innovation and productivity

performance. When a firm grows over a time, it requires more capital to invest in knowledge based assets for higher labour productivity growth.

Section 3 discusses the impact of foreign direct investment on domestic firms and focuses on the role of internationalisation. In developing countries where firms have less resource to invest in innovative projects, foreign direct investment can play an important role in knowledge transformation from MNEs to local firms. Multinational firms are superior in technology and create more employment opportunities in the host economy. The transfer of technologies from foreign to domestic firms and labour turnover may increase firm performance. However, some researchers (e.g. Harris, 2008; Adamou and Sasidharan, 2007) have discussed the negative effects of inward FDI on local firm performance if local firms have poor absorptive capacity. In contrast, the last sub-section discusses the importance of firm internationalisation and its link to firm labour productivity growth. The literature survey identifies firm exporting and outward FDI as key drivers of firm growth.

Chapter 3 provide the survey data analysis by using parametric and non parametric tests. Section 1 discusses the summary statistics of firm basic characteristics using survey data. This section shows the proportions of type of business, family owned business, R&D undertaking, exporting and access to finance. Most of these software firms are engaged in (n= 56) in exporting and their destination of exports also presented in Table 3.4. Additionally long-term obstacles to the success of their businesses are reported ranked from most important to least important. The next section provides information on the links between R&D, innovation and labour productivity. This showed that few firms undertook R&D and these software firms mainly produce incremental type of innovation. It then proceeds to discuss their sources of knowledge and information and also presents the barriers to innovation for software firms, such as their reasons for not undertaking R&D. Section 3 examines the link between firm internationalisation (exporting, inward/outward

FDI) and labour productivity, and the last section discuss the relationship between firm entrepreneurship abilities and labour productivity.

Chapter 4 gives a brief introduction to key literature references related to the drivers of firm's growth (independent variables) and their association with labour productivity growth. Furthermore, this Chapter presents factor and regression analysis of software firms. The principal component factor analysis is used to measure firm business and management variables such as lifecycle, strategic focus, leadership, business improvement methods, culture, knowledge management and absorptive capacity and others. The factor analysis provided low KMO test values: this test measures the appropriateness of factor model before the estimation correlation matrix is used to investigate the multicollinearity problem in models. Stepwise multiple regression analysis is used to estimate two models. The robust standard error method is used to eliminate hetroskedasticity. The Ramsey reset test is also used to examine the functional form of errors. This test accepted null hypotheses which states that models are adequately satisfactory. Overall the models obtained higher R-squared values and this showed that the models were well fitting. However, the analysis is limited in scope to resolve the causality issue during estimation because of lower observations. Finally Chapter 5 presents the concluding remarks of thesis with policy implications, limitations and indications for future research work.

1.5. Principal Findings

In the regression analysis, model-2 shows the negative relationship between labour productivity growth and labour productivity in 2007. This suggests that higher sunk costs (non-recoverable) affect the labour productivity of these software firms. The negative association between firm R&D undertaking and labour productivity growth rejected the prior expectation. This suggests that software firms are externally constrained and have low innovation abilities to undertake R&D projects. When firms are engaged in R&D their

labour productivity suffers due to resource constrain. Similarly, firms have mainly produced incremental type of innovations compared to radical innovation output. On the other hand, only few firms (n=14) undertook R&D because of low rate of return and high risk involvement prevent firms from undertaking innovative projects. Interestingly small firms have higher labour productivity compared to large firms and this implies that small firms are flexible and more skill intensive than capital or intermediate intensive. Furthermore, these software firms are externally constrained and a positive relationship between access to finance and labour productivity growth suggests that firms require external financing for higher labour productivity growth.

In contrast, firm internationalisation (exporting and outward FDI) has a positive impact on firm labour productivity growth. However, few firms are engaged in outward FDI and most of the firms are selling their products and services to less innovative international markets. The negative relationship between absorptive capacity and labour productivity growth rejected the initial hypothesis. This implies that lack of investment in knowledge based assets (i.e. R&D, linkages, human capital) reduced their abilities to internalise external knowledge. Additionally, long-term obstacle to the success of their business such as ‘shortage of skills generally’ have negative impact on firm labour productivity growth. This suggests that these software firms are facing a general skills shortage related to their products and services.

1.6. Contribution to knowledge

Overall, this research study to some extent filled the research gap at firm level analysis of the Pakistan software industry. Previous studies focused more on the manufacturing industry and were limited in scope to analysing the drivers of firm’s growth and their association with labour productivity growth with reference to developing countries. This research identified some key findings such as the negative relationship of R&D and

absorptive capacity with firm labour productivity growth and these findings emphasise the importance of knowledge based assets. Additionally, firm size, access to finance, internationalisation and business improvement methods have positive impact on the firm labour productivity growth. This research in particular indicated policy implications for SME development and more specifically, SMEs related to the IT sector in Pakistan.

2. Review of Literature

2.1. Introduction

Small and medium-sized enterprises (SMEs) are a major source of employment and make a significant contribution to the national income of most developing countries (Moktan 2007; Bari and Cheema, 2005; Drnovsek 2004; Ghoneim 2003; Ayyagari and Beck, *et al.* 2003; Chaudri, 2000; Hoffman and Parejo *et al.* 1998). In particular SMEs internationalisation through exporting and outward FDI has a significant impact on the economic growth of a country (Shen, Xu and Bai, 2009). On the other hand some researchers have argued that in developing countries SMEs have limited growth potential due to their smaller effect on poverty reduction, provide poorer quality jobs and are less innovative than large firms (Liedholm *et al.* 1987; Beck, Kunt *et al.* 2005; Aquilina and Klump *et al.* 2006). This motivated the researcher to investigate the drivers of growth of SMEs and their impact on firm labour productivity growth and innovative performance (i.e. product/process innovation). The introduction part of this chapter provides a brief background to the literature on firm performance and obstacles to firm growth and discusses the research gap in literature.

a) Firm performance (e.g. Productivity)

A number of researchers have analysed firm performance through various indicators such as i) growth in sales ii) growth in employment iii) return on assets (ROA); iv) age of firm v) firm profitability, and others (Sleuwaegen *et al.*, 2002; Robson *et al.* 2008 and Rogerson *et al.*, 2000; Salojarvi, Furu *et al.* 2005). In addition, Saleh and Ndubisi (2006) measured firm performance by using labour and capital productivity¹ for Malaysian SMEs and suggested that barriers to SMEs should be removed. These barriers such as i) low human capital; ii) insufficient funds and; iii) lower firm R&D undertaking affect the growth of

¹ Labour productivity: measured by output per employee (sales/employees) and capital productivity measured by gross value added divided by real fixed assets.

SMEs. However, Raj and Mahapatra (2009) conducted a research study on Indian SMEs by using secondary data and argued that labour productivity growth may not reflect the true gains of productivity and referred to TFPG² (total factor productivity growth). Harris and Moffat (2011) used total factor productivity (TFP) to measure firm performance and examined the determinants (knowledge, R&D and others) of TFP through panel data analysis. Total factor productivity shows firm efficiency levels and technological progress rather than using employment, intermediate inputs and capital (Harris and Moffat, 2011). On the other hand, Farinas and Ruano (2004) investigated the relationship between firm sunk cost and productivity (TFP). Their study analysed 15087 Spanish manufacturing firms³ and found that high sunk costs lowered the firm productivity, efficiency and firms are subject to less market selection (*e.g.*, higher sunk entry costs). In summary, the literature survey will investigate the drivers of firm growth and their association with firm performance (*e.g.* productivity).

In contrast, firm size and age are the determinants of growth and even the firm characteristics such as ownership and capital structure, R&D, human capital and export activities can play important role in firm growth (Heshmati, 2001). For instance, Aw (2002) examined the link between firm size and productivity (TFP) on Taiwanese manufacturing firms. Aw (2002) found that firms grows because of their higher productivity not because of their size; in particular, small businesses can have higher productivity if sunk costs of entry and exits are low and this will strengthen their market selection process. Furthermore, firm age and productivity (TFP) have a positive relationship because older firms have experience in production and have already been exposed to competition from other firms (Aw, 2002). However, some researchers stated that firm growth (*i.e.* an increase in employment) can be negative for older firms compared

² TFPG: Total factor productivity growth not only measured technical progress but also better utilization of capacities, learning by doing, and improved skills of labour.

³ The sample includes both small (10-200) and large firms (over 200).

to younger firms because old firms may fail to invest in existing technologies or emerging technologies and this might reduce the productivity of old firms; put in another way if young firms are better in technology and resources, then age and productivity may have negative relationship (Nichter and Goldmark, 2009; Aw, 2002).

On the other hand, some researchers identified key macro environment issues such as infrastructure development (*e.g.*, power, telecommunication, roads, ports), strengthened financial and capital markets, quality of labour force, reduced cost of doing business by reforming institutional and regulatory framework (low tax and corruption), lack of e-commerce, poor law and order situation and a better environment for foreign investment (Mintoo, 2006; Reddy, 2007; Aidis, 2005; Kapurubandra and Lawson, 2006; Gelb *et al.* 2008). These obstacles not only affect small firms but also large ones and have a negative impact on firm performance. For instance, Bezic *et al.* (2010) identified obstacles to the success of their business such as: transport, customs regulations, access to land/building, competition, obtaining finance; their study⁴ found that competition and customs and trade regulation are the most important obstacle for doing business. Overall, these macro economic problems are more severe in developing countries than in developed countries; these obstacles affect small businesses more than large firms due to extra costs for removing such obstacles at their own expense (Mambula, 2002). In summary, the above literature examples suggest that firm size and age have a positive impact on firm labour productivity and long term obstacles have a negative association to firm labour productivity growth.

b) Research gap in IT-industry

⁴ Tobit analyses were conducted on 707 firms from 9 transition economies such as: Croatia, Czech Republic, Estonia and Hungary etc. their finding suggest that actions of competitors and customs procedures have a negative impact on firm internationalisation.

To date, only research has been conducted on the services sector particularly on the software industry, which is the focus of the present study. The software industry comprises small software firms with high innovation and absorptive capacity (i.e. a firm's abilities to internalise external knowledge) because of qualified IT professionals and better organisational capabilities (Matusik and Heeley, 2005). These knowledge intensive firms have a strong linkages with other sectors of the economy such as the banking sector, airline industry, and the manufacturing sector, which improves the competitive performance of all firms, whether SMEs or large firms (Westhead, 1997; Bell, 1995). This knowledge intensive (better qualified, high-innovation) sector acts as an external source of knowledge for clients because of highly customised services through e-commerce (Koch and Strotman, 2008; Welker *et al.* 2007). Moreover, these small software firms have low entry barriers and even the size of the firm is not critical; few software developers can develop excellent software products and create high export potential. However, the growth of this knowledge-intensive industry requires investments in organisational capabilities in order to improve management qualities, innovation and human capital and so forth (De and Dutta, 2007). These IT professionals might be strong in their expertise, but as overall organisational capabilities⁵ requires further attention from the policy makers to the growth of this new sector of economy. Correa (1996) conducted a study on software firms in developing countries (Chile, Argentina, Brazil and India) and stated that software firms require specific strategies to improve their export performance. These strategies are related to their internal (market size, firm size, quality standards, marketing requirements) and external factors (IPRs). This suggests that these software firms require more investment on knowledge based resources for better firm performance. In summary, the literature survey investigates the drivers of firm growth and their relationship to firm labour productivity growth and innovation performance. Very few empirical studies (*e.g.*, Mathew, 2007; Kim,

⁵ This refers to an organisation's well-coordinated set of tasks and utilising resources for the purpose of achieving results

2000) have been undertaken so far in this specific sector (the IT-related industry). To some extent, this study will fill the research gap related to the software firms in developing countries.

This Chapter has been divided into 3-sections; Section 1 is about the firm resource based view (i.e. related to firm knowledge based assets). Absorptive capacity and proxies of absorptive capacity are discussed in Section 2: proxies such as R&D, IPRs (intellectual property rights), human resource management, access to finance and others. Section 3 concerns firm internationalisation (inward & outward FDI) and its impact on firm labour productivity growth and innovation performance. That is, hypotheses have been drawn from this framework. Additionally, Figure 2.2 shows that how each driver of firm growth is link to firm labour productivity growth and innovative performance. Overall, the conceptual framework (Figure 2.1) used in this study to discuss the important drivers of firm growth is presented. That is, hypotheses have been drawn from this framework. Finally, the conclusion of the literature review is given in Section 4.

Section 1

2.2. Resource Based View (RBV)

“A resource refers to an asset or input to production (tangible or intangible) that an organisation owns, controls, or has access to on a semi-permanent basis” Helfat and Peteraf (2003). This resource-based view (knowledge based view) states that the firm is knowledge bearing entity and human capital is a major asset to firm growth (Walker, 2010). Grant (1996) saw the resource based view of the firm as unique bundle of idiosyncratic resources and capabilities where the primary task of management is to maximise value through the optimal deployment of existing resources/capabilities and develop the firm’s resource base for the future.

Additionally a number of researchers have divided resources into two broad categories i.e., tangible and intangible, which are heterogeneous in nature (Penrose, 1995; Galende and Fuente, 2003; Wernerfelt, 1984; Teece *et al.* 1997, Helfat & Peteraf, 2003). These tangible (i.e. people, machinery, financial capital) and intangible (i.e. organisational principles, skills and process) resources perform productive tasks for the firm (Galunic and Rodan, 1998). Resources, in particular financial, human and organisational resources may improve the firm's innovation performance (Dundas, 2006). Furthermore, Barney (1991) divided the resource based view into 3- major categories such as i) firm resources (physical, human and organisational capital resources); ii) firm competitive advantage, and; iii) sustained competitive advantage. Other researchers have mainly addressed firm resources such as entrepreneurial, organisational and technological resources, with less focus on the firm's competitive advantages (Masakure, Hensen and Cranfield, 2007).

Rangone (1999) argued that resource based view of SMEs and its sustained competitive advantage was based on three basic capabilities i) innovative capability; ii) production capability, and iii) market management capability. According to Rangone (1999), SMEs lack these basic capabilities due to a critical shortage of resources. Similarly, Saleh and Ndubisi (2006) identified certain important firm resources and their significant impact on firm productivity such as: R&D, human capital (knowledge, skills and experience), finance and HRM practices. However, SMEs face resource constraint; in particular, small firms are reluctant to invest in R&D and have low human capital compared to large firms, which may affect their performance (Saleh and Ndubisi, 2006). In contrast, Moreno and Casillas (2007) suggested that SMEs have high potential growth because of their slack resources⁶. It can be argued that the smaller the firm the greater is the indivisibility of resources, causing the availability of slack resources. These idle resources (human or physical) will

⁶ These are financial and non-financial/idle resources which are not fully utilised in the firm and can be redeployed or diverted to achieve organisation goals (*e.g.*, surplus labour, excess liquidity). These slack resources provide flexibility to SMEs related to strategic decisions.

have the capacity to grow SMEs faster than large firms if the firms are entrepreneurial, and the existence of such resources could promote growth (Penrose, 1995). Similarly, Daniel *et al.* (2004) identified that firm slack resources such as available (excess liquidity), recoverable (overhead expenditure) and potential (borrowing capacity) improve the firm's performance, measured by return-on-assets. Managers use these slack resources when a firm faces threats (from competitors) and exploit opportunities (pursue sales growth) to increase firm's size and its innovation abilities (Daniel *et al.* 2004). In particular, Daniel *et al.* (2004) examined the positive relationship between firm's slack-resources and its performance. They found that firm's potential and available slack resources have a strong association to firm's performance rather than with recoverable slack⁷. Overall, a resource based view of firm suggests that these resources cannot be bought, can only be built by the firm and cannot be easily transferred or built-up outside the firm (Harris, 2008).

Nevertheless, some researchers discussed the limitations of resource based view of the firm (Lockett *et al.* 2001). For instance, Lockett *et al.* (2001) stated the difficulties of resource based view (RBV) of firm in terms of empirical analysis. It is difficult to resolve the issue of causality between firm resources (*e.g.*, knowledge, skills) and competitive advantage and this causal ambiguity issue is a problem of identifying firm intangible resources (Lockett, 2001; Barney *et al.* 2001). Similarly, measuring firm knowledge based resources (intangibles) and their association with firm sustained competitive advantage requires longitudinal empirical analysis (both quantitative and qualitative) and this may require substantial time, funds and help of senior researchers (Truijens, 2003).

Wiklund and Shepherd (2003) emphasised the knowledge-based resources (*i.e.* intangibles) as primary resources to the firm's growth and innovative performance. These knowledge

⁷ Recoverable slack (*e.g.*, overhead expenditure) may already absorbed within the firm and thus require substantial organisational change (*e.g.*, downsizing).

based resources are the internal characteristics of the firm and facilitate its sustained competitive advantage (Wiklund and Shepherd, 2003). Moreover, Galunic and Rodan (1998) investigated three major characteristics of knowledge based resources, which are tacitness (knowledge is not codifiable), context specificity (*i.e.* knowledge is highly interactive and communicative), and dispersion (*i.e.*, spread out across the minds of many). Similarly, Hall (1993) argued that a firm's intangible resources such as IPR, business reputation, and know-how of employees, create organisational culture and sustains firm's competitive advantage. Further, Peteraf (1993) developed a theoretical model for firms' long-term sustained competitive advantage. This model identified the four cornerstones of firm performance through sustained competitive advantage. These are i) resource heterogeneity; ii) *ex post* limits to competition⁸; iii) imperfect mobility⁹, and iv) *ex ante* limits to competition¹⁰. In addition, this model refers to firms' superior resources (*i.e.* the four cornerstones), which are the following: limited in supply, facing lower competition, cannot be traded easily, and prior to any establishment of a superior resource position there must be limited competition for that position, which would result in higher rent (*i.e.* above normal profits) for firm performance.

In summary, the literature evidences (*e.g.*, Wiklund and Shepherd, 2003; Saleh and Ndubisi, 2006) on resource-based theory apparently shows that firm knowledge-based assets have a significant impact on the firm performance. Interestingly, overall, most of the researchers combined these knowledge-based resources (*i.e.* intangibles) into one common variable called "absorptive capacity", (Cohen and Levinthal, 1990; Zahra and George, 2008; Harris, 2008, Vinding *et al.* 2000). The next section discusses the role of absorptive capacity and its impact on firm labour productivity growth; antecedents of absorptive capacity are also discussed.

⁸ Firm's gains a superior position by earning high profits through limited competition in the market.

⁹ These resources cannot be traded and might less beneficial for other users and available to the firm for the long-term.

¹⁰ To maintain a firm's superior resource position there must be limited competition

Section 2:

2.3. Absorptive Capacity

This section discusses absorptive capacity in the context of the resource based view (RBV). The literature survey identified various instruments of absorptive capacity; these instruments are called drivers of firm growth. Furthermore, the literature indicated the association between absorptive capacity and firm productivity. The previous section on the resource based view suggests that a firm should invest in intangible assets (i.e. knowledge based assets) to improve firm productivity growth. These intangible assets (knowledge based assets) refer to various antecedents of firm growth such as human capital (highly qualified and skilled employees), R&D, HRM practices, and cooperation with other firms and research institutions (networks) which improve the firm innovation activities (Harris and Reid, 2010; Fabrizio, 2009). Researchers (*e.g.*, Harris and Reid, 2010) argued that a firm's investment in knowledge based assets would not only enhance its firm existing stock of knowledge but it would also benefit from the external stock of knowledge.

Harris (2008) discussed whether intangible assets¹¹ were important to firm growth and productivity. Harris (2008) stated that a related concept which is closely linked to intangible assets is known as absorptive capacity. This absorptive capacity refers to the process of internalising external knowledge (Harris and Li, 2006). In comparison, Cohen and Levinthal (1989, 1990) introduced the concept of absorptive capacity first time as referring to “firm ability to recognize, assimilate, and apply new scientific information for the purpose of innovation and new product development” (Agrawal, 2001). Similarly, this absorptive capacity refers to the use of knowledge based assets and improving firm innovation performance (Aghion and Howitt, 1992). Moreover, Escribano *et al.* (2009)

¹¹ This can be defined as knowledge embodied in intellectual assets, such as R&D and proprietary know how, intellectual property, workforce skills, world class supply networks and brands

argued that no single antecedent of absorptive capacity is superior to all others under all circumstances when measuring absorptive capacity.

In addition, Zahra and George (2002) developed a conceptual model of firm's absorptive capacity. The model shows that potential (knowledge acquisition and assimilation) and realised (knowledge transformation and exploitation) absorptive capacity improves the firm's innovative performance. This conceptual model has also identified the antecedents (knowledge & experience)¹² of absorptive capacity. These proxies influence the firm potential absorptive capacity and this relationship is moderated by activation triggers (*e.g.*, organisational crisis, redefining firm strategies, and radical innovation). Similarly, the relationship between potential and realised absorptive capacity is moderated by social integration mechanism (*e.g.*, firm's social networks). Overall, this model distinguishes the firm potential and realised absorptive capacity and showed its significant impact on the firm sustained competitive advantage (Zahra & Geroge, 2002).

Additionally, a number of researchers empirically tested whether investment in R&D increases a firm's absorptive capacity and profitability and found that R&D as important antecedent for measuring absorptive capacity (Koch and Strotman, 2008; Kodama, 2008; Leahy and Neary, 2004; Caloghirou *et al.* 2004; Stock and Greis *et al.* 2001; Tsai, 2001). However, SMEs cannot afford to invest in R&D due to resource constraints and forming strong collaborations such as intra- and inter-firm relations, and university-industry linkages may increase firms' absorptive capacity (Geroge and Zahra, 2002). Similarly, Upadhyayula and Kumar (2004) used social capital¹³ as an antecedent of the absorptive capacity of firms. Social capital refers to firms social relations through inter-intra firm

¹² Knowledge refers to firm external knowledge sources, which include acquisitions, purchasing, through licensing and inter-organisation relationships (R&D alliances, joint ventures). Similarly, firm experience shows firm past experience in terms of search for technological developments, information and firm experience of learning by doing.

¹³ The ability of people to work together for common purpose in groups and organisation is called social capital (Fukuyama, 1995).

networks and university-industry linkages. Firms' social networks increase their potential (acquisition and assimilation) and realised (transformation and exploitation) absorptive capacity (Upadhyayula and Kumar, 2004). Nevertheless, in developing countries the problem of weak university-industry linkages exists because a communication gap or scarcity of resources hinders the growth of SMEs. Schiller (2006) emphasised the role of university-industry linkages (UIL) for innovation performance of SMEs. However, he argued that there is a wide gap between the absorptive capacity of private firms and knowledge production universities. In developing countries, universities conduct less research than teaching and a low quality of human capital may affect network relationships.

Furthermore, most of researchers argued that absorptive capacity is a multidimensional construct and identified proxies for measuring firm absorptive capacity and its association with firm innovative performance, proxies such as i) licensing; ii) R&D cooperation; iii) inter firm relationships and; iv) knowledge-driven acquisitions (Fosfuri and Tribo, 2008; Nieto and Quevedo, 2005, Matusik and Heeley, 2005; Maes, 2008). The researchers argued that firms having a high absorptive capacity would have a competitive advantage compared to firms with a low level of absorptive capacity. In support of this argument Matusik and Heeley (2005) also called absorptive capacity a multidimensional activity of the firm, which means that new knowledge creation and its input depends upon the level of R&D intensity, individuals working in the firm, structure of the firm (i.e., formal or informal), and relationship to external environment (through networks). Vinding (2000) proposed a model for absorptive capacity, in which R&D efforts, HRM practices, external networks of firm, a high level of education of employees, and experience result in better absorptive capacity of the firm.

Regarding the link between R&D and absorptive capacity, Bougrain and Haudeville (2001) suggested that R&D is usually underestimated in SMEs because although small firms do not have formal R&D department or budgeting related to R&D intensity, this may not accurately reflect the impact of innovation and absorptive capacity on firm performance. In addition, they argued that communication among employees and their level of skills must be measured along with R&D intensity for innovation and absorptive capacity. In contrast, the absorptive capacity of SMEs can be determined through various indicators such as i) the experience and formation of owners and employees; ii) technology embedded in equipment; iii) organisational capabilities; iii) learning and innovation activities; and v) linkages established with other local firms (Fuentes and Dutrenit, 2007). Maes (2008) refers to R&D as one of the proxies for measuring absorptive capacity and source of obtaining benefits from external knowledge flows through clients, suppliers, competitors, universities, and other research institutions. Maes (2008) further states that SMEs face resource constraints and require a greater source of external knowledge to improve the firm's absorptive capacity and innovation (Maes, 2008). Similarly, Liao *et al.* (2003) suggested that intra-firm dissemination and external knowledge acquisition may increase the absorptive capacity of SMEs and makes them more proactive. They stated that absorptive capacity is a process and a diverse activity, and that each antecedent is equally important to the firm growth.

Furthermore, Harris and Li (2009) measured absorptive capacity using factor analysis¹⁴ method. They identified the proxies of absorptive capacity such as firm internal and external knowledge sources, networks, HRM strategies and university-industry linkages, and firm undertaking R&D. Further, Harris's (2012) empirical study on Scottish firms showed the positive impact of R&D and/or exporting on a firm productivity. His findings

¹⁴ Principal component factor is used to investigate the relationship between variables and factors. Factors are linear transformation of the variables and this transformation is exact with no error terms.

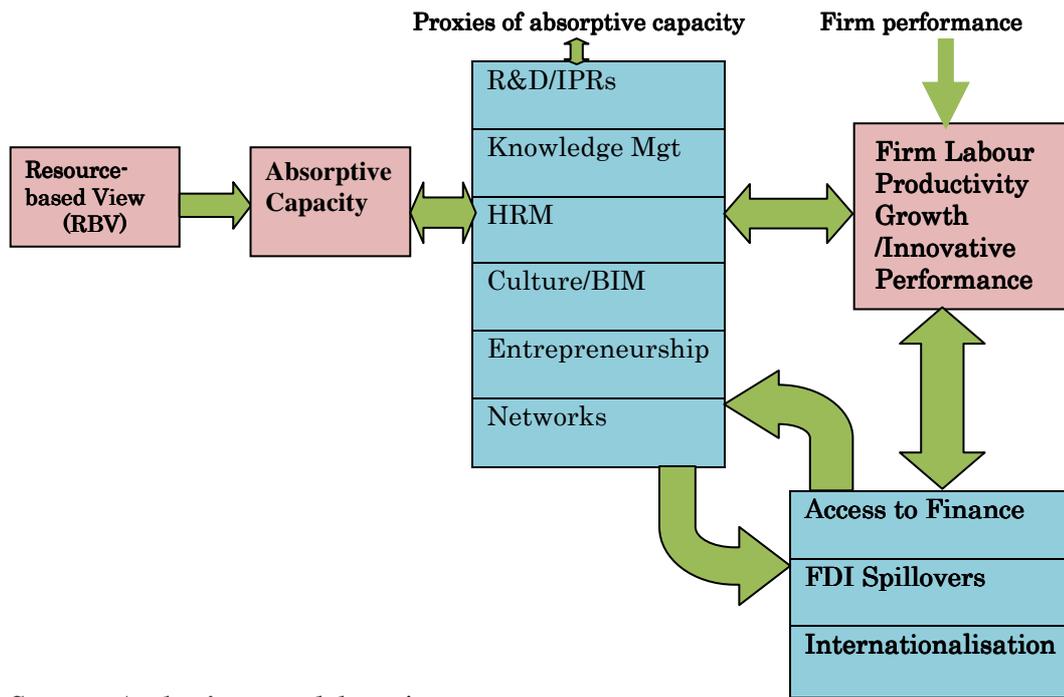
suggest that absorptive capacity has an indirect impact on firm productivity, which operates through its affect on determining R&D and/or exporting. Moreover, Harris *et al.* (2012) investigated that firm linkages with higher education institution (*e.g.*, universities) have a significant impact on the firm's productivity (TFP). Thus empirical findings from the literature suggest that a firm with higher absorptive capacity (collaboration with Universities, undertaking R&D, network with other firms) are more likely to have a higher productivity growth. However, this study have mainly analysed the manufacturing sector, and do not focus on the analysis of software industry.

The previous discussion has defined the importance of absorptive capacity in firm growth and identified various indicators to measure this variable. The literature survey investigated proxies such as R&D, networks, HRM, human capital, IPRs, knowledge management and others. However, these examples of literature were not specifically focused on the services sector (IT industry). This motivated the research question as to whether software firms have higher absorptive capacity and what expected link with firm labour productivity growth is. Supported by the literature findings (*i.e.* absorptive capacity has a positive impact on firm labour productivity growth and innovation performance), two hypotheses are developed to examine the association between firm absorptive capacity and firm innovative performance (product/process output) and labour productivity growth. The hypotheses are as follows:

H1: A firm with higher absorptive capacity has a positive impact on the firm's labour productivity growth

H2: A firm with higher absorptive capacity has positive association to firm innovative performance

Figure: 2.1: Conceptual framework (drivers of firm growth)



Source: Author's own elaboration

In addition, Figure 2.1 above provides information on the determinants of firm performance. In this conceptual framework, absorptive capacity is derived from the resource-based (knowledge-based) view of firm. This absorptive capacity is defined as the firm ability to internalise the external knowledge. Furthermore, Figure 2.1 shows the proxies of absorptive capacity which are the knowledge-based assets (*i.e.*, intangible assets) of the firm. The proxies used here are i) firm undertaking R&D; ii) intellectual property rights (IPR); iii) knowledge management; iv) human resource management (HRM); v) culture; vi) business improvement methods and so forth.

In turn these antecedents of absorptive capacity are linked to firm performance. This two-way link (see Figure 2.1, arrows in both directions) presents the causal relationship between 'absorptive capacity' and its 'proxies' and also shows the causal link between 'proxies' of absorptive capacity and 'firm performance'. The firm performance is measured by the firm's labour productivity growth and innovation performance (*e.g.*, product/process innovations). For instance, a firm undertaking R&D would have a higher

absorptive capacity; likewise, a firm with high absorptive capacity is engaged in R&D. Similarly, a firm undertaking R&D has a higher firm performance and vice versa. The remaining proxies of absorptive capacity show the same causal relationship between variables and interpretation.

Furthermore, Figure 2.1 shows the causal relationship of variables such as ‘access to finance’, ‘FDI spillover’, ‘internationalisation (outward FDI and exporting)’ with proxies of absorptive capacity and firm performance. The causal relationship between proxies and/or absorptive capacity shows that a firm requires external finance for investment in knowledge based assets. A firm with access to finance undertakes more R&D, knowledge management, formal HRM-practices, culture and business improvement methods. In other words, a firm with sufficient financial resources would likely to have higher investment in knowledge-based assets and firm performance. Additionally, the role of entrepreneurship (i.e., innovative abilities) and networking (*e.g.*, R&D alliances) requires financial resources for higher firm performance and absorptive capacity and vice versa. Overall, access to finance has a causal and significant impact on the firm performance and knowledge-based assets (as shown in the Figure 2.1 as proxies).

In contrast, Figure 2.1 provides the causal relationship between FDI spillovers and domestic firm performance. For example, in the host economy foreign firm’s presence improve the performance of domestic firms through linkages. Similarly, FDI spillovers have a causal link to proxies of absorptive capacity: domestic firm with higher investment in knowledge based assets (proxies) would gain more benefits from FDI spillovers. Additionally, the causal link between proxies of absorptive capacity and firm internationalisation shows that a firm with higher absorptive capacity or investment in knowledge-based assets (proxies) is more likely to engage in exporting and outward FDI.

On the other hand, firm internationalisation (exporting and outward FDI) has a causal relationship to firm performance (see Figure 2.1).

In summary, this conceptual framework identified the key drivers of firm growth and their significant association to firm performance. A number of researchers (*e.g.*, Kinoshita, 2001; Sparrow, 2001; Mathew, 2007; Harris *et al.* 2012; Burns, 2007 and Fabrizio, 2009) argued that firms with higher investment in knowledge-based assets (proxies) have a higher firm performance. These knowledge-based resources provide firm sustained competitive advantage, and improve their organisation internal and external stock of knowledge. Previous empirical studies investigated the positive relationship between antecedents of absorptive capacity and firm performance. In contrast, firm access to finance, FDI spillovers and internationalisation have a positive impact on the firm performance (Wiklund and Shepherd, 2005; Kokko, 1994; Harris and Reid, 2010). Overall, these studies are limited in approach, in terms of analysis of the services sector (*e.g.*, software industry). Therefore, this conceptual framework is applied to investigate the performance of small and medium-sized software firms. In the literature, SMEs resource constraint apparently suggested that small firms have poor absorptive capacity than large firms and require sufficient funds for higher firm performance (*e.g.*, Beck and Kunt, 2006).

Lastly, this conceptual framework also provides the mind map of the literature and hypotheses are drawn from this framework. The literature survey is structured in a sequence, in which variables are appeared in the framework (see figure 2.1). This mind map of the literature survey provided discussion on some additional and important determinants of firm performance such as firm leadership abilities, lifecycle and strategic resources. These variables (*e.g.*, leadership) are also linked to antecedents of absorptive capacity and have a positive impact on the firm performance. This framework is further explained (*i.e.*, using studies of Harhoff, 1998; Vanharanta, 2001; Harris, 2012 and so forth

from the literature) by looking into the determinants of labour productivity and firm innovation performance.

2.3.1. Role of R&D in firm productivity and innovative performance

This sub-section discusses R&D as a proxy of absorptive capacity (i.e. a firm's ability to internalise external knowledge) and its relationship with the firm's innovation and productivity growth. From the perspective of input resources, one of the most common indicators used to measure firm innovation is R&D expenditure (Domingo and Borrás, 2007). In particular, R&D intensity (i.e. R&D spending as a proportion of the total sales turnover) and innovation output improve the firm's profitability and long term growth (Harris and Trainor, 1995). Additionally, a number of researchers have argued that R&D is an important intangible asset (as input) which has a significant association with firm growth and innovation (De Clercq *et al.* 2005; Bhattacharya *et al.* 2004; Harris, 2005; Audretsch, 1995; Harris and Trainor, 1995). While some researchers suggest the positive role of R&D on firm growth and found that R&D intensity falls with an increase in firm size (Yang and Chen *et al.* 2005; Kim and Lee *et al.* 2004; Kim, 2000; Franco, 1996; Roper, 1999). For example, Kim (2000) conducted a study on Korean SMEs in the information and technology sector (i.e. software firms) and argued that SMEs have lower R&D employees compared to the large firms but their ratio of R&D employees to total employees is much higher than large firms. Moreover, in the case of software firms R&D intensity was found to be higher for SMEs than larger firms. However, Kim's (2000) finding says little about the availability of financial resources for SMEs because small firms are usually at a disadvantage when it comes to investment in R&D and have a lower innovative performance (Dundas, 2006). In comparison, Cohen *et al.* (1987) conducted a study on 2494 business units and investigated whether business unit size had a significant

association with R&D intensity: the study considered fixed industry effects¹⁵ or measured industry characteristics¹⁶ in its analysis. Overall, Cohen *et al.* (1987) suggest that industry effects have a significant influence on firm's R&D undertakings.

Nevertheless, Roper (1999) and Franco (1996) argued that small firms usually lack a formal R&D department and might also underreport their R&D expenditures. In small firms, R&D work is often mixed with other activities and carried out without a formal R&D budget (R&D being paid out for out of the cash flow), frequently occurring outside the regular working hours (Kleinknecht, 1987). This is why Kleinknecht (1989) emphasised the importance of formal R&D in SMEs like as in large firms and further explained its importance in overcoming barriers to innovation such as scarcity of capital, lack of qualified management and trained staff. In comparison, Hoffman *et al.* 1998 argued that SMEs do not necessarily innovate in a formal way by investing on R&D and can rely on networks such as linkages with other firms/research institutes, which may improve their innovations output. Further, Lane and Lubatkin (1998) argued that R&D alliances (through inter-organizational learning) will increase the firm's innovative output and absorptive capacity, if these small firms are reluctant to invest alone in R&D.

On the other hand, a number of researchers argued that R&D performs two major functions: it generates new knowledge through product/process innovation and increases the firm absorptive capacity, and hence innovative performance (Cohen and Levinthal, 1989; Stam & Wennberg, 2009; Argiles *et al.* 2009; Kinoshita, 2001). According to Cohen and Levinthal (1989), a firm must invest its own R&D in order to obtain benefits from output of its competitors. In support of Cohen and Levinthal's (1989) argument about the two faces of R&D, Kinoshita's (2001) panel data analysis of Czech manufacturing firms

¹⁵ Representing business unit sales and transfer, firm sales and company-financed R&D expenditures

¹⁶ Information included on technological opportunities such as closeness to science (basic science biology, geology etc.), external sources of technical knowledge (equipment, govt. agencies etc.) and industry maturity (in terms of plant etc).

found that the learning effect of R&D (i.e., absorptive capacity) is more important than the innovative effect of R&D in explaining the productivity growth of a firm. Kinoshita (2001) empirical finding clearly indicate that firm's should engage in R&D for higher absorptive capacity and firm performance. Similarly, Griffith *et al.* (2004) provided econometric evidence related to the two faces of R&D for 12 OECD countries through panel data analysis. Their study suggests that R&D improves firm productivity (TFP) through innovation and indirect effect of technology transfer. Harhoff (1998) investigated the significant relationship between R&D and labour productivity growth through panel data analysis of West German manufacturing firms. Harhoff (1998) found R&D to be an important determinant of productivity growth and innovation and concluded that R&D had a significant and large effect on labour productivity growth. Gatignon and Xuereb (1997), in an empirical study conducted through a postal survey of 393 USA firms, argued that R&D was a major resource for a firm's competitive advantage. Their study found that a firm, as well as R&D, requires better strategic orientation (i.e. bases upon customers, competitors, and technological superiority) for new product development. Firms with better strategies have a relative advantage over firms without strategic orientation for radical innovations.

Schumpeter (1942) held that small firms a have resource constraint (low level of R&D) and are less innovative than large firms. Muller & Zimmermann (2008) conducted a study on German SMEs, examining the relationship between equity ratio¹⁷ and R&D intensity. They found that small and young firms rely more on equity finance for financing their R&D projects than debt financing. The firm's equity ratio has a positive influence on R&D intensity and the influence is greater in younger firms. In support of Muller and Zimmermann (2008) empirical results, Harris and Trainor (1995) conducted a panel data analysis of manufacturing firms in Northern Ireland. They argued that R&D grants from

¹⁷ Equity ratio is measured by owner equity divided by total assets.

government agencies are more beneficial in increasing R&D spending and innovation output than R&D financing (through external sources), because it is difficult to obtain R&D finance due to its risky nature (i.e. R&D takes a long time to generate results).

In contrast, some researchers have argued that small firms have an innovative advantage because of entrepreneurial skills, internal flexibility and greater responsiveness to changing environments (Cooper, 1964; Rothwell, 1989; Levy and Powell, 1997, Smallbone and Welter, 2001). Levy and Powell (1997) suggested that the use of information systems and information technology in SMEs may improve organisational flexibility and overall firm performance. However, a lack of strategic planning and lower investment in IT affect SMEs' performance (as quoted in Hagmann and McCahon, 1993). Moreover these small firms usually comprise family members; these family owned businesses are less productive and innovative because of centralised decision making and use of informal procedures (Robson and Haugh, 2008; Lane *et al.* 1998).

On the other hand, some researchers stated that R&D undertaking improves a firm's export performance; a positive relationship between size and export suggests that large firms are more R&D intensive and innovative and have higher export performance than small firms (Ngoc *et al.* 2008; Chih, Jong, and Wen, 2004). In addition, R&D investment and related capabilities such as R&D collaboration, R&D strategies, technological knowledge intensity and acquisition of knowledge from different sources of information may increase the export performance of SMEs (Lefebvre and Lise, 1999). In contrast, Perez *et al.* (2012) investigated the causal relationship between firms engaged in R&D and exporting. They conducted a firm-level study of 10867 Spanish manufacturing SMEs using panel data analysis techniques. Their empirical findings from bivariate probit estimates revealed that a firm engaged in R&D (exports) activities would improve the firm's exporting (R&D) activities.

Overall, examples from the literature have identified R&D as an important determinant of firm productivity and innovative performance. A firm undertaking R&D improves the firm's internal and external knowledge sources through product/process innovations. For instance, a number of studies investigated the positive relationship between firms undertaking R&D and firm performance (De Clercq *et al.* 2005; Harris, 2005; Harhoff, 1998). However, these empirical studies have provided little evidence in terms analysis of services sector (software industry). The overall conclusion emerges in the literature that firm being engaged in R&D has a positive impact on the firm's labour productivity growth and innovation performance. The proposed hypotheses derived from the literature are as follow:

H3: R&D undertaking has a positive relationship with firm labour productivity growth

H4: R&D undertaking has a positive association with the firm innovative performance

2.3.2. Role of Innovation on firm productivity growth

Innovation is an important resource for a firm's competitive advantage (Katila and Shane, 2005). Innovativeness reflects a firm's tendency to engage in and support new ideas, novelty, experimentation, and creative processes that may result in new products, services, or technological processes (Lumpkin and Dess, 1996). Wong *et al.* (2007) suggest that innovation is the combination of product and process innovations which improve the firm's knowledge learning abilities. It is argued that such product (i.e. new product/service development) and process (new technologies with low cost per unit) innovations increase knowledge and skills of employees; if they are employed in large innovative firms, later at some stage they might start their own businesses, which would improves the overall productivity in a economy (Wong *et al.* 2007). Additionally, researchers stated that innovation at macro level promotes economic growth through international trade (by selling competitive products/services in international markets) (Acs, Anselin and Varga,

2002). Radas and Bozic (2009) identified two main factors for firm innovation activities through a postal survey of 448 Croatian SMEs. Both categorised these factors into internal and external¹⁸ drivers of innovation. Furthermore, Radas and Bozic stated that market scope (i.e. marketing concepts or strategies) was an important factor in product and process innovation. Moreover, some researchers discussed the positive link between firm's growth (i.e., size, sales) and innovation, and stated that large firms were more innovative than small ones (Robson *et al.* 2008; Morone and Testa, 2008). Highly innovative and large firms attract more entrepreneurial individuals and this in turn reinforces the innovativeness of companies because product and process innovation requires plant level heavy investment on fixed assets and large firms have an advantage in this (Robson *et al.* 2008).

On the other hand, Hadjimanolis (1999) investigated the barriers to innovation in SMEs and divided these barriers into two categories; internal (lack of funds, lack of technical expertise and R&D) and external (customers, suppliers and environment-related *e.g.*, government regulations). Hadjimanolis (1999) argued that these barriers have more effect on the performance of SMEs than large firms due to resource constraints. Similarly, Radas and Bozic (2009) identified internal and external¹⁹ obstacles to innovation in developing and transition economies. Additionally, Freel (2000) investigated the barrier to innovation in SMEs by conducting a study on 238 firms in the West Midlands region of England. He found that the resource constraint to SMEs innovation can be broken down into four categories: finance, management and marketing, skilled labour, and information (i.e. external information through linkages). Further, these four barriers would affect the innovative performance of SMEs more than that of large firms (Freel, 2000).

¹⁸ Internal and external factors: Internal factors consist of firm age, high qualified scientist/engineers, strong leadership, strategy and R&D investment and external factors include collaboration with other firms, universities, financial resources etc.

¹⁹ Internal such as lack of qualified staff, lack of information concerning technology and lack of information concerning market and external for instance, innovation costs are too high, lack of appropriate finance and insufficient support from government

In contrast, small firms can improve their innovative performance through networking with customers, suppliers, universities and by increasing their management capabilities (Rammer *et al.* 2009). These product and process innovations through such strong networks can enhance the performance of SMEs (Winter and Stam, 2007; Simmie, 2001). In particular, entrepreneurs are able to make strong links with other sources of innovation (customer, suppliers) which can influence the firm's innovative performance (Quayle, 2002). Quayle (2002) conducted a study on 400 UK SMEs and argued that these suppliers are the source of input (i.e. provide raw material) to the firms and effective purchasing (i.e. minimising the cost of purchasing based on priority purchasing within SMEs) from such suppliers would increase the firms' profitability. However, small firms do not have separate purchasing department which have professional approach of purchasing of raw material because small firms are usually owned by family members who are responsible for the purchase of goods (Quayle, 2002). In addition, Hussain (2000) discussed that small firms' linkages between themselves (horizontal links) and with large firms (vertical links) may increase their market share, and improve their investment and technological developments. Further, the resource constrains of SMEs can be overcome through strategic alliances (*e.g.*, joint ventures), subcontracting and clustering (*e.g.*, one geographical location facilitate knowledge transfer) and in turn these linkages should improve the firm performance (Hussain, 2000).

On the other hand, Acs and Audretsch (1987) modified the Schumpeter hypothesis relative to large firms being more innovative than small firms. Large firms are more innovative in imperfect competitive markets²⁰ whereas small firms have the advantage in more closely approximating competitive models²¹; further large firms relatively are more innovative in industries which are capital intensive, concentrated and advertising intensive and produce

²⁰ Imperfect competitive markets: most of the firms in such market structures sell differentiated products. In such industries, the firm itself must decide on the characteristics of the product it will sell.

²¹ Less power for individual firms to influence the market price, and majority of firms selling the homogeneous products

differentiated product (Acs and Audretsch, 1987). Acs and Audretsch (1987) suggested that small firms have a relative innovative advantage in highly innovative industries composed of a high proportion of large firms. To investigate the relationship between firm growth and innovation, Morone and Testa (2008) carried out a survey of 2600 Italian manufacturing SMEs and found a positive link between firm growth (i.e., sales growth) and innovation. Morone and Testa (2008) categorised innovation into 5 major strategies as follows: i) product innovation; ii) process innovation; iii) organisation change; iv) marketing innovation, and v) knowledge strategy. All these five strategies have a different impact on a firm's growth and depend upon the level of expenditure on each strategy (Morone and Testa, 2008).

Moreover, Hagedoorn and Cloudt (2003) identified the indicators of firm innovative performance such as i) R&D intensity; ii) use of raw patents counts; iii) using patent citations and; iv) count of new product development. Their study argued that patent citation is a more appropriate indicator than patents counts (i.e. generating a quantitative measure only) because patent citation considers the measure of the quality of patents. Nonetheless Acs, Anselin and Varga (2002) found through regression analysis that patented inventions were fairly reliable measure of innovative activity, but that these patents counts cannot be the perfect representation of innovative activity, because technological collaboration among firms, undertaking R&D must be considered when measuring firm innovative performance.

In summary, this subsection of R&D identified that innovation is a key factor for firm growth. The empirical studies (*e.g.*, Robson *et al.* 2008) showed that innovative firms are successful in terms of their productivity performance. In particular, examples from the literature show that SMEs are less innovative than large firms and barriers of innovation (*e.g.*, obtaining finance, lack of information) should be removed for higher firm

performance. Overall, findings in the literature suggest that innovation is a key driver of firm growth and firm engage in R&D would likely to have positive impact on the firm's productivity and innovative performance (see hypotheses 3 & 4).

2.3.3. Intellectual Property Rights (IPR)

Daghash (2000) defined IPR (intellectual property rights) system as legal rights which results from intellectual activities in the industrial, scientific, literary, and artistic fields. Intangible assets, in particular, patents and licensing are the proxies of absorptive capacity and may be use as an indicator of firm innovative performance (Fosfuri and Tribo, 2008). Escribano and Fosfuri *et al.* (2009) empirically tested whether a firm would have a more absorptive capacity if it operates in a highly turbulent environment (i.e. firms are active in explorative knowledge) and with strong IPR protection. Escribano *et al.* (2009) argued that innovation was an important driver of firm growth and firms can protect the amount of information disclosed through IPR. In contrast, Jensen and Webster (2006) suggested that SMEs were more likely to apply for patents, trademarks and for registered designs because of a high potential of innovation than are large firms. They conducted a study on Australian industry by using sector level data and stated that SMEs are more innovative than large firms and used the IPR system, because the government has provided greater incentives to SMEs than large firms for obtaining IP protection. In comparison, large firms may have an advantage of low marginal cost due to heavy investment in human and physical resources of the business and the owner managers may be more aware of intellectual property rights, but no empirical evidence for this shown in the analysis of Australian firms (Jensen and Webster, 2006). Overall, Jensen and Webster's (2006) study implies that SMEs require more financial incentives from the government for improving innovation performance and this is rare in developing countries. On the other hand, Ghoneim (2003) proposed three major problems of small firms in protecting their innovative products such as i) size of firm, ii) facing segmented factor markets and, iii)

biased government policies. Moreover, in developing countries banks do not finance intangible assets because of high risk (Ghoneim, 2003).

The strategic utilisation of IP assets can substantially enhance the competitiveness of SMEs and these intangible assets are more valuable than tangible assets (Hung, 2007). In fact a good brand, a trade mark and so forth will increase the reputation of a business in terms of customer satisfaction and will attract more investors. However, the SME sector in developing countries does not have an adequate system of monitoring IP infringements; most of the SMEs neither understand what IP is nor have a licence (Hung, 2007). Firms with an IP licence can gain better access to international markets because of meeting the international standards of legal rights protecting their products and services. In developing countries, SMEs face problems of low literacy rate, lack of entrepreneurship, financial constraints; the high cost of lawyers and so on, which acts as obstacles to SMEs owners to safeguarding their products. Moreover, the role of the WIPO is important in providing legal and technical assistance to SMEs to modernise their IPR system and guarantee high returns.

2.3.4. Knowledge Management

Previous studies on R&D discussed whether R&D generates new knowledge and a firm with new knowledge could enhance its productivity (Maes, 2008; Harris and Trainor, 1995). However, managing knowledge is always challenging for firms whether small or large and an effective way of managing knowledge increases firm performance (Sparrow, 2001). Sparrow (2001) conducted a qualitative research on knowledge management in SMEs and suggested that ‘appreciation of individuals and shared understanding’, ‘effective knowledge base and system’, ‘integrated and contextualised action needed for knowledge projects’, and ‘effective learning process’ are the major components of knowledge management and these could enhance the success of firms. Furthermore, Vanharanta and

Koskinen (2002) argued that the role of tacit knowledge²² is important for the firm's innovative performance. They argued that tacit knowledge improves the innovation process through six steps: 'invention', 'decision to bring the invention into development', 'development', 'decision to produce', 'production', and 'marketing'.

Additionally, Gloet and Samson (2012) conducted a study on 122 Australian firms in the services sector. Their study has examined the positive relationship between knowledge management and firm innovation performance. Further, Gloet and Samson (2012) argued that knowledge management is a multidimensional construct and organisation explicit (IT-related) and implicit (people-driven) knowledge have a positive impact on the firm's performance. Knowledge management includes organisation strategies, use of information technology, effective HRM practices²³; employees knowledge sharing/teamwork, organisational structure (*e.g.*, democratic), senior management support and so forth are important determinants of firm innovative performance (Gloet and Samson, 2012). Furthermore, their empirical study suggests that organisation implicit knowledge (people-driven) has a key role in knowledge sharing across the organisation because of human interaction even if it is mediated by technologies.

In addition, Fathian *et al.* (2007) stated that knowledge is an important resource for a firm's competitive advantage and if this knowledge was properly utilised and transferred throughout the organisation, this could lead to better firm innovative and productivity performance. Fathian *et al.* (2007) conducted a research study through a postal survey of

²² It represents the individual experience, evaluation and attitudes of human actions, their views, commitments, motivation. Gourlay (2004) provided a definition of tacit knowledge which is 'Tacit knowledge is a non-linguistic non-numerical form of knowledge that is highly personal and context specific and deeply rooted in individual experiences, ideas, values and emotions.' Similarly, Nold (2012) defined tacit knowledge as non-codified; exist in the mental model, experience, habits of individuals and groups.

²³ A human resource management (HRM) practice enriches knowledge management through effective recruitment and selection, appraisal and reward system. Further, training and development support knowledge management. Managers should connect HR-activities to overall organisational strategies for maximising the benefits of training and development for improving organisation learning process, and managing knowledge effectively and efficiently.

26 Iranian SMEs from the IT, communication and electronics fields and found that SMEs support tacit knowledge more than explicit knowledge. This study investigated the positive relationship between knowledge management and CEO support, organisational mission, training and employee participation using multiple regression analysis. In addition Valkokari and Helander (2007) emphasised on the role of knowledge management as a key resource to the firm growth. They argued that knowledge sharing could improve the firm networks and performance. A firm can perform better through its new product and services when it has strong networks and networks transfer and shares knowledge through intra-and inter-firm's linkages (Valkokari and Helander, 2007).

Furthermore, Salojarvi *et al.* (2005) conducted research on 108 Finnish SMEs and examined whether there was positive relationship between knowledge management and sustainable sales growth. According to Salojarvi *et al.* (2005) SMEs could improve their financial performance and competitive advantage by using more conscious and systematic approach to knowledge management. Additionally, they argued that firms with better knowledge based assets (i.e. intangibles) who utilised these appropriately could achieve higher firm growth. These intangible assets were grouped into 3 categories i) human capital (employees competencies, commitments), ii) external capital (image, customer relations, and other external relations) and, iii) organisational capital (internal processes and management of the company) which could play an important role in the firm's overall performance (Sveiby, 1997). In summary, the empirical studies Salojarvi *et al.* (2005); Vanharanta (2001) and Gloet and Samson (2012) showed that knowledge management have a positive impact on the firm labour productivity growth and innovation performance. The following hypothesis is to be tested:

H5: Knowledge management has a positive impact on the firm labour productivity growth and innovative performance

2.3.5. Human Resource Management (HRM)

Human resource management plays an important role in improving a firm's absorptive capacity (i.e. the firm's ability to internalise external knowledge). For instance, Cohen and Levinthal (1990) argued that diversified knowledge of employees within the firm has a positive effect on the firm's absorptive capacity and one way of taking advantage of this was through job rotations and hiring the best quality human resources. HRM practices (e.g., recruitment, selection, training & development) improve human skills and employee's behaviour may provide the firm with a sustained competitive advantage which is linked to a resource based view of the firm (Barney *et al.* 2001). Additionally, a firm can experience rapid growth in sales by building up its staff by hiring specialised personnel (Fombrun and Wally, 1989). Fombrun and Wally (1989) conducted a cross-sectional study of 95 small firms in the USA and found that rapidly-growing firms (i.e. with consistent growth in sales) attracted more highly skilled staff because these high growth firms used a more formal appraisal and reward system in their internal structures.

According to Mahmood (2008), a firm's labour productivity increases when a firm hires a skilled labour force and utilises better technology through capital-intensive projects. It is argued that SMEs have low skilled labour forces compared to large firms because small firms adopt more informal recruitment and selection procedures (Mahmood, 2008). This is particularly the case in family owned businesses where family members hire workers through informal HR-practices (Harris and Reid, 2007). Furthermore, a number of researchers argued that lack of formal HR-practices in SMEs reduces the firm's growth due to problems such as low wages & remuneration and lack of training and development of employees (Bartlett and Bukvic, 2001; Bari *et al.* 2005). Moreover, some researchers (e.g., Bartlett and Bukvic, 2001) argued that in these small firms the owner-managers are usually responsible for HR, marketing and finance activities and their non-professional approach or lack of expertise in specialised areas may reduce the firm growth. In contrast,

Feligoj *et al.* (1997) stated that a company should enjoy a competitive advantage in a market when a firm increases its HRM activities (employment and benefits). However, SMEs cannot afford to have formal HR-departments, as is usual in the corporate sector, because of financial constraints. Weeks (2003) stated that SMEs are less efficient compared to large firms because small firms provide a lower quality of jobs, and may produce incremental innovations by utilising less economies of scale.

Similarly, Shane (2009) emphasised the role of providing quality jobs in SMEs and small firms run by poor quality of entrepreneurs (with less managerial experience) may have a lower overall effect on economic growth. The workers in small firms receive low fringe benefits and occupy less secure jobs than those in large firms because SMEs adopt more informal recruitment and selection procedures (through friends and family member contacts) in order to avoid the heavy cost of recruitment (Vinten, 1998). In other words, SMEs have less formalisation of HR practices. HRM formalisation means formal, sophisticated and innovative practices through better quality of human resources and having a HR-department or HR manager (De Kok *et al.* 2003). In comparison, small firms are less focused on HRM because of flexible organisational structure; however, sometime this flexibility of organisation may cause instability in SMEs due to few formal procedures or systems within which to work (Wilkinson, 1999). Overall, literature examples show that human resource management is an important resource for a firm's growth and that SMEs require more to invest in formal HRM procedures.

2.3.6. Training Employees

The aim of training is to develop employees' knowledge, skills and attitude necessary for effective firm performance through the most cost effective means available (Tyson and York, 2000). One way of investing in absorptive capacity is to send employees for advanced technical training and this would improve firm productivity (Cohen and

Levinthal, 1990). In addition, Majumder (2004) argued that improving employee's skills through training and development would improve the organisational performance. Furthermore, Freel (2005) conducted a postal survey of British SMEs by analysing the relationship between training employees and firm innovative performance and suggested that formal or informal employee's training increased the firm's innovative performance (product/process innovations).

On the other hand, Lee (2006) argued that government should provide subsidies to SMEs to help them meet training costs in order to develop their workforce. In fact, SMEs confront the challenge of low quality labour force: entrepreneurs are reluctant to invest in human development and look for external assistance from training institutions or MNEs (Lee, 2006). According to Lee (2006), the average cost of training per employee in small firms is much higher than in large businesses because of fewer employees and a low skilled labour force. The literature related to training and development suggests that small firms requires more assistance in training their employees compared to large firms; better trained employees improve the firm performance.

2.3.7. Organisation culture, leadership, and business improvement methods

Organisational culture is an important resource for a firm's sustained competitive advantage (Zahra et al, 2004) and for superior (i.e. high returns) financial performance (Barney, 1986). According to Barney (1986), three conditions are necessary for firm to achieve sustained competitive advantage and superior financial performance. First, culture must be valuable (*i.e.* add financial values to the firm), second it must be rare and third culture must be imperfectly imitable. Hall (1993) discussed the various characteristics of organisation culture such as the ability to manage change, the ability to innovate, team working ability, participative management style, perception of high quality standards and so forth, and these antecedents of culture contribute to a firm's competitive advantage.

Koebig and Chusmir (1987) defined organisation culture as “a system of shared values and beliefs that produces norms and behaviour and establish an organisational way of life”. Zaheer et al (2006) refer to organisational culture as the personality of the organisation. However, they argued that there is a wide difference between small and large firm culture. The SME sector has an informal culture (*e.g.*, without having specialised departments such as HR, marketing) and lower managerial skills than large firms. Furthermore, Cameron and Quinn (1999) identified four types of organisation cultures, these include, clan (teamwork), adhocracy (entrepreneurship), market driven culture (external maintenance with need for stability and control) and hierarchy (order and regulations). Small firm’s hierarchical structure is not well established because of an informal culture and the leadership style is not administrative which obstructs the growth of small and medium enterprises (Cameron and Quinn, 1999).

Additionally, Zahra *et al.* (2004) investigated the four dimensions of organisational culture in family firms, which are i) individual (i.e. individual excellence) versus ii) group orientation (i.e., stress collaboration, sharing knowledge); iii) internal (i.e. within firm boundaries) versus iv) external cultural orientation (i.e. customers, competitors, suppliers and markets). Moreover, Zahra *et al.* (2004) stated that group and external cultural orientation encourages firm’s innovative performance and entrepreneurial activities in such family firms appear to rely only on individual and internal cultural orientation. Similarly, Naveh and Erez (2004) emphasised the importance of cultural values (*e.g.*, innovation and attention to detail)²⁴ and their significant impact on organisational quality programs and productivity. Furthermore, Nold (2012) conducted a study on 28 large US manufacturing firms. Nold (2012) investigated that organisational culture provides the link between knowledge process (*e.g.*, knowledge creation, knowledge management and organisation

²⁴ Firm innovative culture promotes responsiveness to new opportunities, autonomy and risk taking. On other hand, attention to detail encourages a culture of compliance to organisation rules and procedures, precision and accuracy.

learning) and organisational performance (*i.e.*, price/earnings ratio). His study identified the elements of organisational culture such as i) altruism; ii) reciprocity; iii) trust; iv) openness; v) sociability; vi) motivation; and vii) commitment. In particular, the trust between management and among employees bridges the gap between knowledge processes and organisational performance (Nord, 2012). Overall, this study suggested that trust is an important factor of organisation culture, which assists the firm knowledge processes and its performance.

On the other hand, Mathew (2007) examined the relationship between organisational culture and productivity²⁵ and with quality²⁶ in a study of 464 Indian software firms. The organisation culture was measured through 8 factors: ‘empowerment’, ‘agreement (*i.e.* issues of the basis of mutual give and take)’, ‘integrity’, ‘organisational learning’, ‘concern for employees and trust’, ‘mission (*i.e.* goals, objectives)’, ‘customer focus’, and ‘high performance work orientation’ (Mathew, 2007). According to Mathew (2007), these 8 dimensions of organisational culture have a significant influence on productivity and positive impact on the firm quality. Furthermore, McAdam et al. (2010) developed a model for UK SME innovation. They argued that ‘people and culture’, ‘leadership’, ‘total quality/continuous improvement’ ‘knowledge and information’ ‘product and processes, improve the organisational innovation implementation. They conducted a postal survey of 395 UK SMEs, and found that these variables (*i.e.* culture, leadership, total quality improvement programmes) are connected with each other and have significant relationships with firm performance.

²⁵ In this study, perceptual productivity was used: organisation makes the best use of the capabilities, right people employed, resources are put to the best, and people are equally or more productive to similar other software firms.

²⁶ The organisations are responsible for caring for customers; complaints are addressed and business improvement methods used.

Nevertheless, Morris and Pavett (1992) examined a study of cross-cultural management styles (i.e. leadership, motivation, communication, decision making and controlling) between USA and Mexican firms and their impact on firm labour productivity²⁷. They found that Mexican firms' leadership abilities are more of an 'authoritative type'²⁸, compared to US firms which are of a 'participative type'²⁹. Their findings investigated the relationship of these two different cultures countries and found that the labour productivity was statistically significant to the style of management for both Mexico and USA. However, the labour productivity for USA firms was higher than for Mexican firms. This suggests that more a democratic style of leadership is an important resource for firm labour productivity growth. Similarly, participative leadership encourage employees to focus on individual and organisational goals, and this make them more to work harder (Sadikoglu and Zehir, 2010). Employees feel sense of ownership when there is open communication between employees and management and this reduce their fear of job insecurity and make them more productive (Goetsch and Davis, 2006). Furthermore, Rejas *et al.* (2006) conducted a study on 126 Chilean small firms. Their study suggested that participative (*e.g.*, leader involve subordinates in decision making) and supportive leadership (*e.g.*, establishing good relations with subordinates and satisfying their needs) abilities have a positive impact on the organisational effectiveness.³⁰

In contrast, Chapman and Khawaldeh (2002) examined the link between total quality management (i.e. business improvement methods) and labour productivity for Jordanian manufacturing firms. They developed a conceptual framework which measured elements of total quality management: i) employees participation; ii) education and training; iii)

²⁷ Ratio of direct labour hours per unit produced.

²⁸ Management tends to be more paternalistic and there is less freedom for employees. Their decision making, communication with employees is limited.

²⁹ Employee participation is important in decision making, and they are involved in setting organisational goals, and communications among employees are vertical direction.

³⁰ They measured organisational effectiveness through set of factors such as satisfaction of personnel, growth, image, and relative position of the organisation, economic, financial and budgetary situation.

organisational communication; iii) customer focus; iv) scientific approaches to decision making; v) scientific methods for quality control; vi) organisational commitment to quality and continuous improvement; vii) statistical methods for quality control and; viii) unity of purpose. These elements of business improvement methods were shown to have a positive impact on firm labour productivity for high TQM firms using multiple regression analysis (Chapman and Khawaldeh, 2002). In addition, Harris *et al.* (2012) discusses the effects of business improvement methods on innovation in SMEs. Business improvement methods (BIM) includes the following processes such as ‘to focus customer needs’, ‘management involvement’, ‘continuous improvement’, and ‘employee involvement’ (Harris *et al.* 2012). Harris *et al.* (2012) finding³¹ suggests that business improvement methods improve the firm efficiency and innovativeness (i.e., productivity).

Furthermore, Sadikoglu and Zehir (2010) examined³² the positive relationship between total quality management practices and firm multiple performance measures (customer & employee’s satisfaction and innovative performance). Their study identified 8 factors of total quality management through extensive literature survey such as i) leadership; ii) training; iii) employee management; iv) information and analysis; v) supplier management vi) process management; vii) customer focus and; viii) continuous improvement have a positive impact on overall firm performance (Sadikoglu and Zehir, 2010). Similarly, Hoang and Igel *et al.* (2010) emphasised the importance of total quality management practices (*e.g.*, customer focus, employees’ involvement, education and training) for higher firm innovation performance. The study³³ of Hoang and Igel *et al.* (2010) suggests that

³¹ Harris *et al.* (2012) conducted a study on 606 SMEs from Republic of Ireland, Northern Ireland, and West of Scotland. He used multinomial logit model to investigate the relationship between business improvement methods (BIM) and firm innovation (*e.g.*, undertaking R&D). Further, Harris *et al.* (2012) classified firm responses into successful innovators (introduced a major product innovation in the last 3 years), unsuccessful innovators (engaged in innovation activities but had not introduced a major product innovation) and non-innovators (did not innovate or spend on innovation related capabilities).

³² They used factor analysis and structural equation modelling (SEM) for 373 Turkish manufacturing firms.

³³ This study showed the relationship between implementing total quality management (TQM) and organisation characteristics (size, industry type, type of ownership, and degree of innovation). The structural

TQM-practices large firms have higher quality implementation programs compared to small firms due to their resource constraint. Examples from the literature clearly indicates that firm with open culture, democratic style of leadership, quality improvement programs have a significant impact on the firm's productivity and innovation performance. We proposed to draw our next hypotheses as follows:

H6: Organisational culture/BIM (business improvement methods) and leadership have a positive association with labour productivity growth and firm innovation performance.

2.3.8. Lifecycle and Strategic Resources

Churchill and Lewis (1983) developed lifecycle stage model for SME development, resource availability and growth. This model discusses the five stages of SMEs growth; Stage I - Existence: in this stage the main problems of the business are obtaining customers and delivering the product or services. Stage II - Survival: The company has developed and has sufficient customers, product or services. Stage III - Success: The decision facing owners at this stage whether to expand or to keep the company stable. Stage IV – Take-off: In this stage the key problems are how to grow rapidly and how to finance the growth. Stage V – Resource Maturity: challenges at this stage are, first, to consolidate after growth and second, to retain the advantages of small size, including flexibility.

Additionally, Masurel and Montfort (2006) discussed the lifecycle (*e.g.*, start, growth, maturity and decline) characteristics of SMEs. Both asserted that labour productivity increases from start to growth stage and then gradually started decreasing at the maturity stage due to diseconomies of scale (rise in average total costs). Further, Beverland and

equation modelling (SEM) was used to investigate the 204 Vietnamese firms; results showed that manufacturing and large firms had higher TQM abilities compared to firm from services sector.

Lockshin (2001) developed a lifecycle model for small firms based on time period³⁴. The model identified four stages such as i) pre-birth; ii) start-up; iii) expansion and; iv) growth. Their study suggest that pre-birth stage is important for small firms because at this stage firm gather resources such as finance, gaining skilled employees, and basic business skills (Beverland and Lockshin, 2001). Similarly, Garengo and Nudurupati *et al.* (2007) analysed the firm lifecycle and stated that mature organisations (i.e., at growth, expansion and maturity stages) have more effective system in terms of sharing information, using knowledge resources and pro-activeness. In comparison, less mature organisations (i.e., start up, and survival stages) have more barriers to such effective use of knowledge resources (Garengo *et al.* 2007). Overall, their study³⁵ suggests that performance measurement system (PMS) and management information system (MIS) improve the organisational capabilities adopting a firm life-cycle approach.

Furthermore, Jones (2009) developed a life-cycle model for SMEs growth. This model identified the four stages of SMEs growth life-cycle such as i) start-up; ii) steadying the ship or survival; iii) business consolidation or maturity; and iv) business for the long haul. In addition, Jones (2009) investigated the crisis stages which are classified as ‘plateaus’ for SMEs growth. In other words, this model shows that firms face crisis at every stage of life-cycle which must be resolved to avoid the collapse of the business. For example, a firm at start-up stage (*i.e.*, an early stage of the firm) requires funds and cost control and pricing for their products and services to boost firm sales volume. Similarly, a firm at survival stage (*i.e.*, when a firm begin to expand) may face challenges such as hiring new professional managers, technological innovations, work-force diversity, market

³⁴ This time period is 0-6 months for 1st stage, 0-5 years for 2nd stage, 5-8 years for 3rd stage and 8 years + for 4th stage stage.

³⁵ They study involved 3 Italian and 2 Scottish manufacturing firms, and information collected on firm performance measurement system - PMS (system that supports the decision making process by gathering, elaborating and analysing information) and management information system – MIS (system for planning, developing and using information technology tools that support company members in managing the information process).

regulations, logistic and utility expenses and so forth. In the third stage (i.e., maturity), a firm can make substantial growth due to highly innovative products and exports: even at maturity stage firms could have a issues such as ‘over ambitious investments in new technologies’, ‘intense competition’, ‘market regulations’, and ‘currency fluctuations’ (Jones, 2009). Overall, this life-cycle model³⁶ suggested that SMEs passes through series of life-cycles and at every stage, SMEs have to face new challenges and crises. This model indicates that firms’ managing their challenges and crises over a time effectively would likely to have higher productivity and vice versa.

In contrast, Miles and Snow et al (1978) referred to the organisational strategies for maintaining effective performance. They developed a general model called ‘adaptive cycle’ which was based on certain strategies to provide solution to the organisational problems³⁷. Their research identified three strategic types of organisations: defenders, analysers, and prospectors. The defender strategy (i.e., top management) emphasis on efficiency and cost reduction to maintain existing markets (low level of uncertainty); Analysers – focus on maintaining and growing existing markets while seeking out new markets to sustain and increase growth; Prospectors – a focus on finding and exploiting new product and market opportunities to drive growth (Miles and Snow *et al.* 1978).

In addition, the fourth strategy called ‘Reactor’ states that some organisations do not have clear strategy with a tendency to react to market changes in lag manner (Miles and Snow *et al.* 1978). Overall, their model (i.e., adaptive cycle) suggests that organisations adjust to their environments by pursuing these strategies for better performance (i.e., profitability).

³⁶ In the fourth stage, firm will expand its product range; it will use sophisticated technologies and opening the new branches into emerging markets. However, the challenges and crises would remain there to affect their firm performance.

³⁷ These problems were categorised into entrepreneurial, engineering and administrative. The entrepreneurial problems includes such as how create a stable set of products. The engineering problems such as how to produce and distribute good or services as efficiently as possible. Lastly, administrative problem related to how to maintain strict control of the organisation in order to ensure efficiency.

Similarly, Raymond and Bergeron (2008) study³⁸ stated that strategies (i.e., defender, analyser and prospector) could increase the organisational performance (e.g., growth, productivity), if firms used e-business capabilities (e.g., e-commerce, e-collaboration). Further, they suggest that SMEs should be more strategic, competitive and flexible in order to improve their productivity (Raymond and Bergerson, 2008).

In summary, SMEs life-cycle stage models (e.g., Jones, 2009) apparently suggest that firms are more likely to have higher labour productivity and innovation performance, if firms manage their crises effectively. In other words, firms with lower abilities to manage such challenges and crises would likely to have lower firm performance or simply may go out of the business. On the other hand, firm with better strategies such as defenders, analysers and prospector could improve the firm's labour productivity growth and innovation performance. The hypotheses are as follow:

H7: Firm lifecycle resources have a positive impact on firm labour productivity growth and strategic resources have a positive relationship with labour productivity growth and innovative performance.

2.3.9. Role of Entrepreneurship on Firm Growth

Characteristics of Entrepreneurship

This section reports on entrepreneurship as a major resource to the firm growth and various characteristics of entrepreneurs have been investigated in the literature. Penrose (1995) discussed entrepreneurial qualities and their significant impact upon firm growth. According to Penrose (1995), entrepreneurs are those who are interested in profitability and firm growth for the production and distribution of goods and services. Rangone (1999) also described entrepreneurs as an important factor for firm growth and entrepreneurial

³⁸ They conducted empirical study on 107 Canadian manufacturing SMEs.

abilities can sustained the firm competitive advantage in terms of ‘innovation’, ‘production’, and ‘market management’ capabilities. Additionally, entrepreneurial alertness, knowledge, the ability to coordinate resources and absorptive capacity through experience and learning are important factors for achieving a firm’s sustained competitive advantage (Barney *et al.* 2001). Furthermore, Wiklund and Shepherd (2003) argued that there is positive link between entrepreneurial orientation (EO) and firm performance. Entrepreneurship influences the positive relationship between knowledge-based resources (i.e. intangibles) and firm performance (Wiklund and Shepherd, 2003). These few examples from the literature and their discussion on entrepreneurship raise 3 basic questions such as i) “who are entrepreneurs? ii) what’s their role? and iii) what are their characteristics?” The answer to these questions has been further discussed through literature citations.

Burns (2007) defined entrepreneurs as follows: “Entrepreneurs use innovation to exploit or create change and opportunity for the purpose of making profit. They do this by shifting economic resources from an area of lower productivity into an area of higher productivity and greater yield, accepting a high degree of risk and uncertainty in doing so”. In addition, Burns differentiated the role of owner managers from an entrepreneur on the basis of innovation and stated entrepreneurs as an important driver of firm growth. Moreover, an entrepreneur is defined as the one who owns launches, manages, and assumes the risks of an economic venture (Greve and Salaff, 2003). Cantillon (1775) was one of the first to discuss the role of entrepreneurship and its crucial role in economic theory. According to Cantillon (1775), entrepreneurship is motivated by profits because it is not only for the entrepreneur’s personal stake in the business but it also influences the economy on macro level through firm’s growth. French economist Jean Baptiste Say (1800) stated (as quoted in Drucker, 1995) stated “Entrepreneurs are those who shift economic resources out of an area of lower to an area of

higher productivity and greater yield”. However, this concept was criticized by later stage neo-classical and modern economists because this definition explains the functions of the entrepreneurship rather than its definition.

Schumpeter (1934, 1942) added ‘innovation’ to the role of entrepreneurship. The introduction of new products and new methods of production, new markets, utilisation of new resources would bring positive change to the business and shift the economy PPF³⁹ (production possibility frontier) outwards (Schumpeter, 1942). Further, Kirzner (1973) emphasised that alertness is an important factor for entrepreneurship because alertness is based on discovery and learning and the entrepreneur must take advantage of that and suggested that entrepreneurs must be active, creative, and human rather than passive, automatic, and mechanical. Later, Casson (1982) made a significant contribution to the role of entrepreneurship after the works of Schumpeter, Kirzner and others. Casson (1982), discussed the various characteristics of the entrepreneurship: i) a person with the most relevant information; ii) their personal quality; iii) motivated by self interest; iv) a belief that they are right and others are wrong and; v) creating new markets and better transaction relations. Nonetheless, Gartner (1994) referred to the role of entrepreneurship as organising resources and expanding business activities, while, Gardner, 1992 related entrepreneurship to the marketing concept that an entrepreneur should know about product life cycle, market segmentation, targeting and positioning of the products (he) is involved with.

Furthermore, Kukoc and Regan (2008) defined entrepreneurship as the “process of identifying, developing and bringing forward new innovative ways of doing things for exploitation of commercial opportunities”. Most researchers emphasise the link between

³⁹ PPF: shows all those combinations of public and private good that can be produced if all the nation resources are fully employed, called the production possibility frontier.

innovation and entrepreneurship. For instance, Schumpeter (1934) stated that an entrepreneur was a person who starts a business through product/process innovations and introduces new technologies to the business. Schumpeterian entrepreneurship theory suggests that entrepreneurship through innovation activities have a positive impact on firm growth. In support of Schumpeter view's, Covin *et al.* (1990) conducted an empirical study of 57 small manufacturing firms and argued that entrepreneurial strategic posture is found more in hi-tech, growth-seeking firms than in compare to low-tech growth seeking-firms: hi-tech firms placed greater emphasis on advertising, product-related strengths, formal planning, customer support, external financing and entrepreneurial strategies, which are strongly associated with high performance among growth seeking firms (Covin *et al.* 1990).

On the other hand, a number of researchers argued that the degree of entrepreneurship can be measured through the combination of three factors: i) innovativeness; ii) risk taking and; iii) pro activeness. The major role of entrepreneurship is to introduce new economic knowledge to the business despite its multifaceted heterogeneous activity (Alexandrova, 2004; Entrialgo, Fernandez and Camilo, 2001; Miller 1983). These studies suggested that small firms have fewer resources and this may limit their innovation abilities, pro-activeness, risk taking abilities and cannot grow faster compare to large firms. However, some researchers made opposing arguments, that small firms have low formal channels and do not have a centralized decision making process which gives an advantage of flexibility over large firms (Cooper, 1964; Rothwell, 1989). Similarly, Rejas *et al.* (2006) referred to small firms' flexibility to their more democratic and open culture (*e.g.*, employees are motivated by participation in decision making) than large firms.

Madsen (2007) proposed a positive relation between the degree of entrepreneurship (i.e. entrepreneurial orientation) and firm performance⁴⁰ and conducted a longitudinal study of Norwegian SMEs. Madsen (2007) found that firms which have developed entrepreneurial orientation over a time have better firm performance compared to competitors firms with the same or lower level of entrepreneurial orientation. Further, Wiklund and Shepherd (2005) conducted a study through panel data analysis of 413 Swedish firms and found that entrepreneurial orientation (i.e., innovativeness, risk taking and pro-activeness) has a positive relationship with firm performance⁴¹. This study argued that resource based view of the firm suggest that access to more resources facilitates entrepreneurial orientation, especially when a firm is operating in a dynamic environment (i.e., where demand constantly shifts, new opportunities). Similarly, Lumpkin and Dess (1996) investigated the relationship between entrepreneurial orientation and firm performance and found that; five dimensions such as i) autonomy; ii) innovativeness; iii) risk taking; iv) proactiveness and; v) competitive aggressiveness have a positive impact on the firm growth. Furthermore Lumpkin and Dess (1996) refer to contingent variables such as organisational factors (i.e., size, structure, strategy, firm resources and culture) and environmental factors (dynamism, complexity industry characteristics) may affect the relationship between entrepreneurial orientation (EO) and firm performance.

In contrast, Marcati, Guido and Peluso (2008) found that entrepreneur's education, experience, technical and managerial skills leads to innovation in small firms because such qualities reflect the personality of entrepreneurs. Capaldo and Landoli *et al.* (2003) refer to entrepreneurs as those having knowledge about management and marketing activities; but the quality of the entrepreneurship varies across the world in terms of quality of education, experience and innovation performance. In addition, Van Stel *et al.* (2005) conducted a

⁴⁰ Firm's performance compared to competitors; better market position, larger market share, higher sales growth, higher employment growth, and better financial results.

⁴¹It was measured through sales growth, profitability, age and employment size and stakeholder satisfaction; the majority of researchers used these indicators interchangeably for firm growth and performance.

macro-level study of 36 countries and discussed the role of entrepreneurial activities in both developed and developing countries and their significant impact on economic development (i.e. GDP per capita). Further, they found that entrepreneurial activities have negative effect on economic development in poor countries because of low level of human capital and possibly not having enough large companies: large firms provide better job opportunities and their workers are usually more skilled compared to the small firms. Large firms create small and medium size entrepreneurial firms; which act as suppliers to big firms (Van Stel *et al.* 2005). In comparison, Roper (1998) analysed a micro level study on small business performance in Ireland and argued that the educational background of entrepreneur which has a significant impact on small firm performance. Roper analysed other entrepreneurial characteristics such as age, owner experience in large firm and experience in industry have a less significant impact on firm growth. Nonetheless, Koellinger (2008) discuss the two types of entrepreneurship; Imitative and Innovative. According to Koellinger, the majority of innovative entrepreneurs are from developed countries where there is greater self confidence, high risk taking, higher education levels, more experience and where the unemployed also have a greater likelihood of being able to start an innovative business.

Acs *et al.* (2008) showed the positive relationship between income level and rate of entrepreneurial firms. They argued that entrepreneurship training and education have a positive impact on the creation of a new business. Developing countries lack resources to do this and so people with low income levels and with fewer entrepreneurial skills do not receive sufficient help; as a result lower rate of formation of small businesses and low innovation and knowledge spillovers (Acs *et al.* 2008). However, in such countries foreign direct investment and exports from large firms can act as counter-balance, helping to create better knowledge based entrepreneurs and leads to the creation of new firms with high innovation and knowledge spillovers (Zolton, *et al.* 2007). Their research identified that

these foreign owned companies (inward FDI) help to create a more skilled workforce, provide access to market opportunities in the host country. However, others have argued that entrepreneurship not only brings innovation to the business but also improves the competitive performance of firm through cross-national border activities and increase the likelihood of internationalisation specifically by introducing information technology (IT) into the business (Todd and Javalgi, 2007; Taucean *et al.* 2008). Additionally, Alvarez and Buzenitz (2001) discussed whether managerial and entrepreneurial capabilities increase the firm absorptive capacity. According to Alvarez and Buzenitz (2001), both capabilities (i.e. managerial and entrepreneurial) enhance learning abilities through continuous innovation that convert inputs into heterogeneous output and a firm may increase its absorptive capacity.

Some researchers have discussed the social side of entrepreneurship: “The entrepreneur is the person who makes business to business, bank to business, institutional relationships on the basis of strong networking through social interaction” (Hashi and Krasniqi, 2008). According to Greve and Salaff (2003), entrepreneurs’ social relations would facilitate access to resources, because the entrepreneur requires information, capital, skills, and labour to start business activities. These social relations (*e.g.*, family members, friends, colleagues from earlier jobs and others) would contribute to achieving entrepreneurial goals (Greve and Salaff, 2003). Audretsch (2004) refers to the entrepreneur as the source of knowledge spillovers and innovation in the small firm’s growth. According to Audretsch (2004), the higher the degree of human capital through better education, experience, skills and so forth leads to better absorptive capacity (i.e. a firm’s ability to internalise external knowledge). Audretsch (2004) argued that firm absorptive capacity can be higher if firms are spatially closer to each other and entrepreneurs engage in social interaction with other firms’ employees and overall improve the firm innovative performance through knowledge spillovers.

Cuevas and Carrasco (2007) investigated the relationship between entrepreneurship and territorial economic growth. They refer to two distinct qualities of entrepreneurship structure which includes the degree of productive dependence⁴² and the degree of functional dependence⁴³ and stated as part of territorial economic growth. They conducted a case study by interviewing 400 SME entrepreneurs from one Spanish province (i.e. Seville) and found that when there is a high level of functional dependence in the entrepreneurial structure there would be lower economic growth; this suggests that these enterprises have not found important inputs in the nearest market in order to produce their goods and services. In contrast, Leitao and Franco (2008) analysed entrepreneurial performance by using multiple regression models. They found that entrepreneurial performance is the combination of human and organisational capital⁴⁴; and both have a significant impact on firm entrepreneurial performance⁴⁵.

Van Praag and Versloot (2007) argued that entrepreneurs contribute more to the economy than non-entrepreneurs. Both stated that entrepreneurship as economic value to the business and its role is important in the economy through following factors: i) the contribution to the employment generation and dynamics; ii) innovation iii) productivity and growth and; iv) the role of entrepreneurship in increasing individual utility levels. They stated that entrepreneurial firms (i.e. entrepreneurs) that are young with few employees and are new entrants to markets have an advantage over large firms in terms of job satisfaction, a lower opportunity cost and high autonomy because of self-employment.

⁴² Concentration levels that some firm may possess in relation to the number of suppliers in one hand, and in relation to clients on the other

⁴³ The businesses acquire a large part of its inputs outside their territorial location (the province of Seville) and their high proportion of sales are directed towards the internal territorial market.

⁴⁴ Human capital means individual characteristics, managerial push and managerial pull; organisational capital refers to individual entrepreneurial behaviour, collective entrepreneur behaviour, managerial practices and others.

⁴⁵ In analysis economic (innovation output) and non-economic (enthusiasm at work) indicators are used

In summary, the literature survey related to entrepreneurship identified different characteristics such as risk taking, proactive, innovative, high education, experience and others. For empirical analysis, these proxies (*e.g.*, risk taking, pro-active and innovative) would be used to measure the firm's entrepreneurial abilities. In the literature, a wide range of studies such as Penrose (1995); Wiklund and Shepherd (2003); Burns (2007) and Schumpeter (1942) have found a positive relationship between entrepreneurship and firm's performance. However, these studies were limited in scope in terms of analysis of firm's entrepreneurial abilities in knowledge-intensive industry (software). We conclude that entrepreneurship is important driver of firm growth and can improve the firm labour productivity growth and innovation performance. Our hypothesis is as follows:

H8: Entrepreneurship has a positive impact on labour productivity growth and Innovative performance.

2.3.10. Family-Owned Businesses

Robson *et al.* (2008) defined family business as follow “*A family business as one where there is one or more relatives of the entrepreneur employed in the business*”. They further state that family ownership may reduce the autonomy of entrepreneur to control and manage the firm particularly if family members have supported the new business financially and family-owned business reduces the firm innovative performance. In comparison, Zahra *et al* (2004) suggest that four dimensions (*i.e.* individual and group; internal versus external orientation) of a family firm's culture significantly influence their entrepreneurial activities compare to non-family firms in USA. Furthermore, family-owned business can gain competitive advantage by developing HRM practices (*i.e.*, recruitment and selection, development, compensation and performance) and have a significant effect on family business success and survival (Astrachan and Kolenko, 1994). Dyer (2006) also examined the “family effect” on firm's performance through qualitative research of

resource based view of the firm. The resource based view of the firm suggests three types of capital have been associated with the performance of family firms such as i) human capital (i.e. skills, abilities, attitudes of employees); ii) social capital (i.e. social relations) and; iii) physical/financial capital (Dyer, 2006). Dyer stated these three factors contribute to high performance of family firms and lower the agency costs⁴⁶ due to high trust and shared values among family members. Similarly, in family firms the objectives (e.g., higher firm performance) of family owners and family managers are the same and such strong relationships reduce their agency costs (Dyer, 2006).

In contrast, family-owned businesses have both advantages and disadvantages (Cromie, *et al.* 1995). They investigated advantages such as senior managers in family firms being fully committed and remaining in a post for the long-term and better relationships with customers and suppliers. Disadvantages of family owned firms are for example, adopt defensive strategies, paid salaries to family members without considering market conditions and their performance and succession is one of the major problem for family owned businesses growth (Cromie *et al.* 1995). Further, Cromie *et al.* (1995) argued that competition between father and son is damaging for firm growth and conflict between siblings would have a severe effect on firm performance. In addition, one of the major concerns for an entrepreneur is to whether or not to employ family members because such a decision has a severe impact on entrepreneur, the business, and the family (Dyer and Handler, 1994).

Further, Habbershon *et al.* (2003) developed a unified system model of performance that links the resources and capabilities with enterprising families and their potential for transgenerational wealth creation. They argued that enterprising families' systems (i.e.

⁴⁶ Agency cost rises when a firm hire an agent/employee in which risk is involved that the agent may use the firm resources for its own benefit. In addition, family firms have lower agency costs because of low monitoring costs of their employee's behaviour.

family-influenced firms) must cultivate distinct resources and capabilities which result in above average returns and transgenerational wealth creation: such family-influenced firms are unusually complex, dynamic, and rich in intangible resources and capabilities (Habberson *et al.* 2003). In support of this view, Chrisman *et al.* (2003) argued that familial resources and capabilities related to family involvement and interactions lead to a firm competitive advantage that in turn creates wealth. However, if family involvement and interaction do not contribute to wealth creation or generating non-economic benefits (i.e. preservation of family ties), then the family may decide to alter their level of involvement or change their business strategy (Chrisman *et al.* 2003).

Nevertheless, it is important to know that most of the small firms are single proprietor organisations or comprise mostly of family members (Chrisman *et al.* 2003; Dyer and Handler, 1994). Their study examined the link between entrepreneurship and family-owned businesses, because family members influence entrepreneurial activities through their values and aspirations. However, firms that are family-owned are more likely to dismiss staff to reduce costs compared to other types of firms because family firms maintain the employment of family members and are more prepared to sack workers than non-family owned firms (Batten and Hettihewa, 1999).

In addition, a family owned business supports a more idiosyncratic type of knowledge in the firm because succession is passed through many generations (Bjuggren and Sund, 2002). Likewise, Lee *et al.* (2003) stated that family businesses are highly idiosyncratic knowledge in terms of their succession transfer to family members. The chosen successor must acquire the idiosyncratic knowledge and through working in all major departments of the firm just like other employees (Lee *et al.* 2003). However, if the family member is not competent and such appointment would endanger the firm performance (Lee *et al.* 2003). For instance, succession in Portuguese family businesses is a major problem to the growth

of firms because of the low level of education of family members, preference for male over females, lack of experience outside the family firm, and selection of successor is being based on traditional and emotional rather than rational criteria (Howorth and Ali, 2001). Moreover, Cromie *et al.* (1995) conducted a study on 1203 family firms in Britain and found that family firms are less professionally managed in terms of decision making, designing organisational structures and utilising personnel. They suggest that the key to the success of a family firm is to follow business practices and the ability to manage the conflicts among family members. Furthermore, Harris and Reid (2007) argued that the barriers to growth in family businesses are often more severe than non-family firms such as low innovation, informal HR practices, poor quality control and the lack of strategic planning. In comparison, these family owned businesses have an advantage in access to credit because the owner has personal stake in the business and establish long term relationship with lenders (Bopaiah, 1998). In addition, family firms may have a competitive advantage because it is likely that family members would trust each other and this would reduce their monitoring costs (Dyer and Handler, 1994).

Hausman (2005) suggested a model for US-Spanish small family-owned firm's innovation and adoption by using in-depth qualitative research techniques. This model states that industry concentration, management factors (education, experience, share of control, management of conflict), network effects and tangibility of products have a significant impact on innovation; but small family-owned businesses have very centralised decision making (i.e. reluctant to delegate authority or decision making to others) which constrains innovation among small firms. Further, Sciascia and Mazzola (2008) found a negative relationship between family involvement in management (FIM) and firm performance; the higher the FIM, the lower the firm performance. They investigated this by conducting a cross-sectional study of 620 Italian SMEs and argued that a lack of professional competencies of family members, barriers to increasing social capital, conflicts among

family members and the orientation towards non-financial goals brings negative effect on financial performance.

Additionally, Kellermanns *et al.* (2012) examined the positive and negative relationship between family owned business and firm performance through empirical analysis⁴⁷ of 70 USA family firms. Kellermanns *et al.* (2012) stated that family management involvement and family member reciprocity (cooperative family culture, altruism) have a positive impact on the firm's performance. This clearly suggests that cooperative family culture in the business would improve the family firm performance. However, high generational ownership dispersion has a negative impact on the firm performance because of successors are more likely to be conservative and interested in saving family wealth. This study also found that higher innovative family firms would more likely to have a higher firm growth compared to less innovative family firms. Overall, this empirical study suggests that family-owned business could have a positive and/or negative impact on the firm's performance. One can draw conclusion from the literature examples that family-owned business may have a positive and negative impact on firm's productivity and innovative performance. We developed two hypotheses for empirical analysis as follows:

H9: Family owned businesses have a positive or negative impact on firm labour productivity growth

H10: Family owned businesses have a positive/negative relationship with firm innovation performance

⁴⁷ Multiple regression analysis was used to investigate the relationship between family management involvement, generation ownership, family member reciprocity (independent variables) and firm performance (growth in sales, employees, profitability).

2.3.11. Role of social networks on firm productivity and innovative performance

The previous sections on absorptive capacity and R&D suggested that SMEs can rely on social networks rather than undertaking R&D because of resource constraints. Staveren and Knorringa (2007) defined social networks (social capital) in a broader way as “social relations matter” and examined their impact on the economy. Their study measured firm social networks through inter-and intra-firm relationships, clusters, value chains, business association and business systems. They argued that the economic impacts of social relations are to reduce the transaction cost, enabling collective action and improve learning through knowledge spillovers (Staveren and Knorringa, 2007). Furthermore, Havnes and Senneseth (2001) suggested that firms with large networks would have a better performance than firms with small networks or no networks. These network resources refers to entrepreneurial networks divided into inter & intra-organisational and inter-personal networks which have a positive impact on SMEs’ growth (Wiklund *et al.* 2007).

Additionally, formal networks such as universities, research institutions or clustering have a significant effect on SMEs’ innovative performance (i.e. product/process innovation) because a firm can improve its external source of knowledge when such linkages are exist (Koch and Strotman, 2008; Nam, 2005). SMEs lack of resources and reluctant to invest on R&D and networks may encourage small firms to improve their innovation performance through such linkages (Koch and Strotmand, 2008; Nam, 2005). Similarly, Gronum *et al.* (2012) conducted a longitudinal study on 1435 Australian SMEs and investigated the relationship between networking (*e.g.*, frequency of firm inter-intra interaction) and firm performance. They found that firm networking have a positive impact on the firm’s productivity and innovation performance. This suggests that network provide SMEs with more access to external sources such as complementary skills, knowledge, capabilities which are important factors for higher firm performance (Gronum *et al.* 2012).

Fabrizio (2009) discussed the role of networks and their impact on absorptive capacity (i.e. a firm ability to internalise the external knowledge). Fabrizio (2009) argued that a firm collaboration with university scientists would not only increase the absorptive capacity but also improves the firm innovative performance and stated that collaboration (*e.g.*, university-industry) is an important indicator of absorptive capacity. In addition, Fukugawa (2006) conducted a case study on Japanese small firms from cross industrial groups (i.e. manufacturing, services, wholesale, retail, finance and insurance) and analyse that the firm cooperative activities⁴⁸ leads to innovation. He suggested that network relationship based on shared knowledge among members would increase the absorptive capacity at network level (Fukugawa, 2006). Moreover, Tsai (2001) argued that the organisational units can produce more innovation and enjoy better performance if they occupy a central network position (i.e., intra-organisational networks) that provide access to new knowledge developed by other units and this effect (new knowledge spillovers) depends on the business unit's absorptive capacity.

Prager and Omenm (1980) discussed the importance of university-industry linkages which generate new knowledge and enhance the firm's innovative performance only if new knowledge is transformed into commercial products and services. They state that lack of funding to universities might effect this collaboration and cause the erosion to the firm innovation process. In addition, George *et al.* (2002) discussed the university-industry linkages and their impact on firm innovative performance. They argued that firms with low R&D costs can establish such linkages (i.e. university-industry)⁴⁹ and would improve their innovative performance: this firm innovative performance means a proportion of new product sales to total sales and patents achieved (Fabrizio, 2009; George *et al.* 2002). Some

⁴⁸ These cooperative activities are sharing knowledge through joint product developments, R&D alliances, linkages to public research institutions.

⁴⁹ They conducted a study on 147 biotechnology companies. University-Industry linkages provide several benefits such as strong research activities, universities create entrepreneurial culture in the region and also provide cheap source of labour as trainee (internships) and so forth.

researchers emphasised the role of the internet as the best tool for making networks and these networks established through e-commerce (business transactions by means of telecommunication networks) would reduce the transaction cost and less time consuming (Zwass, 1996; Ojukwu and Georgiadou, 2007).

Mancinelli and Mazzanti (2007) investigated⁵⁰ the complementary relationship between R&D expenditure and the social capital (networking) because both influence each other and at the same time are source of knowledge spillover to the firm growth. In comparison some researchers stated that network may have a lower effects on the firm innovative performance because excess customer-producer relationships may lead to more dependency, lack of trust due to high frequency of interactions reduces firm innovation output (Weterings and Boschma, 2009). Further, they suggest that this does not mean that network relations are not important to the firm growth or innovative performance; firms can adopt a more balanced approach towards making ties. Furthermore, Julien et al. (2004) conducted a survey of 146 SME. They developed a conceptual framework in which information absorptive capacity⁵¹ may significantly affect the firm's weak tie networks⁵² and technological innovative intensity (R&D). The researchers empirically tested that a more innovative firm with high absorptive capacity would have a greater impact on weak signal networks. Moreover, Ritter and Gemunden (2004) conducted a study on 308 German companies and stated that a firm's technological and network competencies⁵³ have a significant relationship with innovation success. This study emphasised the importance of business strategies that indirectly influence the firm's technological and network competencies (Ritter and Gemunden, 2004).

⁵⁰ They conducted a study on 243 Italian SMEs and stated that R&D and networking are important drivers of firm growth. A firm engaged in R&D requires inter and intra-firm's cooperation to achieve economies of scale through integrating diverse skills, technologies and competencies.

⁵¹ Information absorptive capacity measured through the number of graduate in firm, number of employees in R&D department and R&D intensity

⁵² distant/less frequent networks with universities, research organizations and so forth of SMEs

⁵³ It establishes more strong networks with other organisation; and encourage more realistic and market oriented innovations.

Regarding the geographical proximity of firms, Dimitriadis *et al.* (2005) referred to localised economies as industrial districts and stated that majority of these industrial districts comprised by SMEs. In industrial districts, knowledge transfers take place more quickly between firms than between those firms which are not co-located; however, the knowledge level does not have the same impact on all firms because the level of skills (human and physical) varies for each firm (Dimitriadis *et al.* 2005). Similarly, Harris (2009) refers to co-location of firms in order to obtain benefits from knowledge spillovers when similar firm engage in R&D to solve related problems. Harris argued that this physical proximity causes exchanges of employees between firms in the supply chain and they often share innovation. In addition, Grando and Belvedere (2006) proposed that those SMEs operating in industrial districts are better performers than those SMEs operating independently because closed network firms share production activity, improve quality and services and access to credit can be easily availed through clustering or group of firms located closely. Nevertheless, Bezic *et al.* (2010) found a negative impact of co-location of firms on export performance. Their finding suggests that higher geographical proximity may exert upward pressure on costs of input (*e.g.*, externality of agglomeration)⁵⁴.

In contrast, Haahti *et al.* (2005) constructed a conceptual framework for export performance of SMEs. The framework showed informal cooperative strategy between domestic and foreign firms and that this informal cooperative strategy creates export knowledge and result in higher firm export performance. Additionally network relationships may influence the internationalisation of SMEs through better inter firm relationship abroad by setting up offshore offices because these strong social networks may enhance the competitiveness, market selection and so forth, lowering the cost and minimise

⁵⁴ This study is based on Tobit analysis of 707 firms from transition economies (*e.g.*, Estonia, Latvia, Poland and so forth). This externality of agglomeration refers to firm competitive disadvantage specifically for low-technological firms. For example, sharing knowledge with other firms or linkages to universities and research institutions would increase the input costs for low-tech firms which are more focused on price competitiveness.

the risk of failure in the international market (Zain and Ng, 2006). Furthermore, Oum *et al.* (2004) conducted a study on 22 international airline companies based on panel data analysis. Their study found that horizontal alliances (i.e., voluntary and long-term contractual collaboration between firms) have a positive impact on firm productivity⁵⁵ (Oum *et al.* 2004). Overall, Oum *et al.* (2004) empirical finding suggest that higher level of cooperation between firms would improve firm operating efficiency through economies of scale and access to resources and skills.

In summary, the literature findings apparently suggest that SMEs networks with other firms, research institutions would improve the firm productivity and innovation performance. For instance, studies of Havnes and Sennesth (2001); Wiklund *et al.* (2007) showed positive relationship between networking and firm growth. Similarly, the empirical study of Fukugawa (2006) investigated the positive association between firm networks and innovative performance. In addition, researchers (*e.g.*, Zain and Ng, 2006) argued that SMEs may rely on social networks to reduce their barriers to productivity growth through inter-intra firm collaboration, linkages to research institutions for higher firm performance. We proposed a hypothesis derived from the literature related to social network which is:

H11: Networks have positive impact on firm labour productivity growth and innovative performance

2.3.12. Access to Credit/Finance

The resource based view (RBV) suggests that lack of financial, human, organisational resources and capabilities reduce the firm innovation activities (Dundas, 2006). Dundas conducted a panel data analysis of Irish firms and found that lack of access to finance is a

⁵⁵ A ratio of multiple outputs to multiple inputs 'total factor productivity', the firm productivity was measured through multiple inputs (*e.g.*, labour, fuel, capital etc) and multiple outputs (*e.g.*, passenger services, freight services, and other services). For analysis, panel regression model was used.

major constraint to the firm innovation activities. Further, Wiklund and Shepherd (2005) stated that access to credit is important resource for firm performance and they have empirically tested that small business performance is positively influenced by external financing facility available to firms. Furthermore, a number of researchers stated that access to credit is a major constrain to the growth of SMEs (Abor and Biekpe; 2007; Barri et al, 2005; Beck and Kunt, 2006). They argued that SMEs are deprived of formal credit (i.e. borrowing from banks and other financial institutions) and mostly depend upon informal credit (i.e. borrowing from friends and family members) which cannot fulfil their needs for survival; but sometime entrepreneurs plays major role in overcoming the financial constraints by providing capital (Parker, 2000). Many small firms without sufficient initial capital do succeed, raise capital and do grow into large firms because of special entrepreneurial abilities (Penrose, 1995). Similarly, Nichter and Goldmark (2009) stated that access to credit is not an important factor for micro and small firm performance and even not adequate condition for firm growth. There empirical study on small firms growth suggests that factors such as i) entrepreneurial; ii) networks; iii) regulatory and environmental characteristics must be taken into consideration when measuring firm performance along with access to credit, although they found that access to credit has a positive impact on firm growth.

On the other hand, Hoffman *et al.* (1998) emphasised the lack of external finance as constraining to firm innovative performance. They suggested that SMEs rely on internal sources of finance which are not sufficient to undertake major technological developments. Further, Czarnitzki (2006) conducted a study on East and West German SMEs, and found that West German firms are facing 'financing' as an obstacle for increasing their innovative activities (R&D: measure of input for innovation) more than East German firms are. In contrast, Astrakhan and Chepurensko (2003) discussed the reasons behind rejecting loan requests of small business owners. They argue that insufficient collateral, poor record

maintenance and less creditworthiness of borrower are the major obstacles for SME financing. In addition, larger banks loans to SME tend to be more expensive than lending to large firms due high cost of borrowing for both small firms and banks (Liu and Yu, 2008). For SMEs financing, Shen *et al.* (2009) conducted a study through panel data analysis of Chinese SMEs. Their study emphasised the role of SMEs banks which assess the performance of small firms for lending much better than large banks. Lending to SMEs through such specialised banks would generate more intensified competition in local markets: small banks which have less hierarchical levels and their competition can ensure more quickly financing to SMEs (Shen *et al.* 2009).

Abor and Biekpe (2007) investigated the positive relationship between firm age, size, asset tangibility (i.e. firm fixed assets divided by total assets) and the bank debt ratio (bank debt to total assets). The larger the firm's size in term of its employees and tangible assets the more access to finance is usually available. When a successful firm grows over time it requires more capital to finance growth and the firm must turn to external financial resources such as borrowing from banks; access to finance may improve the firm long term productivity (Badia *et al.* 2009). Badia and Sloomakers (2009) conducted a study on Estonian SMEs and stated that a firm with a poor balance sheet (i.e. lower fixed assets) might have limited access to external borrowing. However, they found that financial constraint does not have an impact on the productivity growth. Additionally, Abor and Biekpe (2006) suggested that formal finance (i.e. borrowing from banks) increases the firm's international activities, as it engage more in cross border activities which would require more formal finance than informal finance (i.e. from family , friends) for better export performance. In contrast, Beck *et al.* (2006) conducted a study of 10,000 firms from 80 countries and found that SMEs face more financing obstacles than large firms. They identified the determinants of financing obstacles and found that older, larger and foreign-owned firms reported fewer financing obstacles. Furthermore, they argued that macro

economic variables such as countries with better financial and economic development (i.e. higher GDP per capita and stock market development and legal system efficiency would experience lower financing obstacles.

Hyytinen and Pajarinen (2008) conducted a study on 3825 Finish SMEs by using panel data analysis. They found that firm size is not the only issue while measuring financing obstacles, but creditworthiness of a firm also important for obtaining finance. For instance, Nieuwenhuizen and Kroon (2003) stated that banks should finance small and medium sized enterprises with little security dependent upon the success factors of the entrepreneurs. These criteria should be based on success factors including specifically leadership, the knowledge and skills of the applicant, market orientation, financial insight and management, creativity and innovation, and risk orientation. They argued that the transaction cost (*e.g.*, administrative and risk of default cost) of financing to small firms is much higher than to large firms and cannot be easily recovered. In support of Nieuwenhuizen and Kroon (2003), Walker and Brown (2004) emphasised the role of non financial success factors for small business owners rather than financial factors. They stated that non financial factors such as i) job satisfaction; ii) autonomy and; iii) flexibility iv) motivation are important factors in the success of business apart from financial factors (i.e., profitability, growth in assets).

Gelb *et al.* (2008) found that those firms with formal status (which means they are registered with the government and pay regular tax) have high access to external credit and other infrastructure facilities than informal firms. On the other hand, Thornhill and Gellatly (2005) proposed a positive relationship between the SMEs growth history⁵⁶ and financing intangible assets (i.e. R&D, licensing, marketing and training cost) through debt and equity

⁵⁶ Growth history refers to the consistent performance of small and medium enterprises in terms of greater age, greater size and a good track record of retained earnings

financing. In the SME sector it is not easy as proposed by Thornhill and Gellatly (2005) because SMEs face severe problems of resources for survival and growth. The consistent growth of SMEs becomes a challenge for researchers to address the issues through cooperation of various public and private bodies for growth and development.

Overall, the literature examples on access to finance suggest that SMEs are externally constrained compared to large firms and access to credit may improve the firm's productivity and innovative performance. For instance, previous empirical studies (*e.g.*, Dundas, 2006; Beck and Kunt, 2006 and Badia *et al.* 2009) showed that access to finance could improve the performance of SMEs because successful firms require sufficient capital to invest on innovative projects. The link between access to finance and firm performance motivated the researcher to develop a hypothesis which is to be tested on software firms.

H12: Access to finance has positive association with the firm labour productivity growth and innovative performance.

Section 3:

2.4. Foreign Direct Investment and Knowledge Spillovers (Inward FDI)

Smallbone (2005) argued that the potential benefits of FDI are to improve knowledge and innovation transfer, human capital development and increasing employment in domestic economy. These potential benefits of FDI are important for host countries where financial constraints act as major barrier to the growth of SMEs. Kokko (1994) argued that technology and productivity of domestic firms may increase when foreign firms enter the domestic market and demonstrate new technologies, provide technical assistance to their local suppliers, customers, train workers and managers who may later be employed by the local firms. Similarly, Aitken and Harrison (1999) suggested that domestic firms may increase their productivity simply by observing nearby foreign firms and diffusion may occur from labour turnover (*e.g.*, from foreign to domestic firms). Aitken and Harrison

(1999) conducted a study on over 4000 Venezuelan manufacturing firms: their study discussed that foreign ownership increased the productivity (TFP) of local firms⁵⁷. Additionally, Dasch and Franziska (2010) conducted a study on innovation activities⁵⁸ of subsidiaries of German multinational firms in 16 European countries. They stated that foreign owned firms in developing countries may improve the productivity of local firms through highly innovative products of foreign firms may be used as inputs in the production process of domestic firms.

In contrast, Harris and Robinson (2004) identified three types of FDI spillovers such as intra-industry spillovers (through demonstration effects, competition and labour market), inter-industry spillovers (backward/forward linkages) and agglomeration effects (geographical proximity). These spillovers effects (knowledge or technology) have a positive impact on firm productivity growth (Harris and Robinson, 2004). Foreign firms are superior in technology and management capabilities compared to local firms (Kinoshita, 2001; Aitken and Harrison, 1999). On other hand, a number of researchers referred to the importance of absorptive capacity before local firms receive benefits from FDI spillovers (Fosfuri *et al.* 2001; Kinoshita, 2001; Harris and Robinson, 2004). For instance, externality effects of FDI (knowledge spillovers) increased the productivity if recipients firms have high absorptive capacity (Fosfuri *et al.* 2001). Similarly, Fu (2008) emphasised that FDI has a positive impact on regional innovation through better absorptive capacity of domestic firms; if local firms have certain level of R&D intensity and better quality of labour force would have significant effect on local firm's innovation performance. On macro level foreign direct investment contributes to economic growth only when the host country has sufficient absorptive capacity (Borensztein *et al.* 1998).

⁵⁷ Aitken and Harrison (1999) found a positive relationship between foreign ownership and productivity of small firms; suggest that foreign ownership benefits more productive firms. Their study also identified that increase in foreign investment reduced productivity of local firms due to market stealing effects.

⁵⁸ They used indicators such as innovation input intensity (i.e., R&D as percent of turnover) and innovation output intensity (share of products new to the firm on turnover).

Borensztein *et al.* (1998) conducted a panel data analysis of 69 countries and argued that the high level of education (proxy of human capital) in the host economy would increase the abilities of local firms to benefit from MNCs which are superior in technology.

In developing countries where a major sector of the economy comprising SMEs and local firms has a low absorptive capacity due to lack of skilled labour force, use of outdated management, low R&D undertaking and poor networks with other firms & institutions would not be easy to receive benefits from foreign direct investment (Chudnosky *et al.* 2008). Moreover, Goedhuys (2007) conducted a study in Tanzania analysing the effects of FDI spillover on domestic firms: his empirical study suggested that foreign firms are superior in technology, skills, innovation and host firms can make strong networks with foreign firms for improving their performance. Moreover, these foreign firms are highly R&D intensive and have an absolute cost advantage over local firms and can increase knowledge spillovers in host country (Todo, 2006). However, SMEs are disadvantageous compared to large firms or foreign firms due to limited resources and might not grow as fast as other firms (Goedhuys, 2007).

In addition, Laurids (2004) stated that foreign direct investment (FDI) has an important role on small firm development because MNC culture support local suppliers through backward linkages and these local suppliers are mostly SMEs that supply major inputs to the large firms. However, the problem arises in developing countries when there is a technological and managerial gap between MNCs and local suppliers (Laurids, 2004). Therefore these local small firms must be efficient in production, competitive in price, quality and services and must be better at outsourcing. In developing countries the consistent government policies towards attracting the FDI are very important and SME must be involved in the international trade through searching for location technical

efficiency because SMEs are more sensitive to location than large firms due to their limited resources (Li & Hu, 2002).

Harris (2009) discussed the impact of FDI on domestic firm's productivity (TFP) could be either positive or negative; positive effects come when foreign firms bring new technology, superior management, marketing capabilities and better export contacts increase the firm's productivity (Harris, 2009; Sadik and Bolbol, 2001). In comparison, FDI may have a negative effect on domestic firm's productivity if local firms have poor forward and backward linkages to foreign firms and low absorptive capacity may reduce their productivity (Harris, 2009; Marcin, 2008). Similarly, Adamou and Sasidharan (2007) discussed the role of foreign direct investment and its impact on domestic firm's growth. Foreign direct investment affects the growth of firms in two ways: first, foreign firms bring positive changes to firm growth through demonstration effect (new technology and new product), labour turnover to foreign firms with better wage, forward and backward linkages and learning by exporting of domestic firms. Secondly, negative effects such as reverse labour turnover, high average cost force domestic firms to decline, and foreign firms are reluctant to establish linkages with domestic firms and therefore bring their own suppliers (Adamou and Sasidharan, 2007).

In contrast, Acs *et al.* (2007) suggested that FDI spillovers have a significant effect on entrepreneurship level in recipient country and if host economy has high personal absorptive capacity through better human capital and skills may encourage new business formation. Furthermore, Terjesen *et al.* (2007) stated that FDI not only creates knowledge spillovers but also leads to entrepreneurial cultures into host country, because foreign investment is attracted on the basis of existence of strategic assets in host country, where human capital is considered to be an important factor for survival of MNEs. Pack (1993) (as quoted by Fosfuri *et al.* 2001) argued that labour mobility from MNEs to local firms is

important that often trained managers leave multinationals and run their own businesses. Additionally, Sinani and Meyer (2004) emphasised that usually foreign firms attract skilled labour force through better wage rate and domestic firms may face the shortage of skilled labour force because the labour turnover may affect the growth of local firms, particularly in developing countries. However, if a domestic firm's owners have previous foreign firm experience and training with better education, there would be higher productivity (i.e. TFP) for the domestic firm through workers mobility from multinationals to domestic firms (Gorg and Stobl, 2005).

To sum up literature on FDI spillovers, a wide range of empirical studies (*e.g.*, Harris, 2009; Fosfuri *et al.* 2001 and Kokko, 1994) showed that inward FDI could have a positive or negative impact on the domestic firm's productivity and innovative performance. This relationship is influenced by absorptive capacity of local firms. This apparently suggests that a domestic firm with weak backward or forward linkages to foreign firms would likely to have lower productivity and innovation performance. Further, the studies from the literature are limited in terms of analysis of the impact of inward FDI on small software firms. We developed next hypothesis to test the relationship foreign ownership and its impact on local firm labour productivity growth.

H13: Inward FDI has a significant effect on firm labour productivity growth and innovation performance: if local firm have high absorptive capacity.

2.5. Internationalisation of SMEs (exporting and outward FDI)

In the globalised economy, firms whether small or large, are striving to increase their market share through exporting and outward FDI. This sub-section focuses on firm internationalisation and its impact on firm productivity and innovation performance. For instance, Harris and Reid (2010) linked firm internationalisation and absorptive capacity;

their study suggested that firm with better internal capabilities (*e.g.*, R&D, human capital, networks) would be more likely engage in exporting/outward FDI and experienced higher total factor productivity (TFP).

Internationalisation is divided into two categories exporting and outward foreign direct investment (Lu and Beamish, 2006). Lu and Beamish (2006) conducted a study on 164 Japanese SMEs and found that SMEs internationalisation have a positive impact on the firm's performance (return-on-assets). This suggests that firm engage in internationalisation broadens the customers' base through entering into new markets, increases the firm internal stock of knowledge from new markets and achieve big volume of production (Lu and Beamish, 2006). In comparison, this study has found the negative relationship between internationalisation and SMEs profitability⁵⁹. In addition, Lu and Beamish (2006) argued that resource constraint (or inadequate resources) is one of the major problems for SMEs growth by exporting or investing abroad⁶⁰. Internationalisation means learning by exporting and firm productivity growth is influenced by exports which increase the firm knowledge learning abilities and innovative performance through international contacts (Castellani, 2002). Further De Clercq *et al.* (2003) found that entrepreneurial orientation has a significant impact on firm internationalisation activities. In particular, SME internationalisation requires knowledge exploration and exploitation through human capital and other intangible assets such as R&D and so forth. In comparison, SMEs have poor investment in human capital and a lack of investment in R&D may reduce their performance.

⁵⁹ This finding shows that high currency fluctuation reduced the firm profitability and suggests that SMEs should adjust their internationalisation strategies during high currency fluctuations.

⁶⁰ In particular, SMEs with outward FDI usually make errors when choosing business partner abroad or difficulty in recruitment and training of employees, or simply lack of experience in the local market reduce the firm performance.

Furthermore, Barrios *et al.* (2003) investigated the relationship between firm own/in-house R&D activity and exporting using panel data analysis of Spanish manufacturing firms. Barrios *et al.* (2003) argued that firm own or in house R&D intensity has a significant impact on both domestic and foreign firm's export ratio (i.e., export sales/total sales). In addition, R&D spillovers are stronger for foreign firms than for domestic firms due to high absorptive capacity of MNEs (Barrios et al, 2003). Delgado *et al.* (2002) examined the relationship between total factor productivity and exporting through panel data analysis of 10, 595 Spanish manufacturing firms. They found that productivity was higher for exporting firms than for non-exporting firms because exporting firms are efficient in production and product market competition is higher in international market than domestic market. In support of Delgado *et al.* (2002) finding, Wagner (2007) stated that exporting firms have higher labour productive growth and that firms involved in international markets face intense competition and require better innovative products and services. Additionally, Harris and Li (2009) conducted a study on 5120 UK manufacturing and non manufacturing firms. They investigated whether R&D and absorptive capacity could improve a firm's exporting and its overall productivity. Harris and Li (2009) argued that a firm with better internal absorptive capacity through its organisational and HRM characteristics would reduce the firm obstacles to a firm's internationalisation activities.

Nevertheless, a firm should enter into a foreign market when it has firm-specific advantages (FSA) in terms of brand name, product differentiation, R&D, and external and internal economies of scale (Svetlicic *et al.* 2007). In particular, due to resource constraints SMEs requires external finance to internationalise their business activities (De Maeseneire, 2007). For instance, Bell (1997) stated that small firm require high marketing costs (*e.g.*, advertising) to internationalise their business activities and that export finance may help SMEs cover that cost, SMEs usually face lower economies of scale (*i.e.*, high average total cost) compared to large firms and this high cost might reduce their performance (Van

Beers and Panne, 2009). Van Beers and Panne (2009) argued that small firms can benefit less from internal (at firm level) and external (*i.e.* at industry level) economies of scale and would be less likely to export than large firms because large firms have the advantage of both internal and external economies of scale.

In contrast, a number of researchers stated that there is a positive relationship between knowledge intensity⁶¹ and firm internationalisation (Nummela *et al.* 2005; De Clercq *et al.* 2005). Further, De Clercq *et al.* (2005) conducted a study of 92 Belgium SMEs and argued that a firm's international learning efforts and entrepreneurial orientation would be likely to increase its cross border activities. This finding suggests that firm knowledge exploration and exploitation related to foreign markets and entrepreneurial abilities would likely to improve the firm internationalisation (De Clercq *et al.* 2005). Ruzzier *et al.* (2007) asserted that dynamic SMEs⁶² need to internationalise their business activities, which are based on multi dimensional factors such as operation mode (how to enter a foreign market), market, product, time and performance (growth of international sales).

On the other hand, Moen, Galven and Endresen (2004) discussed small software firms and their internationalisation. They stated that software firms have internet-based communication and they may quickly enter the international market by establishing a local subsidiary in an international market. These small software firms have strong linkages with other multinational firms and have psychological, operational, organisational advantages over other types of firm's (Moen *et al.* 2004). Further, Kundu and Katz (2003) discussed software firms as "Born Global⁶³", because of their high entrepreneurial abilities and technological innovation in such knowledge intensive sector. In addition, Pope (2002)

⁶¹ The development of knowledge related to foreign markets and this will reduce the cost of internationalisation. This suggests that the more knowledge a firm acquire regarding foreign markets would be likely to have higher export performance.

⁶² Those firms have expanded their domestic markets and engaged in exporting

⁶³ Born global are those firms that begin exporting consistently within two years of their existence.

conducted a study⁶⁴ on small exporting US (California) manufacturing firms. Pope (2002) empirical results suggested that small exporting firms have a significant association with motivation factors or reasons to export such as i) the firm has a unique product; ii) the firm products have a technological edge over competitors; iii) the firm has special knowledge about foreign markets or customers; iv) the firm senior management interest in foreign markets; v) firm scared of losing domestic market and; vi) the firm's domestic market is saturated.

In a global economy where trade liberalisation (removing trade barriers) becomes a key issue to survival of SMEs in developing countries: SMEs are facing many challenges such as scale of diseconomies in R&D, lack of marketing information, scarcity of human and physical resources which may force the SMEs to decline (Chen, 2003). For survival of SMEs strategies such as: tail cutting (reducing environment regulation expenses), involved in global supply chain and cooperative strategies may help smaller firm to overcome barriers of internationalisation (Chen, 2003). Further SMEs are to be born global rather than following the Uppsala model⁶⁵ which passes through different stages of internationalisation: to compete in this age, the SME sector has to be involved in cross-border activities through exporting and outward FDI (Moen *et al.* 2004). The major role for SMEs is to adopt a proactive strategy to upgrade their manufacturing capabilities (in technology acquisition, marketing and human resources) and equipment to international best practice (Wignaraja, 2003). Knight and Cavusgil (2004) have found a positive relationship between the born global firms and innovative performance. To become "Born Global" a firm must be rich in knowledge based resources which is linked to firm resource

⁶⁴ The study was based on postal survey of 137 small exporting firms and were analysed using two way ANOVA method to examine the relationship between firm exporting (percent of total sales) and their motivation factors.

⁶⁵ Johanson and Vahlne (1977) developed a model of firm internationalisation which states that firm goes through gradual process of development through following stages: no regular exports, export via independent representative like agent, establishment of overseas sales subsidiary and begin production in the host country.

based view (RBV) because born global firms are knowledge intensive with superior management and other organisational capabilities (Bell *et al.* 2003; Beck. *et al.* 2003).

In contrast, firms with high entrepreneurial and marketing abilities will encourage the early internationalisation of the business and innovation (Zahra *et al.* 2007). Moreover, Zahra, Naldi *et al.* (2007) suggested the importance of ownership, governance especially through top management team members, venture capital investor and outside board of directors have positive effects on the internationalisation of SMEs. These factors are knowledge based resources which increase the internationalisation of SMEs. On the other hand, Zucchella and Palamara (2007) identified the drivers of early internationalisation such as: entrepreneurship, social networks, business clusters, and niche positioning. They argued that these drivers of international trade may not exist everywhere because of low entrepreneurship culture, lack of industrial districts, and poor marketing strategies. Wright *et al.* (2007) suggest that a firm must decide when and how to internationalise its activities. They further state that SME sector cannot exports directly because of limited resources and SME can export initially through subcontract with large firms if both agreed on mutual interest. Similarly, Coviello and Munro (1997) found that network relationships are important for firm internationalisation because these strong networks through major partners, customer supplier relations will influence investment in domestic market as well as the internationalisation activities. Additionally, Hollenstein (2005) concluded that small firms prefer cooperative arrangement when they go for internationalisation because of resource constraint and large firms choose more equity based organisation of their international activities.

Nonetheless, Doi and Cowling (1998) argued that majority of SMEs are vulnerable firms which received subcontracted work from large firms and these subcontracted transactions may have large export competitiveness. A number of researchers argued that SMEs require

sufficient investment both in time and resources because this sector is weak compared to large firms in terms of access to resources and therefore best social networks should be established for internationalisation of their products and services (Flies and Carlos, 2006; Zhou and Luo, 2007; Cooke and Wills, 1999). In summary, empirical studies (*e.g.*, Harris and Reid, 2010; Delgado *et al.* 2002) suggest that firms are engaged in exporting and outward FDI have a higher productivity and innovation performance. In the international markets firms experience intense competition and are involved in producing more innovative products/services for higher firm performance. In particular, some studies (*e.g.*, Moen *et al.* 2004) stated that small software firms should be born global due to their strong internet-based communication system. However, these software firms still require better capabilities (*e.g.*, entrepreneurial, marketing) for higher firm performance. Overall, the literature survey apparently shows that internationalisation has a positive impact on the firm's performance. On the other hand, we clearly identified from the literature examples that less research is undertaken related to software industry; therefore, so we developed our hypotheses to investigate the positive relationship between firm internationalisation and labour productivity growth thus innovation performance.

H14: Internationalisation (exporting and outward FDI) has a positive relationship with the firm labour productivity growth and innovative performance.

2.6. Conclusions

The literature survey investigated the firm resource based view. The firm's resources were divided into two broad categories: tangibles and intangibles. Further, firm knowledge based resources (*i.e.* intangibles) were identified by using a conceptual model. Conceptual model showed link between variables (drivers of firm growth): drivers of firm growth were identified such as i) absorptive capacity ii) R&D iii) social networks iv) entrepreneurship v) Inward/Outward FDI vi) exporting and others. Also hypotheses were drawn to examine

the relationship between drivers of firm growth (independent variables) and firm labour productivity growth and innovation performance.

The introduction part of this chapter discussed the motivation of study and also identified initial hypotheses such as: firm size, age had positive relationship with labour productivity growth and long-term obstacles had a negative impact on firm performance. Section 1 discussed the firm resource based view. The resource based view of firm categorised firm resources into tangible and intangible resources. This research mainly emphasised the firm intangible resources such as: absorptive capacity, R&D undertaking, IPR, knowledge management and others. Additionally, section 2 provided information on firm absorptive capacity and its antecedents. The multilevel construct ‘absorptive capacity’ refers to the firm’s ability to internalise external knowledge and various indicators (*e.g.*, R&D, networks, human capital, knowledge management and others) used to measure this variable. The first proxy of absorptive capacity such as R&D was investigated. Previous studies discussed the two major roles of R&D. First R&D generated new knowledge and second it improved the firm innovative performance. A number of researchers argued that SMEs have resource constraint to undertake R&D compared to large firms. In comparison, firms with formal R&D structure produced more innovations (*i.e.* both product and process) than firms without formal R&D structure. Literature on R&D suggests that it has a positive impact on firm labour productivity growth and innovation performance.

The literature examples identified knowledge management was important driver of firm growth and had positive relationship with firm labour productivity growth. Additionally, human resource management played important role in the learning abilities of firms. Better recruitment and selection, training and development improved the firm performance. However, SMEs relied on informal recruitment and selection procedures compared to the large firms and one reason was to avoid cost of human resource management activities.

Further, organisational culture improved firm labour productivity growth and this could be achieved when a firm hired qualified individuals by providing them better work environment. In contrast, some studies suggested that firm with a democratic style of leadership and business improvement methods had a positive impact on firm labour productivity growth.

Literature on entrepreneurship discussed whether firm entrepreneurial abilities such as risk taking, pro-active and innovativeness had significant association with firm labour productivity growth. However, family-owned business constrained the firm entrepreneurial performance due to family members having a non-professional approach towards firm goals. On the other hand, social networks such as university-industry linkages, inter- and intra-firm collaboration had a positive relationship with firm labour productivity growth and innovation performance. In addition, a number of empirical findings showed that lack of access to finance might affect the performance of SMEs. In particular, SMEs requires more external finance to invest on innovation input such as R&D undertaking.

Section 3 discussed the role of inward FDI on local firms and then argued about firm internationalisation. Researchers emphasised the importance of inward FDI and its impact on domestic economy. Foreign firms had advanced technologies and had better organisational capabilities compared to local firms. Overall, FDI improved the labour productivity growth and innovation performance of local firms through forward and backward linkages. However, some researchers argued that the domestic economy could benefit more from FDI spillovers when local firms had higher absorptive capacity. Lastly, the literature survey showed that firms engaged in exports and outward FDI had high labour productivity growth and innovation performance.

Overall, the literature survey identified that few studies had analysed the software industry using firm level data: the conceptual framework would be applied to software industry to investigate the relationship between drivers of firm growth and firm performance. For empirical analysis, the research study has selected the Pakistani software industry to analyse the performance of these small software firms. The source of data and hypotheses derived from the literature are empirically tested in the next chapters.

3. Analysis of Software Industry

3.1. Introduction

According to the Board of Investment website, Pakistan has attracted substantial foreign direct investment in the Telecom and IT sector in recent years: specifically from 2002 to 2008. Pakistan is currently home to some of the world largest and most prominent information technology multinationals: Microsoft, Siemens, IBM, Cisco, HP, and Oracle. The majority of these multinationals operate their own training programmes and certifications. In addition, these multinational companies contribute to the capability development within the local industry through development partnership (e.g. the Microsoft partnership programme) with local software companies that promote knowledge spillovers (P@SHA, Annual Review of Pakistan Software Industry, 2007).

Pakistan has a 2.8 billion dollar IT industry with annual IT exports of USD 1.2 billion. These software firms exports their products predominantly to the USA, UK and the rest of the world such as Middle East, Europe, Canada Australia and Japan. These software companies provide services to the financial sector such as banks, as well as to government, automotives, telecommunications, energy and retail sector and so forth. The majority of these software firms are located in three major cities of Pakistan (Karachi 35%, in Lahore 33 %, and Islamabad/Rawalpindi, 26%). The remaining 6% are located in other parts of the country. The government has constructed 11 IT parks in major cities of the country which cover an area of 750,000 sq ft. One of the main reasons for the heavy investment from multinationals is that the Pakistan government has allowed 100% ownership of equity and 100% repatriation of profits for foreign investors. Major tax incentives for companies are in place till 2016. Moreover, the Government has given a tax holiday on the income from the export of computer software and related services (PSEB, Pakistan IT Industry Yearbook 2007-08).

As far as the IT labour market is concerned, there are an estimated 110,000 IT professionals working in this sector. However, according to the P@SHA (Pakistan Software House Association) annual report the shortage of good well-trained workers such as graduates, is one of the most significant challenges for the Pakistan software industry. Approximately 5000 of these graduates come from good quality institutions such as GIKI, LUMS, NUST, FAST, UETs, KU, PU and IBA. The difference is made up from the “second tier” institutions. Industry professionals suggest that no more than a couple of thousand of these graduates are of a high enough quality to engage in programming and related occupation in software companies. To deal with this human resource development challenge, the PSEB (Pakistan Software Export Board) is working with the HEC (Higher Education Commission Pakistan) to enhance the quality of graduates through its internship and apprentice programme.

In addition to having one of the fastest-growing cellular industries in the world, Pakistan also has an edge over neighbouring global giants in terms of its thriving business process outsourcing. Pakistan is extremely competitive; with costs are as much as 30 percent lower, while also enjoying infrastructure advantages of high speed internet connectivity in all the major cities are available at competitive rates. There is rapid growth in connectivity towards broadband services which are taking precedence in homes and businesses. There have been extensive efforts to network the country, and so far over 1800 towns and cities have been connected to the internet infrastructure. The Pakistani ICT industry’s major growth area has been in telecommunication, with an increase in cellular network operators over the last year, as well as the doubling of subscribers over the course of single year. However, the Pakistani IT-Industry is still very small compare to that of neighbouring countries such as India. India had estimated global revenue USD 47 billion compare to Pakistan USD 2.8 billion for the year 2006-07. Further, internet bandwidth usage for India is 600 GBS and while Pakistan has 8 GBS. The advantages for Pakistan over India is that

the operating cost of the Pakistani software Industry is much lower compared to that of India, according to an international report “The Buying Triangle, 2006”. However, the lack of data on key indices (*e.g.*, employment, output) across different sectors (*e.g.*, IT, airline, banking, and textile) of the economy showed limitation in terms of comparative performance measures.

Overall, the interesting characteristics of the Pakistan software Industry and the lack of research in this area motivated the researcher to study local software firms using micro level analysis. This research study examines the policy implications for the development of this knowledge intensive sector (IT-Industry) by analysing R&D, innovation, exports and inward/outward FDI (foreign direct investment) at firm level.

3.2. Methodology

For this report, a research survey was undertaken in two stages. In the first stage, a pilot study of 5 firms was conducted in 2009 in two regions of Pakistan *i.e.*, Islamabad (the Capital of Pakistan) and Rawalpindi district. In the second stage, a final survey was made again during April-May, 2010. A list of 300 IT companies was provided by Pakistan Software Export Board (PSEB). However, 150 firms were excluded from the list, because the firms were not involved purely in the software business or the list did not provide correct information about the firms’ whereabouts. Finally, 150 firms were randomly selected for face-to-face interviews using a structured questionnaire. Firms were contacted through emails and phone calls for appointment and only 69 firms responded (46%) for interviews. Of the total, 65 firms were interviewed in Islamabad and the remaining 4 in Rawalpindi. Of the 69 firms, only 3 firms were interviewed on the telephone because of the owner not being present or because of company policy. Further, 8 firms refused to provide financial information. The average time per interview took approximately 35 minutes. The data were analysed with SPSS.18.

In contrast, the strengths of the dataset such as i) first time, firm level data is collected on variables, R&D, internationalisation, business and management factors of innovation on Pakistani software industry; ii) the findings from data analysis (at firm level) could be use for policy implications for overall Pakistani software industry. However, a small number of observations (n=69) result in limitations of the dataset, for instance, to analyse the causal relationship between variables requires large dataset. In addition, the stratified random sampling could be a good sample selection, if the list of firms had provided information on firm size and sales volume. Similarly, the cross-sectional data techniques are limited in terms of analysis because of selection and measurement bias. Further, the data collected at single point will not capture the long term effects of these variables (*e.g.*, R&D, productivity).

This chapter has been divided into five major sections and two sub-sections. Section 1 is about the firm basic characteristics which include *inter alia* type of firms, proportion of R&D firms, percent of firms exporting, and proportion of family-owned businesses. In section 2 the focus is the links between R&D and Innovation. In addition to that, sub-section 3.4.1 provides information on the barriers to innovation activities; and sub-sections 3.4.2 & 3.4.3 are about R&D and labour productivity; family-and non-family owned businesses and their relationships with R&D/non-R&D firms; innovation and labour productivity of family-and non-family owned will be discussed through use of cross-tabulations (i.e. sub-section 3.4.3.). Section 3 examines the internationalisation of firms by looking into firms with exports, outward/inward FDI using non-parametric tests (i.e., Kruskal Wallis test) and parametric tests such as chi square test. In section 4, the discussion is based on the association between entrepreneurial abilities (i.e., risk taking, pro activeness) and firm innovative performance by using parametric tests (t-test). Finally, the last section 5 provides a conclusion and the limitation of the report and suggestions for policy implications for the growth and development of the IT industry in Pakistan.

Section 1

3.3. Firm Characteristics

In this section, the firm basic characteristics are discussed such as i) type of business; ii) proportion of firms applied for external finance (i.e. banks); iii) proportion of firms sought finance in the past 3-years; iv) proportion of family-owned business; iv) proportion of business engaged in R&D and; v) proportion of firm with foreign ownership. Further, long term obstacles to the success of their business (i.e. from 1=most important to 5=not important) and its association with firm size are discussed.

Table 3.1: Type of Business (in percentages)

| Type of Business | Percent (%) |
|---------------------|-------------|
| Sole proprietorship | 30.4 |
| Partnership | 7.2 |
| Private Ltd Company | 60.9 |
| Public Ltd Company | 1.4 |
| Total | 100 |

n=69.

Table 3.1 reports the type of business of the 69 firms; 60.9% of firms are registered as private limited companies compared to 30.4% of firms are owned by sole proprietors. Only one firm (i.e. 1.4%) is registered as a public limited company. Table 3.2 reports the proportion of firms expecting to finance their business growth through internal or external sources.

Table 3.2: Funding business in future

| Funding business | Percent (%) |
|----------------------------|-------------|
| Internal finance | 75.4 |
| Both (internal & external) | 24.6 |

n=69

Total =100

Approximately 75% of firms are expecting to finance their business growth through internal sources and only 24.6% firms would expect to finance their business growth from both sources (internal and external). This suggests that firms are externally constrained and

rely on internal funds growth; there could be many reasons such as high interest rates, lack of securities, risk and uncertainty. Further, Table 3.3 provides information on the various characteristics such as previous borrowing history, family- or non-family-owned business.

| Table 3.3: Firm characteristics | |
|------------------------------------|--------------------------|
| Characteristics | Percent (%) ^a |
| Sought finance in the past 3-years | 11.6 |
| Family-owned business | 21.7 |
| Business engaged in R&D | 20.3 |
| Foreign ownership | 24.6 |
| Engaged in exports | 81.2 |

n=69

^a Figures are % of firms in each case reporting 'yes' to the question'

Table 3.3 shows that only 11.6% of firms sought finance in the past 3 years and the rest never applied for external finance⁶⁶ during this period. This suggests that firms are externally constrained. In addition, approximately 22% firms are family-owned, and only 20.3% undertook R&D. Firms were asked about the shared capital owned by foreign company/companies in their business; and nearly 25% have foreign ownership⁶⁷. Unfortunately, the non-availability of firm level data related to the IT (i.e. information technology) sector overall and to other sectors (i.e. financial, business, textiles, chemical) of the economy is one of the limitations in being able compare over results on foreign ownership (i.e. shared capital owned by foreign company/companies) at firm level. Finally, most of the firms (81.2%) are exporting to international markets and while the remaining firms are selling their products just locally (i.e. Pakistan).

Furthermore, Table 3.4 shows the export destination of products and services for exports; firms are predominantly exporting to the USA & Canada and the UK. Of the 56 exporting firms, USA and Canada are the most important destination (52.2%) of their products and

⁶⁶ During interviews with owners it is found that, there is no financing facility (i.e. bank loans) to this sector (i.e. software firms); reasons were given as lack of securities, high interest rates, risk of default for loans are high etc.

⁶⁷ Of the 17 firms (24.6%) are 100% foreign ownership; 15 firms have more than 50% shared capital owned by foreign company/companies and the rest are <=25% foreign owned.

services. Approximately 16% are exporting to countries such as China, and Singapore and so forth.

| Table 3.4: Destination of exports rank wise (from most important destination to least) | |
|--|-------------|
| Countries | Percent (%) |
| USA & Canada | 52.2 |
| UK | 34.8 |
| Europe | 27.5 |
| Middle East | 29 |
| Others (China, Singapore) | 15.9 |

n=56

The survey also asked all the firms to rank (i.e. from 1=most important to 5=not important) 16 obstacles to the long-term success of their business. Table 3.5 provides information about these obstacles.

| Table 3.5: Five major obstacles (rank wise) to the success of business (row percentages) | | | | | | | |
|--|------|------|------|------|-----|------------|-------|
| Obstacles | 1st | 2nd | 3rd | 4th | 5th | Not Ranked | Total |
| Economy | 33.3 | 8.7 | 14.5 | 2.9 | 0 | 40.6 | 100 |
| Recruiting staff | 13 | 13 | 8.8 | 2.9 | 0 | 62.3 | 100 |
| Crime and Security | 7.2 | 14.5 | 7.2 | 2.9 | 1.4 | 66.8 | 100 |
| Shortage of skills generally | 7.2 | 14.6 | 5.8 | 1.4 | 1.4 | 69.6 | 100 |
| Keeping staff | 2.9 | 2.9 | 11.6 | 11.6 | 1.4 | 69.6 | 100 |
| Shortage of managerial skills | 4.3 | 5.9 | 13 | 0 | 1.4 | 75.4 | 100 |
| Obtaining finance | 4.4 | 2.9 | 5.8 | 7.2 | 0 | 79.7 | 100 |
| Others (political/energy crisis) | 10.1 | 4.4 | 1.4 | 0 | 0 | 84.1 | 100 |
| Competition | 4.3 | 5.8 | 1.4 | 2.9 | 1.4 | 84.2 | 100 |
| Cost of premises | 3 | 4.3 | 4.3 | 1.4 | 1.4 | 85.6 | 100 |
| Regulations | 0 | 5.8 | 4.3 | 2.9 | 0 | 87 | 100 |
| Taxation | 2.9 | 4.3 | 2.9 | 0 | 0 | 89.9 | 100 |
| Transport | 2.9 | 2.9 | 2.9 | 0 | 1.4 | 89.9 | 100 |
| Keeping up with new technology | 1.4 | 0 | 7.3 | 0 | 1.4 | 89.9 | 100 |
| Lack of financial understanding | 1.4 | 1.4 | 2.9 | 2.9 | 0 | 91.4 | 100 |
| Pension | 0 | 0 | 0 | 0 | 0 | 100 | 100 |

n=69.

For example, of the 69 firms, 33.3% of firm's ranked economy as their most important obstacle. This suggests that the 'economy' is overall the major issue for the majority of firms. Further, recruiting staff ranked the second most important obstacle. Only a small proportion of firms (7.2 %) ranked crime and security crisis as their first obstacle to the

long term success of their business. Further, political and energy crises ranked most important to 10.1%.

The last four rows in Table 3.5 show the lowest ranked obstacles to the long-term success of their business. In the case of 'taxation' only 2.9% of firms ranked this as the most important obstacle. Lastly, none of the firms ranked pension as their obstacle to the growth of their business. However, a number of researchers argued that these macro (i.e. regulation, law and order) and micro level (i.e. labour skills) obstacles can affect the performance of firms whether large or small size: and these obstacles are more severe in developing countries (Mintoo, 2006; and Reddy, 2007 *et al.*). In order to test the association between these long term obstacles and firms size (based on the Kruskal Wallis test⁶⁸) it was found that there was a statistically significant association⁶⁹ between 'long-term obstacles' such as i) keeping staff at 10% and ii) shortage of managerial skills at 5% to the success of their business and firm size.

Section 2

3.4. R&D, Innovation and Labour Productivity

Based on the literature, a number of researchers state R&D (i.e. a measure of innovation input) is one of the most important indicator for measuring firm innovative performance (Harris and Trainor, 2005; Audretsch, 2004). The empirical studies (*e.g.*, Harhoff, 1998) showed that firm undertaking R&D has a significant impact on the firm's productivity innovation performance. R&D generates new knowledge and in turn increases the firm internal abilities to benefits from external knowledge sources through product/process innovations (Cohen and Levinthal, 1989). In the literature, the empirical studies (*e.g.*,

⁶⁸ Kruskal Wallis Test: K-W test (named after William Kruskal and W. Allen Wallis) is a non-parametric test and does not assume normal distribution. This test is based on ranked data from lowest to highest orders (Field, Andy, 2005).

⁶⁹ Before applying the K-W test; firms were examined by their extreme values (i.e. large deviations in data) and 6 firms were excluded (outliers), in order to reject the null hypothesis.

Harris, 2005) on R&D suggest that R&D is an important driver of firm's growth. This section is based on findings related to the firm's innovative performance, the single most competitive factor in determining its performance, and labour productivity and its relationship with R&D. Firms were also asked about their 'important source (s)' of knowledge and information for innovation activities; and 'barrier to innovations' are also reported in sub section 3.4.1.

In this section, three hypotheses are tested and discussed; i) R&D undertaking has a positive relationship with firm innovative performance; ii) firm 'single most important factor' for competitive edge of the business in the next 3-5 years has significant association with firm R&D; iii) long-term obstacles to the success of their business have a significant affect on the firm R&D undertaking or not. Additionally, two more hypotheses are tested and discussed in sub section 3.4.2 (i.e. the relationship between R&D and labour productivity; and have relationship firm size and labour productivity. Lastly, sub-section 3.4.3 examine the relationship between family/non-family owned business and firm innovation abilities (e.g., R&D, type of innovation) and also investigate the association between family/non-family owned business and labour productivity.

In order to test the first of three hypotheses, firms in the survey were asked a number of questions about whether they were involved in innovation related activities: i) whether they had introduced any major product/process innovations in the last 3 years; ii) the type of innovation⁷⁰; iii) whether they had engaged in R&D; iv) the 'single most important factor'⁷¹ for the firm competitive advantage in the next 3-5 years.

⁷⁰ The type of innovation is divided into two categories; i) new to the business or ii) completely new.

⁷¹ All firms were asked to answer the question 'what is their single most important factor for competitive edge of their business in the next 3-5 years, from the list of four: 1=product design, 2=cost of effectiveness 3= marketing and 4= others (financial management etc).

Table 3.6 present the relationship (i.e. cross-tabulation) between firms involved in product/process innovation and their type of innovation introduced in the last 3 years.

Table 3.6: Percentage of firms that innovated in the last 3-years sub divided by their type of innovation (figures are in row percentages)

| Innovation in last 3-years | n=69 | Type of Innovation | | | Total |
|-------------------------------|------|---------------------|----------------|------|-------|
| | | New to the Business | Completely New | Both | |
| Product Innovation only | 17 | 58.8 | 41.2 | - | 100 |
| Both (prod/process) | 51 | 66.7 | 25.5 | 7.8 | 100 |
| No product/process innovation | 1 | - | - | - | 100 |
| Total | | | | | 100% |

Of the 69 firms surveyed, only one firm did not introduce any product/process innovation in the last 3 years. Further, Table 3.6 shows that 17 of 69 firms introduced a product innovation in the last 3 years and of these nearly 59% were incremental innovations (i.e. new to the business) compared to the 41.2% who introduced radical innovation (i.e. completely new). Further, the second row of Table 3.6 present results when firms were involved in both (product/process) innovations in the last 3 years. In addition, 51 of 69 firms (i.e. 67%) introduced an incremental type of innovation compared to the nearly 26% which were completely new; and of these 51 firms only 7.8% firms were involved in both type of innovation. This suggests that firms were more involved in incremental type of innovations compared to radical innovations.

Further, firms that innovated in the last 3 years (n=68 firms) were given a number of statements related to their sources of knowledge and information for their innovation activities. Figure 3.1 reports the results (%) of sources of knowledge and information (K&I) for their innovation activities.

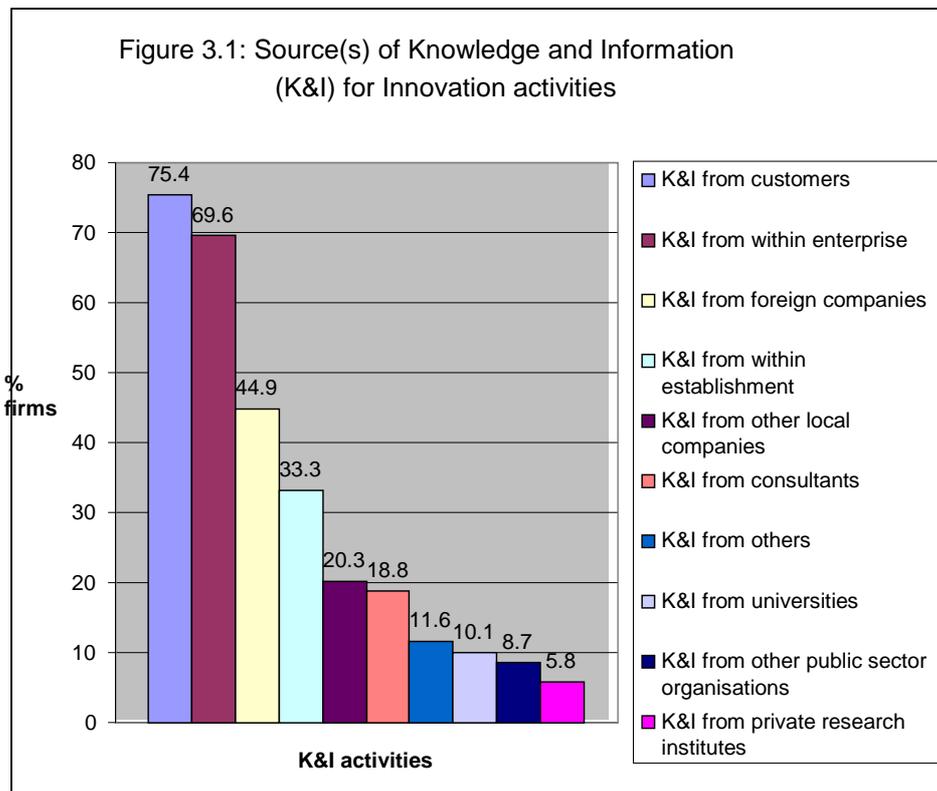


Figure 3.1 shows that of the 68 firms, approximately 75% placed ‘K&I, from customers’ as their most important source of knowledge and information for innovation activities compared to the nearly 70% selected ‘K&I, within enterprise’ as their second most important source. In addition, approximately 45% selected ‘K&I, from foreign companies’ compared to the nearly 33% placed ‘K&I from within establishment (i.e. design, production, operational)’ as their sources of knowledge and information for innovation activities. In comparison, a small proportion (5.8%) of firms placed ‘K&I, from private research institutes’ as their least source of knowledge and information for innovation activities compared to the 8.7% firms selected ‘K&I, from universities’.

Overall, Figure 3.1 suggests that most of the firms are receiving knowledge and information from within the enterprise, foreign companies, and customers for their innovation activities and less relied on outside private research institutes and universities. It also implies that these innovated firms have weak linkages with universities and other research organisations. For instance, empirical study of Fukugawa (2006) stated that firm

with networks (*e.g.*, inter-intra firm) improve the firm’s innovation performance. In particular, SMEs require linkages with universities and other research organisations for higher firm performance (Wiklund *et al.* 2007). However, these small software firms have poor networks with other research organisations which may reduce the firm innovation performance.

In order to test the first hypothesis, Table 3.7 provides information on the relationship between firm R&D undertaking and type of innovation in the last 3 years.

Table 3.7: Percentage of firms engaged in R&D by their type of innovation, figures are in row percentages

| Engaged in R&D | n=68 | No Innov ^a | Type of Innovation* | | | Total |
|----------------|------|-----------------------|---------------------|----------------|------|-------|
| | | | New to business | Completely new | Both | |
| Yes | 14 | | 57.1 | 35.7 | 7.1 | 100 |
| No | 54 | 1.8 | 65.5 | 27.3 | 5.5 | 100 |

* Pearson chi-square value: 0.705

^a one firm (1.8%) did not make any type of innovation in the last 3 years

Of the 68 firms (see Table 3.7), R&D firms (n=14) had 57% ‘new to the business’ innovation output compared to nearly 36% of ‘completely new’. In comparison, non-R&D firms (n=54) had introduced nearly 66% ‘new to the businesses’ innovations compared to 27.3% with ‘completely new’. Overall, Table 3.7 shows that, those firms were engaged in R&D did more radical innovations (*i.e.* completely new). However, the small difference between values (%) of R&D and non-R&D firms and their type of innovations shows that there is a weak relationship. The test of association⁷² of R&D and type of innovation shows no statistical relationship between these two; and our first hypothesis is not supported. This suggests that these ‘completely new’ innovations are not very radical by

⁷² The test of association (*i.e.* cross tabulation using a chi-square test which examines the relationship between two categorical variables) has been used to analyse the relationship between R&D and firm involved in a type of innovation in the last 3 years.

international standards⁷³. It also suggests that if innovation requires no R&D undertaking it is likely to be only marginally better.

Additionally, each firm was asked to choose the single most important factor for competitive edge of their business in the next 3-5 years. For the second hypothesis, Table 3.8 reports the relationship between the single most important factor for competitive advantage of their business and whether they undertook R&D.

Table 3.8: Percentage of firms engaged in R&D in Pakistan sub-divided by their Single most important factor for competitive advantage in next 3-5 years (figures in row percentages)

| Single most competitive factor | | Engage in R&D in Pakistan* | | |
|--------------------------------|-------------|----------------------------|-------------|------------|
| | | Yes | No | Total |
| Product design | 24.6% | 35.5 | 64.7 | 100 |
| Cost effectiveness | 37.7% | 15.4 | 84.6 | 100 |
| Marketing | 20.3% | 7.1 | 92.9 | 100 |
| Other factors ^a | 17.3% | 25.0 | 75.0 | 100 |
| Total | 100% | 20.3 | 79.7 | 100 |

* Pearson chi-square value: 4.414

^a Financial management

Table 3.8 shows, of the 69 firms surveyed, 24.6 % placed ‘product design’ as the most important factor for their business in the next 3-5 years, and of firms in this sub-group just over 35% undertook R&D. In comparison, a larger proportion (37.7%) of firms selected ‘cost effectiveness’ was the most important factor, with only 15.4% of this sub group undertaking R&D. In addition, ‘marketing’ was the most important factor for 20.3% of the 69 firms and in this sub category, only 7.1% carried out R&D. This shows clear evidence of the expected link⁷⁴ between undertaking R&D and where product design being the most important competitive advantage of the firm.

Further, Table 3.9 reports the significant difference between long-term obstacles to the success of their business, from “most important” (coded 5) to ‘not important’ (coded 1)

⁷³ Each firm (i.e. innovative) was asked a question ‘how many of these been patented?’ and very few firms (i.e. only 6) patented their small number of products/processes in the last 3 years.

⁷⁴ The test of association (chi square value) shows no statistical association, the null hypothesis is true

and firm R&D undertaking using t-test⁷⁵ (based upon Levene's test). These obstacles are subdivided into two subgroups: those which undertook R&D (n=14) and those which did not undertake R&D (n=55). The first column shows the list of 16 long-term obstacles, and in 'Mean' columns, shows the mean values of long-term obstacles, subdivided into R&D and non R&D firms. In the fourth column, the t-values of the difference in mean values are reported. Take for example, the first obstacle 'economy'; the mean value for R&D firms is 2.21. This compares with the mean value of same obstacle for non-R&D firms (n=55) which is 3.01. The t-value (-1.683) for obstacle 'economy' shows that there is statistically difference between the mean values of two sub-groups; which rejects the null hypothesis. This suggest that firms which do not undertake R&D tend to view the economy as an obstacle more than firm which do undertake R&D.

| Table 3.9: Test Statistics between R&D and Long term Obstacles to the Success of their Business | | | | |
|---|-------------------|---------------|-----------|------------------|
| Obstacles | R&D=14 | Non-R&D=55 | | Levene's test |
| | Mean ^a | Mean | t-values | |
| Economy | 2.21 | 3.01 | -1.683* | equal variance |
| Obtaining finance | 2.29 | 1.38 | 1.917** | unequal variance |
| Taxation | 1.71 | 1.20 | 1.254 | unequal variance |
| Recruiting staff | 2.14 | 2.11 | 0.072 | equal variance |
| Keeping staff | 1.43 | 1.58 | -0.505 | equal variance |
| Transport | 1.00 | 1.33 | -2.471** | unequal variance |
| Regulations | 1.57 | 1.22 | 1.094 | unequal variance |
| Keeping up with new Technology | 1.00 | 1.25 | -2.436** | unequal variance |
| Availability/Cost of premises | 1.00 | 1.44 | -3.032*** | unequal variance |
| Competition | 1.36 | 1.42 | -0.188 | equal variance |
| Shortage of managerial skills | 1.64 | 1.60 | 0.121 | equal variance |
| Shortage of skills generally | 2.21 | 1.76 | 0.914 | unequal variance |
| Lack of financial understanding | 1.29 | 1.16 | 0.587 | equal variance |
| Crime and Security | 1.79 | 1.93 | -0.332 | equal variance |
| Pension | 1.00 | 1.00 b | . | . |
| Others (i.e., Political/energy) | 1.43 | 1.60 | -0.427 | equal variance |

*/**/** significant at 10/5/1% levels

^a variables are measured from 5=most important to 1=not important: **b**. none of the firm ranked pension as obstacle

⁷⁵ T-test: is parametric test based on normal distribution and tests null and alternative hypotheses. If null hypothesis (i.e. the difference between mean values is zero) is true, then we expect no difference between population means or otherwise alternative hypothesis: H1.

Moreover, statistically significant differences (at $p < 0.1$) are presented for only five of the 16 possible long-term obstacles: 'economy', 'obtaining finance', 'transport', 'keeping up with new technology', and 'availability/cost of premises'. For instance, firms which undertake R&D tend to view 'obtaining finance' as more of an obstacle than firms which do not undertake R&D. For other long term obstacles, there is so statistically difference between the mean values of the responses of the two groups of the firm.

3.4.1 Barriers to Innovation

This sub-section provides information on the answers to the question 'what are the reasons for not undertaking innovative activities (*e.g.*, R&D)?'. The section presents responses of non R&D firms (i.e. $n=55$). The replies were coded as follows; strongly agree= 2; agree = 1; neither agree/disagree= 0; disagree= -1; strongly disagree = -2. The average response across the firms was represented by an overall single value which was then converted back to nearest statement to which it corresponded (*e.g.*, an average response of -0.66 was rounded to -1, which equates 'disagree'). Table 3.10 show the average response of non-R&D firms to 'reasons for not undertaking R&D'.

Table 3.10: Reasons for not undertaking R&D

| | Average Response |
|---|------------------|
| The nature of our product does not require or justify expenditure on R&D | neutral |
| External economic/market conditions prevent us from undertaking R&D | neutral |
| Lack of access to internal finance restricts our ability to undertake R&D | neutral |
| There is limited competition for our products so we do not engage in R&D | neutral |
| We are unable to engage in R&D due to lack of appropriate skills in the business | neutral |
| If we were confident of generating a high rate of return and or low level of risk we would invest in R&D | agree |
| It makes more sense to wait and copy the innovation of competitors than undertake R&D ourselves | neutral |
| Senior management do not regard R&D as strategic priority | neutral |
| We are unable to develop links with external bodies/organisation that would stimulate R&D as strategic priority | neutral |
| There are insufficient govt. grants or tax incentive to make R&D spending worthwhile | agree |

n=55

Table 3.10 present the results for non-R&D firms (i.e., n=55); most of firms were neutral (i.e. neither agree nor disagree) with regard to the statements. This shows little indication of why they are not engaged in R&D. However, in the case of ‘If we were confident of generating high rate of return and or low level of risk...’ the majority of firms responded ‘agree’ to the statement. This suggests that firms are more risk adverse. In other words, the firm’s financial performance is weak and they cannot invest on such risky nature of investment (i.e. R&D). Furthermore, for the last statement ‘There are insufficient govt grants or tax incentive to make R&D spending worthwhile’ the average response rate was ‘agree’ to the statement. This suggests that these software firms are not receiving sufficient govt grants or tax incentive for R&D and overall R&D undertaking is very low in this sector (only 14 firms undertook R&D).

In addition, each firm (i.e. n=69) was asked to answer the question such as ‘In the last 4 years has your business received any of the following form of public support?’ and a list of options were provided to them by showing card⁷⁶.

| Table 3.11: Public support for R&D in the last 4 years | |
|---|-----------------------|
| | No public support (%) |
| Tax incentives such as the R&D allowance for capital spending | 98 |
| Tax incentive such R&D tax credits | 100 |
| Capital grants from Govt (PSEB) | 88.4 |
| Other grants from Govt. (such as R&D grants) | 100 |
| Loans or interest relief from Govt. | 100 |
| Equity Investment by Govt. | 100 |
| Advisory services | 94.2 |
| Assistance in establishing network with other organisations | - |
| Encouraging links with universities | 99 |
| Training courses | 94 |
| Others (tax holiday) | 84 |
| | 68 |

n=69

Table 3.11 provide information on the public support in the last 4 years. As can be seen, most of the firms did not receive any kind of public support from the government for their innovation activities, which suggest that these software firms have poor support from public sector organisations apart from their risk-averse behaviour on R&D. The Table show, most of the firms replied ‘No’ to any public support in the last couple of years. Further, each firm was asked ‘what do you consider are the most effective incentive that public sector can provide to encourage firm innovation activities?’ The majority of firms answered i) infrastructure facility; iii) R&D related funds and; iii) encouraging links with universities and research organizations. This suggest that firms requires more public support for increasing their innovation activities; that is why these firms were more engaged in the incremental type of innovation rather than radical in the last 3 years (i.e. see Table 3.6).

⁷⁶ While in interview with owner-managers, the managers were provided with a list of answers to the questions through cards. The manager has to select the answers related to their firms.

Each non-R&D (n=55) firm was asked to answer ‘what is the most important factor might encourage your business to undertake R&D in future?’ Figure 3.2 provide information on these factors (i.e. most important) for non-R&D firms

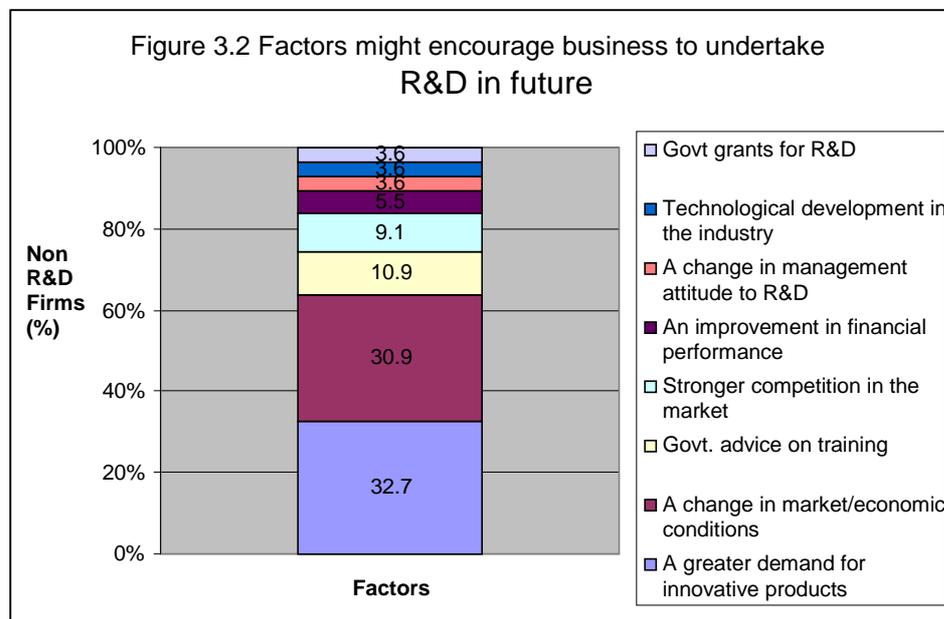


Figure 3.2 shows that, of the non-R&D firms (i.e. n=55) majority of firms (i.e. approximately 33%) replied ‘a greater demand for innovative products’ would encourage their business to undertake R&D in future. This suggests that most of the firms are selling not highly innovated products. On the other hand, majority of firms are involved exports (i.e. see Table 3.3), but implies their exports are not highly innovated products. Additionally, a large proportion of firms (i.e. nearly 31% of non R&D firms) placed ‘a change in market/economics conditions’ as their important factor for R&D. This implies that firms are also facing tough market/economic conditions in order to invest on R&D. In addition, predominantly firms placed economy as their most important obstacle to the long term success of their business (i.e. Table 3.5). In comparison, nearly 6% of firms selected ‘an improvement in financial performance of the businesses might encourage them to undertake R&D; and only 3.6% firms selected ‘government grants for R&D’ as their factors for considering R&D in the future. Overall, Figure: 3.2 suggest that there is lower

demand for innovative products and poor market economic conditions prevent firms to undertake R&D.

3.4.2. R&D, Labour Productivity and Size

In this sub-section, two hypotheses are tested and discussed; i) R&D has a significant positive association with firm labour productivity; and ii) firm size has a significant association with labour productivity. Table 3.12 reports the relationship between whether firms engage in R&D and labour productivity⁷⁷; it shows that, of the 61 firms (i.e. 8 firms refused to provide financial information), 14 R&D firms have higher labour productivity US\$ 19120 compared to the non R&D firms (i.e. 47). However, a t-test value of the null hypothesis that undertaking R&D is associated with higher productivity is not rejected; the difference in the mean values, given the variance around each mean is too close to establish that R&D and higher productivity are linked.

| Table 3.12: Labour productivity of R&D/Non R&D firms | | | |
|--|------|-------------------|----------|
| Engage in R&D | n=61 | Mean ^a | t-value* |
| Yes | 14 | 19120 | 0.326 |
| No | 47 | 16463 | |

^aMean values measured in US\$ (1US\$=84 PKR)

* t-value considered at equal variance (i.e. based on Levene's test)

Table 3.13 provides information on the relationship between firm size (subdivided into 5 size bands based on the number of employees) and labour productivity.

| Table 3.13: Labour productivity and firm size | | |
|---|------|--------------|
| Size Bands (employees) | n=61 | Mean (US\$)* |
| 1 to 10 | 9 | 6516 |
| 11 to 20 | 13 | 24418 |
| 21 to 30 | 14 | 15280 |
| 31 to 80 | 15 | 20572 |
| 81 to 500 | 10 | 14287 |

*Chi-square value: 10.223 (i.e. based on Kruskal Wallis test)

⁷⁷ Labour Productivity: sales/employees; sales volume and number of employees taken at current year values.

It shows that labour productivity is low (i.e. US\$ 6516) for the smallest firms (size band; 1 to 10). Further, labour productivity is higher (US\$ 24418) for size band 11 to 20 compared to any other size band. Overall, Table 3.13 shows that there is little by way of a linear relationship between firm size and labour productivity. However, a Kruskal Wallis test shows that there is statistically significant association between firm size and labour productivity (at 5% significance level), although there is no clear pattern.

3.4.3 Family Owned Businesses, Innovation and Labour Productivity

We now consider the association between family-owned businesses⁷⁸ and firm innovation and labour productivity. The literature suggests that a family member's involvement in the business constrains the firm's innovative performance. The succession in family business is one of the major problems for firm productivity growth (Bjuggren and Sund, 2002). Further, barriers to growth are more severe in family-owned business compared to non family-owned business such as low innovation and productivity. However, a number of researchers have argued that family-owned business have advantages such as low monitoring cost (e.g. family members trust each other) and family members remain in post for long term for better relationship with customers and suppliers. In this sub-section two major hypotheses are tested and discussed. First, whether family-owned businesses have a positive relationship with firm innovative performance and second whether they have association with labour productivity.

In order to test the first hypothesis, Table 3.14 provides information on family-/non-family owned businesses in terms of whether they engage in R&D, and the type of innovation (i.e. new to the business and completely new) in the last 3 years.

⁷⁸ A family owned business majority owned by members of the same family.

Table 3.14: Family-owned business, R&D and type of innovation (row percentages)

| Family owned business ^a | Engage in R&D* | | Type of Innovation** | | | |
|------------------------------------|----------------|------|----------------------|----------------|------|----------|
| | Yes | No | New to business | Completely New | Both | No Innov |
| Yes (21.7%) | 13.3 | 86.7 | 73.3 | 26.7 | - | - |
| No (78.3%) | 22.2 | 77.8 | 61.1 | 29.6 | 7.4 | 1.9 |

^a show relationship to 'R&D' and 'type of innovation' using test of association

*Pearson Chi-Square value: 0.574

**Pearson Chi-Square value: 1.699; n= 69

The survey asked each firm to answer 'Is your business a family-owned?' with over 78% reporting they were not family owned. In the case of family-/non family owned business and firm, whether firm was involved in R&D or not; Table 3.14 shows, of the 21.7% of family owned businesses approximately 13% undertook R&D, while non-family owned firms, some 22.2% undertook R&D.

Further, of the family-owned businesses approximately 73% produced incremental types of innovation (i.e. new to the business) compared to the nearly 27% having a radical innovation in the last 3 years. In addition, the same outcome (i.e. more incremental innovations) is found for non-family owned businesses. This suggests that radical innovation is very low for both family -and non-family owned businesses. However, a test of association shows no statistical relationship between family-/non-family owned businesses and R&D and the same insignificant association is found between type of innovation and family/non family owned businesses (based on chi- square tests, with the test values reported in Table 3.14).

To test whether there is relationship between family owned business and labour productivity, Table 3.15 shows clearly that labour productivity is higher (i.e. US\$ 25140) for family-owned businesses. However, a t-test (choice of t-test value 0.766 is based on Levene's test) shows that there is no significant difference between the means values being family/non-family owned and labour productivity.

Table 3.15: Family owned business and labour productivity

| Family-owned | Mean (US\$) | t-value* |
|--------------|-------------|----------|
| Yes (21.7%) | 25140 | 0.766 |
| No (78.3%) | 14888 | - |

* t-value considered at no equal variance (i.e. based on Levene's test)
n=61

Section 3

3.5. Internationalisation (Exports, Inward/Outward FDI) and Labour Productivity

This section looks at the internationalisation of firms through exporting and outward foreign direct investment. According to Castellani (2002), Internationalisation is associated with higher levels of firm productivity; it also has a positive impact on the firm knowledge learning abilities and innovative performance. However, SMEs internationalisation requires knowledge exploration and exploitation through its knowledge assets such as i) R&D and ii) Human Capital (De Clercq *et al.* 2005). Barrios *et al.* (2003) stated that firm own/in-house R&D undertaking has a significant affect on the firm exporting for Spanish manufacturing firms. They found that firm own R&D is an important indicator for the firm whether to export or not. In addition, Knight and Cavusgil (2004) found a positive relationship between firm internationalisation activities and innovative performance. In support of Knight and Cavusgil (2004), Harris and Reid (2010) argued that firms engage in internationalisation will have higher productivity growth, because such firms have higher learning abilities to absorb external knowledge. In this section the following hypotheses are tested and discussed: i) R&D has a significant association with firm exporting; ii) firms which export have a higher labour productivity; iii) the firms single most important factor for its competitive edge for the business in the next 3-5 years (*e.g.*, product design, cost effectiveness, marketing) has a significant association with exporting; iv) firms involved in investment abroad (i.e. outward foreign direct investment) have higher productivity and finally; v) The long term obstacles to the success of their business are linked to whether a firm exports or not.

In order to test first hypothesis, table: 3.16 provides information on the relationship between firms R&D undertaking and exporting.

| Table 3.16: Exports and business engage in R&D (figures are in row percentages) | | |
|---|--------------------|------|
| Engage in R&D | Engage in exports* | |
| | Yes | No |
| Yes (20.3%) | 64.3 | 35.7 |
| No (79.7%) | 85.5 | 14.5 |
| Total (100%) | 81.2 | 8.8 |

*Significant at 10% using Pearson Chi square test (3.270); n=69

It shows, of those that undertook R&D (some 20%) firms, approximately 64% are involved in exporting. In addition, nearly 80% of firms not engaged in R&D sell approximately 86% overseas. That is, non-R&D is more involved in exports compared to the R&D firms. A test of association between R&D/non-R&D firms and exports resulted in chi square value of 3.3 shows statistical relationship at 10% significance level.

Table 3.17 presents results on the relationship between exports and labour productivity (i.e. second hypothesis).

| Table 3.17: Exports and labour productivity | | | |
|---|--------------------|-------------|----------------------|
| Engage in Exports | N= 55 ^a | Mean (US\$) | t-value ^b |
| Yes | 44 | 11518 | 3.029* |
| No | 11 | 6247 | |

^a Before applying t-test; firms were examined by their extreme values (i.e. large deviations in data) and 6 firms were excluded (outliers), in order to reject the null hypothesis

^b t-value considered at unequal variance (i.e. based on Levene's test); * Significant at 1%

It shows that the majority of firms who are involved in exports (i.e. n=49)⁷⁹; had labour productivity of US\$ 11518 which is higher for firms compared to the firms without exports (i.e. US\$ 6247). However, for the t-test of null hypothesis; there is a significant difference between mean values; which shows the significant association between labour productivity and exports at 1% level.

⁷⁹ 8 firms refused financial information, and of this, 7 firms with exports had not disclosed their exports figures and only 1 firm without export.

Additionally, Table 3.18 provides information on the relationship between firms ‘single most important factor’ for competitive advantage in the next 3-5 years and whether exports or not.

Table 3.18: Percentage of firm engaged in exports sub divided by their single most factor for competitive advantage in next 3-5 years (figures in row percentages)

| Single most competitive factor | Engaged in Exports | |
|--------------------------------|--------------------|------|
| | Yes | No |
| Product design (24.6%) | 76.5 | 23.5 |
| Cost effectiveness (37.7%) | 80.8 | 19.2 |
| Marketing (20.3%) | 92.9 | 7.1 |
| All other factors (17.4%) | 75.0 | 25.0 |
| Total (100%) | 81.2 | 8.8 |

Pearson Chi-Square value: 1.798
n=69

Of the 69 firms interviewed, 24.6% selected ‘product design’ as their most important factor for competitive edge, and in this sub group a large proportion (76.5%) are selling their products and services abroad. In comparison, approximately 38% of firms placed ‘cost effectiveness as their single choice and in this sub group and nearly 81% of these are exporting. Overall, Table 3.18 suggests that firms were engaged in exports required to improve their product design (i.e. highly innovative products), and for better export performance they have to minimise their costs compared to the other factors. Test of association (based on chi-square value reported in Table 3.18) shows no statistical association between ‘single most competitive factor’ and exports; which accepts the null hypothesis (i.e. variables are independent).

In addition, the literature survey suggested that the firms invest abroad through outward FDI should have a better performance. Table 3.19 provides information on the relationship between firm foreign investment abroad (i.e. offshore sale office, joint venture) and labour productivity.

| Table 3.19: Firms with outward FDI/ Investment abroad and labour productivity | | | |
|---|------|-----------|----------|
| investment abroad | n=61 | Mean US\$ | t-value* |
| Yes | 12 | 19740 | -0.386 |
| No | 49 | 16419 | |

*t-value considered at equal variance (i.e. based on Levene's test)

It shows that few firms (i.e. 12) have invested abroad and their labour productivity is higher US\$ 19740 compared to the firms with no investment abroad. However, t-test value (0.386) of null hypothesis; rejects that there is significant association at 10% between labour productivity and the firm investment abroad. Furthermore, each firm involved in exporting and outward FDI were question 'what proportion of your total sales (2008-9) has generated from overseas activities?' Table 3.20 shows of the 12 firms that invested abroad, approximately 42% stated that sales from their overseas operations amounted to between 5-15% of their total sales. In comparison only 25% of firms generated over 60% of their sales from abroad. Overall, there is low sales volume from overseas activities through outward FDI.

| Table 3.20: Proportion of sales generated from overseas activities, last year (figures in column %) | |
|---|-------------|
| Range (%) | Percent (%) |
| 5-15% | 41.7 |
| 16-25% | 8.3 |
| 26-40% | 8.3 |
| 41-60% | 16.7 |
| over 60% | 25 |

n=12

Lastly, Table 3.21 shows the significant association between long-term obstacles to the success of their business (i.e. from 5=most important to 1=not important) and firm exporting using a t-test.

Table 3.21: Test statistics between firm exporting and long-term obstacles to the firm success

| Obstacles | Exports | | t-values | Levene's test |
|---------------------------------|-----------------------------|-------------------|----------|------------------|
| | Yes=56 Mean ^a | No=13 Mean | | |
| Economy | 2.88 | 3.08 | -0.334 | unequal variance |
| Obtaining finance | 1.30 | 2.69 | -2.706* | unequal variance |
| Taxation | 1.38 | 1.00 | 2.707** | unequal variance |
| Recruitment | 2.07 | 2.31 | -0.490 | equal variance |
| Keeping staff | 1.54 | 1.62 | -0.255 | equal variance |
| Transport | 1.27 | 1.23 | 0.135 | equal variance |
| Regulations | 1.36 | 1.00 | 3.028** | unequal variance |
| Keeping up with new technology | 1.21 | 1.15 | 0.279 | equal variance |
| availability/cost of premises | 1.39 | 1.15 | 1.153 | unequal variance |
| Competition | 1.34 | 1.69 | -0.873 | unequal variance |
| Shortage of managerial skills | 1.61 | 1.62 | -0.023 | equal variance |
| Shortage of skills generally | 1.91 | 1.62 | 0.674 | equal variance |
| Lack of financial understanding | 1.20 | 1.15 | 0.198 | equal variance |
| Crime and Security | 2.07 | 1.15 | 3.632** | unequal variance |
| Pension | 1.00 | 1.00 ^b | - | |
| Others (i.e., political/energy) | 1.70 | 1.00 | 3.591** | unequal variance |

*/** Significant at 5/1 % levels

^a variables are measured from 5=most important to 1=not important:

b. none of the firm ranked pension as obstacle

Firms are divided into two sub-groups: those which are engaged in exports (n=56) and those which are not involved in exports. The first column presents the list of 16 possible long term obstacles: the second and third columns show the mean values of two subgroups. For example, the mean value of first obstacle ‘economy’ for exporting firms is 2.88. This compares with the mean value of same obstacle for none exporting firms, which is 3.08. The t-test value -0.334 (based upon Levene’s test⁸⁰) suggest that there is no significant difference between the mean values of these two subgroups.

Statistically, significant difference (at $p < 0.1$, at least) are reported for only five of the 16 long-term obstacles: ‘obtaining finance’, ‘taxation’, ‘regulations’, ‘crime and security’, ‘political and energy crisis’. For instance, ‘obtaining finance’ as long-term obstacle the t-value (-2.706) suggest that obtaining finance is more problem for non exporting firms than exporting ones. On the other hand, ‘taxation’, ‘regulations’, ‘crime and security’, ‘political and energy crisis’ are greater obstacles for exporting firms.

⁸⁰ When variances in two groups are equal we accept the null hypothesis, otherwise alternative hypothesis

3.5.1 Inward FDI, R&D, Size and Labour Productivity

This sub-section provides information on foreign firms operating in Pakistan and how these foreign firms affect the performance of local firms through forward (i.e. with customers) and backward linkages (i.e. with suppliers). The literature survey suggested that inward foreign direct investment improves the productivity of host firms. These foreign firms should have access to better technology and be more innovative, which can improve the knowledge abilities, human skills of local firms. In addition, these foreign firms are expected to be more R&D intensive and have a cost advantage over local firms. Thus three major hypotheses are tested and discussed. First, that foreign-owned firms have high labour productivity; second that R&D is more likely in foreign-owned firms; and finally there is positive relationship between the size of the firm (i.e. present number of employees divided into 5 size bands) and the nature of contacts⁸¹ with foreign owned companies.

Table 3.22 provides information on the relationship between inward FDI at firm level and labour productivity.

| Table 3.22: Inward FDI and Labour Productivity | | | |
|--|-------------------|-------------|----------|
| | N=55 ^a | Mean (US\$) | t-value* |
| Foreign Ownership | 13 | 13745 | 1.782 |
| Local firms | 42 | 9448 | |

^aBefore applying t-test, firms were examined by their extreme values, and 6 firms were excluded (outliers)

*Significant at 10%, t-value considered at equal variance (i.e. based on Levene's test)

It shows that labour productivity on average US\$ 13745) is higher for foreign-owned companies than for local firms. However, based on a t-test, there is a significant association between foreign ownership firm and labour productivity at 10% level, which rejects the null hypothesis. The literature states that foreign owned firms are more innovative and better in technology. Table 3.23: shows that, of the 20.3% firms engaged in

⁸¹ Each firm was asked to answer 5-statements about their nature of their contacts with foreign firms on a scale of 1 to 5; 1=strongly agree; 2=agree, 3=neutral, 4=disagree; 5=strongly disagree.

R&D, approximately 36% are foreign owned. In comparison, 79.7 % non- R&D firms; nearly 22% are foreign owned companies. This suggests that foreign-owned companies somehow undertake more R&D compared to the local firms.

However, the test of association accepts the null hypothesis between R&D undertaking and foreign owned companies; they are not related to each other.

Table 3.23: R&D and foreign owned firms (figures in row percentages)

| Engage in R&D | Foreign ownership* | |
|---------------|--------------------|-----------|
| | <u>Yes</u> | <u>No</u> |
| Yes (20.3%) | 35.7 | 64.3 |
| No (79.7%) | 21.8 | 72.2 |
| Total (100%) | 24.6 | 75.4 |

* Pearson Chi-square value 1.161

Further, Table 3.24 shows the relationship between firm size (subdivided into 5 size bands based on the number of employees) and nature of contacts with foreign firms is analysed using Kruskal Wallis test.

It shows the mean rank values of ‘nature of contact with foreign firms’; subdivided into 5 size bands. Of the 69 firms, 14 firms in the first size band (1 to 10) have the lowest mean rank value (i.e. 28.86) in response to the statement ‘we have joint innovative projects’ compared to the other size bands. The later have similar mean ranks suggesting there is little association between size and the answer were given. This is confirmed by a formal test of null hypothesis (i.e. variable are independent).

In the case of second statement ‘we received training and development...’, size bands (81-500) and (11 to 20) have higher mean rank values compared to the other size bands. This suggests that there is an association between size bands and this nature of contact at 1%

significance level. This is confirmed by rejecting the test of null hypothesis. Overall, Table 3.24 suggests that micro-size firms (size group 1 to 10) are low in contacts with foreign firms compared to the medium to larger size firms.

Table 3.24: Foreign firms contacts and firm size groups

| Nature of contacts | Size Bands | n | Mean Rank | Chi-square |
|---|------------|-----------|-----------|------------|
| We have joint innovative projects | 1 to 10 | 14 | 28.86 | 2.208 |
| | 11 to 20 | 13 | 35.81 | |
| | 21 to 30 | 14 | 35.61 | |
| | 31 to 80 | 15 | 38.87 | |
| | 81 to 500 | <u>13</u> | 35.69 | |
| | Total | 69 | | |
| We receive training and development (HR) regularly from foreign companies | 1 to 10 | 14 | 21.5 | 14.747* |
| | 11 to 20 | 13 | 42.27 | |
| | 21 to 30 | 14 | 30.64 | |
| | 31 to 80 | 15 | 36.97 | |
| | 81 to 500 | <u>13</u> | 44.69 | |
| | Total | 69 | | |
| We get help in exploring new international markets through exhibitions | 1 to 10 | 14 | 24.82 | 7.201 |
| | 11 to 20 | 13 | 35.54 | |
| | 21 to 30 | 14 | 33.18 | |
| | 31 to 80 | 15 | 41.93 | |
| | 81 to 500 | <u>13</u> | 39.38 | |
| | Total | 69 | | |
| We have strong linkages as customer to such foreign firms | 1 to 10 | 14 | 36.57 | 0.776 |
| | 11 to 20 | 13 | 34.31 | |
| | 21 to 30 | 14 | 32.14 | |
| | 31 to 80 | 15 | 34.27 | |
| | 81 to 500 | <u>13</u> | 37.92 | |
| | Total | 69 | | |
| We have strong linkages as supplier to such foreign firms | 1 to 10 | 14 | 28.86 | 3.182 |
| | 11 to 20 | 13 | 40.69 | |
| | 21 to 30 | 14 | 34.39 | |
| | 31 to 80 | 15 | 36.39 | |
| | 81 to 500 | <u>13</u> | 34.35 | |
| | Total | 69 | | |

*Significant at 1% (i.e. based on Kruskal Wallis test)

Finally, in order to test the more strong association between firm's size and their contacts with foreign firms are tested in Table 3.25.

Table 3.25: Foreign firms contact and firm size divided into two groups

| Nature of contacts | Size (1 to 10) ^a | Size(11 to 500) ^b | t-test value | Levene's test |
|--|-----------------------------|------------------------------|--------------|------------------|
| | Means | Means | | |
| We have joint innovative projects | 3.43 | 3 | 1.387 | equal variance |
| We received training and development (HR) regularly from foreign companies | 4.07 | 3.25 | 5.583** | unequal variance |
| We get help in exploring new international markets through exhibitions | 3.21 | 2.49 | 2.471* | equal variance |
| We have strong linkages as customers to such foreign firms | 3.14 | 3.25 | -0.387 | equal variance |
| We have strong linkages as supplier to such foreign firms | 2.43 | 2.07 | 1.225 | equal variance |

*/** significant at 5/1% levels

^a n=14; **b. n = 55**

In the first statement ‘we have joint innovative projects’ there is no significant difference between the mean values of micro size firms and the rest which test the null hypothesis; the t-test value (choice of t-test values is based on Levene’s test) obtained is 1.387 which is not statistically significant at 10%. In the case of second statement ‘we received training...’ the t-test value is significant at 1% compared to the third statement ‘we get help in exploring...’ significant at 5%. This suggests that micro-size firms 1 to 10 (only 14 firms responded to the statements) have weak contacts with foreign companies compared to the other size group (11-500).

Section 4

3.6. Entrepreneurship

Based on the literature a number of researchers have argued that entrepreneurial abilities such as innovative ability (Schumpeter, 1934) and risk taking and pro active abilities (Miller, 1983) have a significant impact on firm productivity (Van Praag and Versloot, 2007). Thus it is argued that entrepreneurs usually invest in knowledge based resources (i.e., R&D) and initiate innovation through new product/process innovations. Further an

entrepreneur should have strong networks with other firms which improve the overall learning abilities of the firm. In this section two hypotheses are tested and discussed. First entrepreneurship has a positive impact on firm labour productivity and entrepreneurship abilities have a significant impact on firm innovative performance.

Table 3.26 provides information on the relationship between entrepreneurial abilities⁸² and labour productivity.

Table 3.26: Entrepreneurship and Labour Productivity

| Entrepreneurship characteristics | Ranks (1 to 5) | n=61 | Mean (US\$) |
|---|-------------------|------|--------------|
| Our firm has strong proclivity for low risk projects (with normal and certain rates of return) rather than In our firm has strong proclivity for high risk projects (with chances of very high return) | strongly agree | 3 | 21447 |
| | agree | 28 | 19393 |
| | neutral | 9 | 14381 |
| | disagree | 19 | 14369 |
| | strongly disagree | 2 | <u>15833</u> |
| | Total | | 17073 |
| Most people in this organisation are willing to take risks regarding competitive strategies (marketing abilities, cost control) | strongly agree | 3 | 45219 |
| | agree | 36 | 18715 |
| | neutral | 13 | 8842 |
| | disagree | 9 | 13011 |
| | strongly disagree | 0 | <u>0</u> |
| | Total | | 17073 |
| In our firm there is strong tendency to follow competitors in introducing new things and ideas rather than In our firm we always try to be ahead of our competitors in product novelty or or speed of innovation and usually succeed | strongly agree | 4 | 39756 |
| | agree | 21 | 10578 |
| | neutral | 7 | 7899 |
| | disagree | 23 | 22614 |
| | strongly disagree | 6 | <u>14143</u> |
| | Total | | 17073 |

The first two statements ‘our firm has strong proclivity...’ and ‘most people in this organisation...’ it is evident that firm that agree with statements have on average higher productivity. Combining these two sub groups and comparing their mean against the mean for other 3 sub groups (neutral to strongly disagree). In the case of third statement ‘in our firm there is strong...’ shows little about firm proactive abilities, roughly half of the firms

⁸² Each firm was asked to give their level of risk taking and proactive abilities on scale of 1 to 5 (i.e. Likert scale).

responded 'agree' against 'disagree'. A t-test value⁸³ (0.494) rejects that, there is significant difference between labour productivity and entrepreneurship characteristics and shows no association.

Lastly the entrepreneurship abilities and their impact on the firm innovative performance⁸⁴ are analysed. The test of association⁸⁵ rejects the null hypothesis; there is statistically significant association at 5% level between entrepreneurship and firm innovation. This suggests that these entrepreneurial firms somehow have a positive impact on the firm innovative performance. However firms produced predominantly incremental type of innovations in the last 3 years (Table 3.6). The test of association between firm R&D undertaking (innovation input) and entrepreneurship abilities shows no significant relationship at 10% level.

Section 5

3.7. Conclusions

This report identified the long-term drivers of growth of SMEs; and examined their interrelationships by looking into variables such as 'R&D', 'innovation', 'firm single most competitive factor', 'labour productivity', 'firm size', 'family-owned business' 'inward/outward FDI', and 'entrepreneurship'. Further, long-term 'obstacles' for success of their business from most important to not important were analysed with the firm exporting and R&D undertaking. It was also found that a firm engaged in R&D had higher labour productivity, better innovative performance and was more likely to export were discussed. Similarly, the relationship between family-owned and non-family owned business and their impact on the firm labour productivity and innovative performance were

⁸³ In order to obtain t-test value, the statements were recoded into two groups; strongly agree/agree/neutral =0 and disagree/strongly disagree=1.

⁸⁴ Firm innovative performance was divided in to two groups; 1=firms innovated and 0=did not make any innovation in the last 3 years, of the 69 firms, only one firm did not produce any type of innovation.

⁸⁵ Based on chi-square value: 5.987

examined. In addition, firm entrepreneurial abilities were analysed by a comparison with labour productivity and innovation.

In order to test the relationships between variables, three statistical tests were used in this report. First, a test of association (i.e. cross tabulation using chi-square test), which examined the relationship between two categorical variables. Second, a t-test (parametric test) was used for group variable, testing the significant difference between the mean values of a group and rejected the null hypothesis when there was significant difference between the mean values. Third, Kruskal Wallis test (a non parametric test) was also used in the case of ranked data.

The data was collected through face-to-face interviews with owner managers in two regions of Pakistan (i.e. Islamabad and Rawalpindi). The data had their origin in a structured questionnaire survey of 69 software firms. The questionnaire was related to the 'firm basic characteristics, such as firm age, employees, sales turnover, and type of business', 'access to finance', 'product/process innovation' 'R&D and non R&D', 'internationalisation', and 'entrepreneurship'. Further, several statements related to their firms' ability to internalise the external knowledge were also given using Likert scale, which was left for analysis in the next report.

A survey of literature suggested that there are important links between 'R&D and labour productivity, 'R&D and innovation'. Researchers found that a firm R&D undertaking had a positive impact on the firm labour productivity and innovation output. Further, long-term obstacles to the success of their business might affect the overall performance of the firm both at micro and macro level. A literature survey also provided sufficient evidences that small firms were more in disadvantageous position compared to large firms in terms of labour productivity and innovative performance, because of the resource constraint. In

contrast, previous studies argued that family-owned business had lower labour productivity and innovative performance than those were non-family-owned.

Furthermore, a number of researchers investigated the positive relationship between exporting and labour productivity; and firms were engaged in exports more likely to be innovative than non exporting firms. Moreover, the long-term obstacles to the success of their business might affect their exporting performance. In comparison, foreign firms had higher labour productivity compare to the local firms, because they were more superior in technology and innovation. However, local firms could improve their performance if they had strong forward and backward linkages with foreign-owned firms. However, most of the researchers emphasised on the role of entrepreneurship in firm growth. They argued that entrepreneurs introduced more innovations in the business and improved the firm labour productivity through their risk taking and pro active abilities.

The empirical results suggested that there was no link between R&D and innovation using test of association and neither with firm single most competitive factor such as product design, cost effectiveness, marketing. However, the chi-square test has certain limitations; for instance, a low expected frequency (>5) in one or more cells of the table could result in erroneous conclusions. Similarly, this test failed to provide information about the strength of the relationship between two variables. while five long-term obstacles of the 16 to the success of their business such as 'economy', 'obtaining finance', 'transport', 'keeping up with new technology', and 'availability/cost of premises' had significant difference between the mean values of two subgroups of firms R&D/non-R&D undertaking. Obtaining finance had more significant affect on the firm with R&D; and the other four obstacles were found more related to non-R&D firms. Firms with R&D had higher labour productivity than non R&D firms, but there was no statistically significant difference between their mean values. This suggests that firm R&D undertaking may improve the

labour productivity. Moreover, the labour productivity was found higher for medium to large size firms compared to the micro size firms; and there was a relationship between firm size and labour productivity using a Kruskal Wallis test. In addition, no statistical association was found for family-/non-family owned business and firm innovation. Further, the labour productivity was found to be higher for family owned business, but there was no statistically significant difference was found between their mean values.

There was no relationship found between firm R&D undertaking and exporting. However, there was statistically significant difference between their mean values labour productivity and exports. While no relationship was found between firms' single most competitive factor and exports, and the same outcome was found for outward FDI and labour productivity. Long-term obstacles to the success of their business such as 'obtaining finance', 'taxation', 'regulations', 'crime and security' , and 'political and energy crisis' were found statistically significant difference divided into two subgroups exporting/non-exporting firms; and obtaining finance tent to view as more important obstacle for non-exporting firms than exporting. The remaining four tent to view as more obstacles for exporting firms. In contrast, there was statistically significant difference between the mean values of inward FDI and labour productivity. In the case of local firms linkages with foreign owned firms; there was statistically significant difference between the mean values of micro and medium to large size firms for 'receiving training and development' and 'exploring new markets'; and suggested that micro size firms had lower linkages compared to other size bands. However, entrepreneurship and labour productivity had no link; while entrepreneurship and firm innovative performance had association; yet no association was found between entrepreneurship and firm R&D undertaking.

Overall, this report suggested the policy makers to consider the long-term drivers of growth of SMEs such as R&D, labour productivity, innovation, and internationalisation

and entrepreneurship, by removing the micro and macro level obstacles (*e.g.*, economy, obtaining finance, shortage of skills) to the growth of firms. Report implied that these software firms require external finance to undertake R&D; which could improve the firm innovative performance (*i.e.* more radical innovations). Presently, these software firms are externally constrained and reluctant to invest in R&D. Unfortunately, this knowledge intensive sector is still not formally recognised by the country's banking sector; and most of the firms have relied on internal sources of funds, which do not provide enough capital to produce radical innovations. Furthermore, these software firms need assistance such as R&D grants/subsidies, access to finance, infrastructure facilities (*e.g.*, suitable premises, high speed connectivity) for higher firm performance. The government should facilitate this knowledge-intensive industry by providing incentives to encourage IT-industry. Further, government should also encourage these software firms to have better linkages with universities and other research institutes for improving their social networks.

4. Factor and Regression Analysis

4.1. Introduction

This chapter discusses the empirical analysis of software firms using factor and regression analysis. A summary of literature review is presented by using key references. Hypotheses are also drawn from the previous literature survey for empirical analysis. The literature emphasises the resource based theory of the firm on the role of knowledge based assets (i.e. intangibles) for improving firm performance. Firm performance (i.e. as a dependent variable) is measured through labour productivity. For instance, studies of Harhoff, (1998); Saleh and Ndubisi, (2006) used labour productivity as an indicator of firm performance. However, these studies were limited in their approach to analysing software firms.

This empirical Chapter investigates the relationship between drivers of firm growth and labour productivity growth. The drivers of firm growth analysed are: ‘firm size and age’, ‘absorptive capacity’, ‘R&D’, ‘life cycle’, ‘knowledge management’, ‘organisation culture’, ‘business improvement methods’, ‘internationalisation’ and others. Nichter *et al.* (2009) and Heshmati (2001) state that large and old firms are more productive compared to smaller firms. Large firms are more formally structured and have sufficient resources to undertake innovative projects for better firm performance. In contrast, some researchers discussed the long-term obstacles to the success of a business. Mintoo, (2006) (a detailed argument is made in Chapter 2) investigated micro and macro level of obstacles to the growth of firms. These were ‘poor infrastructure development’ ‘power cuts’, ‘telecommunications, roads, taxation’ and ‘poor law and order’. They also found that these problems are more severe in developing countries than in developed world.

The literature survey (for details see chapter 2) showed a research gap for software firms in developing countries. There have been very few studies involving cross-section data

analysis of software firms that consider the determinants of labour productivity. For this there is brief discussion about the drivers of growth in firms using key references from the literature and more focused on empirical analysis. The structure of this report is divided into 3 sections; the first section discusses the summary of literature led by hypotheses; in sections 2 & 3 the hypotheses are empirically tested using factor and regression analysis: The conclusion explains the policy implications and limitations of this study.

Section 1: Literature Summary

4.2. Absorptive Capacity

A number of studies have identified the positive relationship between a firm's absorptive capacity and labour productivity growth (*e.g.*, Escribano *et al.* 2009; Harris, 2008). This hypothesis has its origin in the conceptual framework (see Figure 2.1 in chapter 2). The conceptual framework shows that absorptive capacity is derived from the resource-based (knowledge-based) view of firm and is the key to the firm performance. In addition, empirical studies (*e.g.*, Harris and Li, 2009; Kodama, 2008) measured absorptive capacity using proxies such as 'R&D', 'networks', 'HRM strategies', 'human capital', 'university-industry linkages' and so forth. These intangible assets (proxies) are important drivers of firm growth. Further, the conceptual model of Zahra and George (2002) showed that firm potential (knowledge acquisition and assimilation) and realised absorptive (knowledge transformation and exploitation) capacity improve the firm's sustained competitive advantage (for detail see chapter 2).

Nevertheless, in the literature survey, some researchers argued that SMEs have less absorptive capacity than large firms due to resource constraint (*e.g.*, Upadhyayula *et al.* 2004; Zahra and George, 2002). They suggest that SMEs could make networks (*e.g.*, university-industry linkages, inter-intra firm relations) for higher firm performance. This network relation increases the firm's potential and realised absorptive capacity. Overall,

the examples of absorptive capacity in the literature clearly suggest that a firm's investment in knowledge based assets (R&D, networks and human capital) will have a positive impact on its firm labour productivity growth. Prior empirical studies (Fabrizio, 2009; Harris and Li, 2006) identified research gap in the services sector (*i.e.*, the software industry) by analysing the relationship between absorptive capacity and firm labour productivity growth. The first hypothesis is as follow.

H1: A firm with higher absorptive capacity will have higher labour productivity growth.

4.3. R&D on firm labour productivity

In the literature survey, several empirical studies (Harhoff, 1998; Harris and Trainor, 1995) identified R&D as an important determinant of firm productivity growth. Researchers have found positive relationship between firm undertaking R&D and productivity, using macro (Griffith *et al.* 2004) and micro (Kim, 2000) level of studies (for details see Chapter 2). A firm engaging in R&D may produce highly innovative products -/processes and export to highly innovative international markets for higher firm performance (Acs *et al.* 2002; Ngoc *et al.* 2008). This clearly indicates that a firm's involvement in R&D will lead to a higher firm performance (see Figure 2.1 in Chapter 2). Additionally, some studies (*e.g.*, Kinoshita, 2001; Harris, 2005) suggested that a firm's undertaking of R&D generates new knowledge within a firms and this new knowledge creation will improve the firm's internal knowledge sources which in turn, will improve the firm absorptive capacity (for details see Chapter 2).

In contrast, several researchers argue that SMEs are reluctant to invest in R&D and may rely on R&D alliances or networks with other research institutions (Dundas, 2006, Hoffman *et al.* 1998) for higher firm performance. The reason for not undertaking R&D is that small firms are externally constrained (Beck and Kunt, 2006). In addition, a few

researchers (*e.g.*, Harris and Trainor, 1995) suggest that R&D grants/subsidies can benefit SMEs by allowing them to undertake -or increase R&D investment for higher firm performance. In summary, the literature survey investigated that a firm's undertaking R&D has a positive impact on its labour productivity growth and absorptive capacity. The lack of research in the software industry motivated this study to examine the relationship between these variables. This variable (R&D) is also a part of our economic model for analysis leading to the next hypothesis;

H2: R&D undertaking has a significant impact upon on firm labour productivity growth and thus absorptive capacity

4.4. Knowledge management

In the literature survey, quantitative (*e.g.*, Maes, 2008; Fathian *et al.* 2007) and qualitative (*e.g.*, Sparrow, 2001) studies examine the positive relationship between knowledge management and firm performance. Firm knowledge-sharing through inter-intra firm linkages, employees' competencies, strategies, HRM and so forth improve the firm's internal and external knowledge sources (for detail, see Chapter 2). On the other hand, some researchers have argued that employees experience, views, commitments and so forth (implicit knowledge) improve the firm's competitive advantage (*e.g.*, Koskinen, 2002). Additionally, the conceptual framework shows that knowledge management is an important antecedent of absorptive capacity and has a significant impact on the firm's performance (see Figure 2.1 in Chapter 2).

Furthermore, some studies (*e.g.*, Gloet and Samson, 2012; Fombrun and Wally, 1989) suggested that HRM-practices (*e.g.*, recruitment and selection, training and development) improve the firm's knowledge management: the presence of highly skilled staff and the organisation's appraisal system which improve the firm's knowledge acquisition and

transformation. Similarly, the literature survey also identified that explicit (technology-based) and implicit (people-based) knowledge has a positive impact on the firm's performance (for details see Chapter 2). The above studies argued that small firms have fewer capabilities to manage new knowledge and transforming it into higher firm performance because of resource constraints. Overall, the literature on knowledge management implies that firms with better internal and external knowledge sources should have improved labour productivity growth. In the light of this, the next hypothesis is:

H3: Knowledge management has a positive impact on the firm's labour productivity growth

4.5. Culture, Leadership, Total Quality, Lifecycle and Strategic Resources

A number of studies (*e.g.*, Mathew, 2007; Barney, 1986) examined the positive relationship between culture and firm performance (for details see Chapter 2). The democratic culture (Cameron and Quinn, 1999), innovative abilities (Hall, 1993), networks (Zahra *et al.* 2004), quality standards (McAdam *et al.* 2010), formal rules and procedures (Naveh and Erez, 2004), customer focus, integrity, goals and objectives (Mathew, 2007) of a firm would have a significant impact on the firm performance. These antecedents (*e.g.*, innovation, customer focus) of organisational culture improve the firm's sustained competitive advantage. However, some studies (*e.g.*, Zaheer *et al.* 2006) suggest that small firms have a more informal culture (less hierarchical structure) than large firms because lower managerial skills, less formal HR and marketing procedures reduce the firm's performance (for details see Chapter 2).

Furthermore, the literature survey identified that leadership abilities in a firm have a significant impact on the firm performance (for details see Chapter 2). A firm with democratic style of leadership motivates employees to work harder, involves them in

decision making, while open communication between subordinates and management improve the firm's performance. This clearly indicates that a firm with a participative or democratic style of leadership would be likely to have a higher labour productivity growth. In contrast, several empirical studies (*e.g.*, Chapman and Khawaldeh, 2002; Harris *et al.* 2012) showed that business improvement methods have a positive impact on the firm's productivity (for details see Chapter 2). These business improvement methods are the use of statistical and scientific methods for quality control (Chapman and Khawaldeh, 2002), management involvement, customer focus, continuous improvement (Harris *et al.* 2012), information and analysis, and employee education and training (Sadikoglu and Zehir, 2010), all of which are important factors for higher firm performance.

Furthermore, a number of studies (*e.g.*, Churchill and Lewis, 1983; Garengo *et al.* 2007) investigated the lifecycle stages of firm growth. These studies suggest that firms at growth (survival) and maturity stages have a higher firm performance (for details see Chapter 2). This implies that firms at these stages have developed an adequate customer base and focus on expanding the business. This would appear to suggest that firm at growth or maturity stages have higher labour productivity growth. On the other hand, some researchers (*e.g.*, Miles *et al.* 1993) argue that firm strategies (*i.e.* with new ideas) improve the firm's performance. Strategies such as defender (*e.g.*, cost reduction), analyser (expanding existing markets) and prospector (exploiting new markets) have a positive impact on the firm productivity (for details see Chapter 2). The above examples from the literature suggest that organisational culture; leadership abilities, total quality improvement programmes, firm lifecycle and strategic resources have a significant impact on the firm's labour productivity growth. However, the approaches of these studies are limited in terms of analysing the software industry. This led to new hypotheses related to the determinants of labour productivity growth, as follows.

H4: Organisation culture, leadership abilities, total quality improvement methods have positive relationships with labour productivity growth

H5: Firm lifecycle resources have a positive impact on firm labour productivity growth; and firm strategic resources have a positive association with firm labour productivity growth

4.6. Social networks

The conceptual framework (see Figure 2.1 in Chapter 2) shows that networks are an important determinant of firm performance. A wide range of empirical studies have examined the positive relationship between social networks and firm performance. Firm networks such as inter-intra firm (Gronum *et al.* 2012), university-industry linkages (George *et al.* 2002), R&D alliances (Lane and Lubatkin, 1998), and industrial districts or firms' geographical proximity (Dimitriadis *et al.* 2005) have a positive impact on the firm's performance (for details see Chapter 2). These networks improve the firm's knowledge sharing (Fukugawa, 2006), knowledge resources (Tsai, 2001), and competitiveness (Zain and Ng, 2006), and reduce transaction costs (Zwass, 1996).

In particular, due to resource constraints, SMEs can improve their performance by establishing networks. These networks provide SMEs technological competencies through sharing production activity and the exchange of highly skilled employees (for details see Chapter 2). Nevertheless, the aforementioned studies focused on the manufacturing sector mainly and revealed a research gap for analysis of the software industry. Overall, examples from the literature concluded that firms with social networks have a higher labour productivity growth, thus leading to the hypothesis below.

H6: Firms' social networks have positive impact on their labour productivity growth

4.7. Entrepreneurship

The literature survey identified entrepreneurship as determinant of firm performance; entrepreneurship affects the positive relationship between firm knowledge-based assets (*e.g.*, R&D, networks) and firm performance (for details see Chapter 2). Regarding the link between entrepreneurship and firm performance, researchers have indicated that entrepreneurship has a significant impact on the firm's growth (Penrose, 1995), sustained competitive advantage (Rangone, 1999), and innovation and productivity (Burns, 2007). To measure entrepreneurship, a number of empirical studies used proxies of entrepreneurship such as innovation ability (Schumpeter, 1942), marketing knowledge (Gardner, 1992), risk taking and pro-active abilities (Wiklund and Shepherd, 2005), education and experience (Guido *et al.* 2008), and entrepreneurs' social relations (Hashi and Krasniqi, 2008). These entrepreneurship abilities have a positive impact on the firm's performance (for details see Chapter 2).

Some studies (*e.g.*, Van stel *et al.* 2005) have shown that entrepreneurs are less innovative and less productive in developing countries than in developed countries because of the low level of human capital (for details see Chapter 2). In summary, previous empirical studies (*e.g.*, Wiklund and Shepherd, 2003) suggest a positive relationship between firm's entrepreneurship abilities and labour productivity growth. The lack of research in the services sector (the software industry) investigating the relationship between entrepreneurship (*e.g.*, using proxies such as risk-taking and pro-active abilities) and firms' labour productivity growth. This is tested empirically through the following hypothesis.

H6: Entrepreneurship has a positive impact on a firm's labour productivity growth.

4.8. Family owned business

From the previous chapter in the literature survey, it can be seen that there are two different arguments about the role of family-ownership of a business and its impact on firm labour productivity growth. On the one hand, some researchers (*e.g.*, Chrisman *et al.* 2003) argued that being family-owned has a positive impact on a firm's performance because of family members' long-term involvement in the business. Empirical studies have identified that a cooperative family (Kellermanns *et al.* 2012), the chosen successor supporting the idiosyncratic knowledge (Lee *et al.* 2003), and family members with entrepreneurial abilities (Dyer and Handler, 1994) have a positive impact on the firm's performance (for details see Chapter 2).

On the other hand, some studies have argued that family-ownership has a negative impact on a firm's performance. For instance, a family-owned business may adopt defensive strategies and there may be conflict between siblings (Cromie *et al.* 2004), low level of education of family member, gender discrimination and lack of experience (Howorth and Ali, 2001), informal HR-practices, lack of strategic planning and centralised decision making (Harris and Reid, 2007), which may reduce the firm's performance (for details see Chapter 2). The examples from the literature suggest that family ownership may have a positive/negative impact on firm performance (*e.g.*, in terms of growth in sales, employees). This will be empirically tested using data on software firms.

H7: Family-ownership has a positive/negative relationship with the firm's labour productivity

4.9. Access to finance

The conceptual framework (see Figure 2.1 in Chapter 2) shows that access to finance has a significant impact on the firm's performance and knowledge-based assets. Similarly, a

number of researchers (*e.g.*, Wiklund and Shepherd, 2005; Dundas, 2006) identified the positive relationship between access to finance and firm performance. These examples from the literature suggest that when a successful firm grows, it requires financial resources to undertake innovative projects and expand the business (for details see Chapter 2). However, SMEs are externally constrained and have a lower firm performance due to lack of access to finance. The reasons for their lack of access to credit are insufficient collateral, poor borrowing history and poor creditworthiness of the borrower.

In comparison, some researchers (*e.g.*, Nichter and Goldmark, 2009) argued that lack of access to finance is not the only important factor in firm performance. Small firms should also rely on networks and entrepreneurial abilities as well as external finance. In turn this clearly suggests that investment in knowledge-based assets require sufficient capital to boost the firm's performance. Overall, this literature survey identified that access to finance has a positive impact on a firm performance. The key literature (*e.g.*, Badia *et al.* 2009; Wiklund and Shepherd, 2005) assist our understanding that access to credit might improve the firm's labour productivity growth. We made one more hypothesis to examine the relationship between access to finance and small software firms' labour productivity.

H8: Access to credit has positive relationship with labour productivity growth

4.10. FDI spillovers

In the literature, several studies (*e.g.*, Kokko, 1994; Aitken and Harrison, 1999) identified that foreign direct investment (FDI) improves the performance of domestic firms. These foreign firms may be superior in technology and have better management capabilities than local firms. Additionally, the potential benefits of FDI on a host economy are knowledge spillovers (Harris and Robinson, 2004), forward and backward linkages (Marcin, 2008), increasing the employment level (Smallbone, 2005), and developing entrepreneurial

culture (Terjesen *et al.* 2007). These potential benefits of inward FDI have a positive impact on domestic firms' performance (for details see Chapter 2).

In comparison, some researchers (*e.g.*, Harris, 2009; Adamou and Sasidharan, 2007) argued that inward FDI may have a negative impact on domestic firms' performance if these have poor absorptive capacity. This poor absorptive capacity suggests that local firms have a weak investment in knowledge-based assets (*e.g.*, in-house R&D, networks, human capital). Overall, the literature findings suggest that inward FDI may have a positive or negative effect on the performance of local firms. In this light, the next hypothesis is to made to investigate the relationship for software firms.

H9: Inward FDI may have positive or negative effect on the labour productivity growth of domestic firms

4.11. Internationalisation

The literature survey discussed the positive relationship between firm internationalisation activities (exporting and outward FDI) and labour productivity. Castellani (2002) and Delgado *et al.* (2002) investigated if productivity is higher for exporting firms. The reason for this is that a firm involved in exporting may face intense competition and innovative international market and can enhance its performance. Additionally some studies investigated the link between R&D, absorptive capacity and firm internationalisation. Harris and Reid (2010) examined that firm investment in knowledge based assets such as R&D, human capital; cooperative activities through networking and if these activities would improve firm absorptive capacity and thus internationalisation.

The literature survey related to the 'born global' firms which are knowledge intensive industries who start exporting at early stage of their business start up. For instance the

software industry firms may start exporting at the beginning due to highly skilled intensive industry through internet based communication. For smaller firm's the lack of R&D funding, low market size and substandard quality products may pose challenge to the firm growth no matter which type of sector is. The previous literature examples states that networking can also play important role in the internationalisation of SMEs. Small firms may reduce their cost of internationalisation (i.e. marketing cost) through networks with large firms. Large firms have better contacts with customers abroad. Overall, the literature on firm internationalisation (for details see Chapter 2) suggests that exporting and outward FDI are important drivers of firm growth and they will be empirically tested through the following hypothesis.

H10: Internationalisation (exporting and outward FDI) has a positive impact on firm labour productivity growth.

Lastly, Table 4.1 provides information on the summary of drivers of firm growth and their expected relationships with labour productivity. These expected links are derived from the literature reviews.

Table 4.1 Hypotheses drawn from the literature reviews and their expected links

| Dependent variable | Direction | Independent variables | Key References |
|----------------------------------|-----------|-----------------------|-------------------------------|
| Labour productivity ^a | ‘+, -’ | Age | Nichter <i>et al.</i> 2009 |
| | ‘+’ | RD | Harhoff, 1998 |
| | ‘+, -’ | FOB | Cromie, 1995 |
| | ‘+, -’ | Lifecycle | Masurel and Montfort, 2006 |
| | ‘+’ | Leadership | Morris and Pavett, 1992 |
| | ‘+’ | Strategic focus | Lumpkin and Dess, 1996 |
| | ‘+’ | Culture | Mathew, 2007 |
| | ‘+’ | BIM | Chapman <i>et al.</i> 2002 |
| | ‘+’ | KM | Salojarvi, <i>et al.</i> 2005 |
| | ‘+’ | Entrepreneurship | Wiklund <i>et al.</i> 2003 |
| | ‘+’ | Networks | Staveren <i>et al.</i> 2007 |
| | ‘+’ | Access to finance | Abor and Biekpe, 2007 |
| | ‘+, -’ | Inward FDI | Aitken <i>et al.</i> 1999 |
| | ‘+’ | Exports | Harris and Reid, 2010 |
| | ‘+’ | Outward FDI | Harris and Reid, 2010 |
| | ‘-’ | Obstacles | Mintoo, 2006 |
| | ‘+’ | Size | Heshmati, 2001 |

Notes: ‘FOB = family-owned business’, ‘BIM = business improvement methods’, ‘KM = knowledge management’ ‘Obstacles = long-term obstacles to the success of their business’

^a Labour productivity and labour productivity growth; as the dependent variables

4.12. Data and methodology

A research survey was conducted from the two regions of Pakistan using structured questionnaire (see detail in Chapter 3). In total 69 firms were interviewed. Before the face to face interviews with owner managers firms were contacted through phone calls and emails for appointment. For empirical analysis Stata 12 software has been used.

Section 2

4.13. Factor analysis of business and management variables

The questionnaire was structured for face to face interviews and initial information was collected related to the firm business and management variables on Likert scale (1=strongly agree to 5=strongly disagree); such as 'lifecycle', 'strategic focus', 'leadership', 'culture', 'business improvement methods', 'knowledge incorporation and acquisition', 'absorptive capacity'. Firms replies were recoded for each statement as '2 = strongly agree', '1= agree', '0 = neutral' '-1 = disagree and -2 = strongly disagree'. In order to extract core information principal component⁸⁶ factor analysis has been used.

Principal component factor analysis reduces the number of variables and examines the structure relationship between variables. Kline (1994) defined this "factor as a dimension or construct which is a condensed statement of the relationship between a set of variables". Factors are linear transformation of the variables and this transformation is exact with no error terms. These factors are extracted based on Kaiser Criterion (Kaiser, 1960); which suggest that retain those factors with Eigen values equal or greater than one. In contrast, some previous management empirical studies used frequency counts for reporting likert scale variables by analysing the data. In this case these likert scale variables are analysed by using factor analysis and then each of these extracted factors are used for regression estimation.

Table 4.2 provides information on the factor analysis of 'Lifecycle' of the business. A number of questions were asked to each firm (n=69) related to the firm survival and expanding their business. Two factors are extracted: factor 1 connected to the firm survival problem and factor 2 linked with expansion in the business (See Table 4.2). For improved

⁸⁶ This method is used when variable are highly correlated, and objective of this method is to reduce the data.

correlation between the variables and each factor, variance maximising⁸⁷ orthogonal is used.

Table 4.2: Questions relating to the Lifecycle of the business

| | Factor 1 <u>Survive</u> | Factor 2 <u>Expand</u> | Uniqueness | KMO ^a |
|---|----------------------------|---------------------------|------------|------------------|
| The main problem of the business are obtaining customers and delivering the products and services | 0.8987 | 0.1440 | 0.1716 | 0.5019 |
| The company has now developed sufficient customers, and satisfies them sufficiently with its products and services | -0.8830 | 0.0582 | 0.2169 | 0.5138 |
| The decisions facing owners at this stage is whether to expand or keep the firm stable and profitable, providing a base for alternative owners activities | -0.1332 | 0.8436 | 0.2706 | 0.4640 |
| The key problems facing business how to grow rapidly and how to finance growth | 0.3478 | 0.4677 | 0.6603 | 0.4837 |
| Challenges are to consolidate and control financial gains brought on by rapid growth, and to retain the advantage of small size, including flexibility | 0.0860 | 0.6780 | 0.5330 | 0.4604 |

^aOverall Kaiser-Meyer-Olkin (KMO) measures of sampling adequacy is **0.4948**

In Table 4.2 Factor 1 and Factor 2 shows higher factor loadings⁸⁸ (shown in bold italic values); these factor loadings represent correlation of a variable with a factor. The first question (i.e. as variable) has higher factor loading which is 0.8987; this suggests that businesses with a problem of obtaining customers would be likely to have more survival problems. The second statement with factor loading -0.8830 implies that businesses with sufficient customers and their higher customer satisfaction would be less likely to have survival problems.

The last three questions such as ‘expand or keep the firm stable’, ‘key problem of business’, and ‘to consolidate and control the financial gains’ are positively related to the factor 2 (expanding business). The third statement is more strongly correlated (i.e. which is 0.8436)

⁸⁷ This method minimised the variance around the new variables (new factors), and increases the variability of new factors. This means that factors are uncorrelated with each other.

⁸⁸ These are correlations or showing correlation between the variable and the factor.

to expanding business compared to others questions. Additionally the column labelled as 'uniqueness' measures the variance of a variable that is not connected with other variables in the factor model. This is with first variable which has a uniqueness value of 0.1716; and states that the variable is not shared by 17.61% with other variables in the factor model. In the Table the last two questions have higher uniqueness values (i.e. more than 0.5%) which suggests weak correlations with Factor 2. Alternatively, the uniqueness column implies that the lower the uniqueness of a variable, the greater the importance of that variable in the factor model. In order to test the appropriateness of factor model the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy⁸⁹ is used.

Table 4.3 present the factor analysis of firm 'strategic focus'; one factor is retained and labelled as 'new ideas'. Each firm (n=69) asked a number of questions related to the firm strategies such as product, markets, searching new opportunities and how these strategies could affect the firm new ideas (i.e. factor 1). The second column shows the higher factor loadings (i.e. shown in bold italic values) which are correlation between each variable and factor. The first question 'the company has a narrow range of products and markets' with factor loading -0.5233 has negative correlation with the firm new ideas. This suggests that firms having a narrow range of products and markets would less likely to introduce new ideas into the business. The second question with factor loading 0.5264 is positively correlated with the firm's new ideas. This implies that firms involved in searching new markets opportunities will bring new ideas into the business. In comparison the third question with a higher factor loading of 0.7579, shows strong correlations between the firm new ideas and competitor strategies (see factor 1). This suggests that a firm has awareness of competitor strategies will introduce more new ideas into the business. The third column in Table 4.3 shows uniqueness values. The uniqueness values are higher for first and

⁸⁹ Test shows how well data is factored; overall the value of Kaiser Meyer Olkin (KMO) measure of sampling adequacy is 0.4948. Further, large values of KMO test indicate that factor analysis of the variable is good idea.

second questions and suggest that these variables are not shared by approximately over 70% with other variables in the factor model. The last column shows the Kaiser-Meyer-Olkin statistics of sampling adequacy predicts how well data is factored.

| Table 4.3: Questions relating to the Strategic focus of the business | | | |
|---|-----------------------|------------|------------------|
| | Factor 1 New ideas | Uniqueness | KMO ^a |
| The company has narrow range of products and markets | -0.5233 | 0.7262 | 0.5993 |
| The company continually searchers for new markets opportunities | 0.5264 | 0.7229 | 0.6348 |
| Company watch their competitors closely for new ideas, and then rapidly adopt those which appear to be the most promising | 0.7579 | 0.4256 | 0.5614 |
| Organisation makes changes until forced to do so by environmental pressures | -0.6006 | 0.6393 | 0.5966 |

^aOverall Kaiser-Meyer-Olkin (KMO) measures of sampling adequacy is **0.5871**

Table 4.4 provides information on the factor analysis of firm leadership abilities. A number of questions were asked from each firm related to their firm leadership abilities by covering answers on creativity, goals achievement and motivation of employees. Three factors are extracted and labelled as ‘creativity’, ‘goals’, and ‘motivation’. First and second last questions with higher factor loadings (i.e. shown in bold italic values) have positive correlation with motivation of employees (see factor 3). This suggests that’s senior management role is important for employee’s motivation. The next four statements have positive correlation with factor 1 labelled as ‘creativity’. Management creative thinking, new ways of doing things, planning change would bring more creativity into the firm innovation performance. Further a clear organisation plan and management constructive/creative approach might help to achieve organisational goals (see factor 2). The uniqueness column show lower uniqueness values (in most cases less than 0.5%) imply that variables are closely linked to each other. However, the uniqueness value for 4th question is 0.6052, which states that 60% of this variable is not shared with other variables in the factor model. Overall Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy is 0.5146.

Factor analysis was used on organisational culture in Table 4.5 Firms were asked questions related to organisation culture by covering several dimensions of the variable (i.e. culture) such as openness in the culture, learning environment, change in culture and overall employee's performance of the firm (four factors are retained see labels). The first statement with higher factor loading which is 0.5338 is positively correlated with factor 2, which states strong team spirit at all levels of the organisation may improve the firm learning abilities. The second question is connected to factor 3 labelled as 'change' and this suggest that organisational culture promote change. Further an organisation with two way communication would have more open culture for better firm performance (see factor 1). The last three questions related to the employee's skills and better working environment would improve the organisation performance (see factor 4). Column labelled as uniqueness present the variance of each variable which is not connected to the other variables in the factor model. Overall the Kaiser-Meyer-Olkin measure of sampling adequacy for this factor model is 0.6846, which is slightly higher compared to previous Factor models. The higher KMO test value means the model is well factored.

Table 4.4: Questions relating to the firm leadership abilities using factor analysis

| | Factor 1 Creativity | Factor 2 Goals | Factor 3 Motivation | Uniqueness | KMO ^a |
|---|------------------------|-------------------|------------------------|------------|------------------|
| The senior management team make a point 'being seen' around the organisation | 0.0624 | -0.1339 | 0.8629 | 0.2336 | 0.3443 |
| Management fosters creative thinking and innovation in the company | 0.6568 | -0.0580 | 0.2365 | 0.5093 | 0.5213 |
| Our top managers like to try new ways of doing things | 0.7559 | 0.1027 | 0.0575 | 0.4148 | 0.5116 |
| Management spend adequate time planning change | 0.6126 | 0.1395 | -0.0052 | 0.6052 | 0.6147 |
| If the company is performing well, change is still priority | 0.7251 | 0.1898 | -0.1409 | 0.4184 | 0.5592 |
| The organisation is working to clear organisation plan | 0.1151 | 0.8492 | -0.0425 | 0.2638 | 0.5141 |
| Management encourage everyone in the organisation to come with new ideas | 0.0159 | 0.4414 | 0.7190 | 0.2880 | 0.4388 |
| The management team take time to think constructively/creatively about the future | 0.1572 | 0.7596 | 0.1084 | 0.3866 | 0.5750 |

^aOverall Kaiser-Meyer-Olkin (KMO) measures of sampling adequacy is **0.5146**

Table 4.5: Questions relating to the organisational culture using factor analysis

| | Factor 1 Openness | Factor 2 Learning | Factor 3 Change | Factor 4 Performance | uniqueness | KMO ^a |
|--|----------------------|----------------------|--------------------|-------------------------|------------|------------------|
| There is strong team spirit at all levels of the organisation | 0.3640 | 0.5338 | 0.5334 | 0.0487 | 0.2957 | 0.8106 |
| The culture in this organisation promotes change | -0.0834 | 0.2040 | 0.8033 | -0.0212 | 0.3058 | 0.5165 |
| Two way communication happens at all levels of the organisation | 0.7286 | 0.0750 | 0.3337 | 0.1984 | 0.3129 | 0.6801 |
| There is clear organisational structure which everyone understands | 0.1151 | 0.7720 | 0.0361 | 0.1893 | 0.3537 | 0.7088 |
| There are clearly defined roles and responsibilities | 0.1586 | 0.8382 | 0.0098 | 0.0691 | 0.2674 | 0.7392 |
| The structure of the organisation facilitates change | 0.1939 | -0.2252 | 0.7739 | -0.0549 | 0.3098 | 0.4916 |
| The organisation is not bureaucratic | 0.7704 | 0.3426 | -0.0186 | -0.0514 | 0.2861 | 0.7393 |
| There is feeling of openness in the organisation | 0.8447 | 0.0796 | 0.0223 | 0.3491 | 0.1577 | 0.6220 |
| Overall, employees have access to all the resources needed to get the job done | 0.0824 | 0.5379 | 0.1057 | 0.4963 | 0.4464 | 0.7289 |
| Employees are involved in setting and agreeing performance targets | 0.0299 | 0.1833 | -0.0705 | 0.7691 | 0.3690 | 0.6752 |
| Everyone in the company has good grasp off how the organisation is performing | 0.3871 | -0.0057 | -0.0462 | 0.6601 | 0.4123 | 0.6625 |
| Employees get useful feedback about their work | 0.1490 | 0.2433 | 0.4970 | 0.5348 | 0.3857 | 0.7251 |

^aOverall Kaiser-Meyer-Olkin (KMO) measures of sampling adequacy is **0.6846**

Table 4.6 provides information on ‘business improvement methods’ using factor analysis. One factor is extracted and labelled as ‘total quality’. The first question ‘organisation has formal/informal...’ has higher factor loading which is 0.7645. This suggests that firm using formal/informal total quality continuous program would have positive impact on the firm’s overall quality improvement. The remaining statements such as ‘clear responsibilities for TQ/CI’, ‘TQ/CI teams’, ‘adequate resources’, ‘reward and recognition’, ‘greater force’, ‘improve process’, ‘clear organisational goals/objectives’ are positively correlated to the firm total quality of the firm with higher factor loadings (i.e. shown in bold italic values). The third column in Table 4.6 reports the ‘uniqueness’ values; which are the proportion of each variable is not linked with other variables in the factor model. The table shows that most of the variables have lower uniqueness values. The last column show the overall Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy which is 0.8947 and the higher KMO values found for this model which suggests that the factor model used is appropriate.

Table 4.7 shows the factor analysis of ‘internal and external knowledge processes’. Two factors are extracted from the number of questions related to the firm knowledge incorporation. These are labelled as ‘knowledge incorporation 1’ and ‘knowledge incorporation 2’. The first two statements are connected to the factor 2 with higher factor loadings (i.e. shown in bold italic values), which suggests that managing employees knowledge have positive correlation with knowledge incorporation. The last four questions are correlated with factor 1 such as ‘sharing knowledge’, ‘lesson from daily experiences’, ‘knowledge incorporation’, ‘active management of information’. These four variables (factors) can improve the overall knowledge process of the organisation. The fourth columns shows uniqueness values showing the first question with uniqueness value 0.1922 (19.22%) is not correlated with other variables. The overall Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy is 0.6780.

Table 4.6: Questions related to the 'Business Improvements Methods' using factor analysis

| | Factor 1 <u>Total quality</u> | Uniqueness | KMO |
|---|--------------------------------------|------------|--------|
| The organisation has formal/inform total quality continuous improvement programme | 0.7645 | 0.4155 | 0.9140 |
| Responsibilities for the TQ/CI programme are clearly defined | 0.8727 | 0.2384 | 0.9014 |
| Successful TQ/CI problem solving teams are spread throughout the organisation | 0.9108 | 0.1704 | 0.8562 |
| The programme is adequately resourced | 0.8875 | 0.2124 | 0.9116 |
| There is clearly defined reward and recognition scheme for TC/CI activity | 0.8075 | 0.3480 | 0.9305 |
| Greater than 50% of the workforce are involved in TQ/CI | 0.6403 | 0.5900 | 0.8576 |
| The TQ/CI programme is used to improve processes | 0.7730 | 0.4025 | 0.9108 |
| The TQ/CI programme has clear goals, objectives, and measure of success | 0.8904 | 0.2072 | 0.8757 |
| A number of quality improvements have been achieved from the programme | 0.8758 | 0.2330 | 0.9002 |

Table 4.7: Questions related to internal and external knowledge process (Knowledge Incorporation)

| | Factor 1 Knowledge Incorp-1 | Factor 2 Knowledge Incorp-2 | Uniqueness | KMO |
|--|--|--|-------------------|------------|
| Everyone is in possession of the information/knowledge necessary to do their job | -0.1816 | 0.8802 | 0.1922 | 0.4609 |
| Knowledge that employees hold in their heads (i.e. tacit knowledge) is managed and captured effectively | 0.4141 | 0.7434 | 0.2759 | 0.6792 |
| Efforts are made to share information/knowledge across the organisation | 0.6464 | 0.3658 | 0.4483 | 0.7864 |
| Lessons learned from daily experiences and projects are captured and disseminated | 0.7125 | -0.1088 | 0.4806 | 0.6935 |
| New information/ knowledge is effectively incorporated within the process and routines within the organisation | 0.8534 | -0.0306 | 0.2708 | 0.6763 |
| Active management of information/knowledge produces a range of business benefits | 0.6367 | 0.3356 | 0.4821 | 0.6940 |

Table 4.8 reports the factor analysis of knowledge acquisition abilities. Each firm (n=69) was asked a number of questions related to their knowledge acquisition abilities. Four principal component factors are extracted based on Kaiser Criteria, and these are labelled from 'knowledge acq1 to knowledge acq4'. Knowledge acquisition 1 to 4 covers questions related to the knowledge acquisition abilities such as frequent market research, licensing, linkages with other firms and research institutes. The first two questions show higher factor loadings (shown in bold italics) and have positive correlation with factor 1. This suggests that frequent market research and use of licensing may improve the firm knowledge acquisition abilities. Similarly firm collaboration with other firms could enhance firm knowledge acquisition. However the fourth question has a negative correlation with firm knowledge acquisition (see factor 3) which is -0.7247. This suggests that firms with a high level of awareness about the information/technology of competitors would be less likely to acquire knowledge from external sources.

The last two statements in Table 4.8 show a positive correlation between firm external networks with research institutes and knowledge acquisition (factor 2). This indicates that firm with better external linkages through private and public research organisation, such as consultants and universities, would have improved knowledge acquiring abilities. The uniqueness column shows the variance of each variable is not linked with other variables: overall this factor model for knowledge acquisition has lower uniqueness values compared to other models. For testing factor model appropriateness the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy is used, giving a value of 0.5349.

Table 4.8: Questions related to knowledge acquisition using factor analysis

| | Factor 1 Knowledge e acq1 | Factor 2 Knowledge e acq2 | Factor 3 Knowledge e acq3 | Factor 4 Knowledge e acq4 | uniqueness | KMO ^a |
|--|---------------------------------|---------------------------------|---------------------------------|---------------------------------|------------|------------------|
| We conduct frequent market research so that we are aware of customer needs | 0.7744 | 0.1145 | -0.0287 | 0.3000 | 0.2965 | 0.5890 |
| Licensing is a method we often use to obtain information/knowledge or technology | 0.8124 | 0.0948 | 0.1120 | -0.1231 | 0.3033 | 0.5809 |
| We have developed new products/services/ or processes in collaboration with other firms | 0.0881 | -0.0367 | 0.0994 | 0.9123 | 0.1488 | 0.4584 |
| We are well aware of the information/technology being developed by our competitors | 0.3721 | -0.3253 | -0.7247 | -0.1137 | 0.2176 | 0.4886 |
| We have become an information and technology supplier to other firms in the sector | -0.1531 | 0.3210 | 0.7816 | 0.2818 | 0.1831 | 0.4905 |
| We usually go to go outside private sector bodies (e.g. consultants) to find out about fresh opportunities for introducing new products and services | 0.1944 | 0.7300 | 0.2672 | -0.2486 | 0.2961 | 0.5631 |
| We usually go to outside public sector bodies (e.g. universities) to find out about fresh opportunities for introducing new products/services | 0.05587 | 0.8328 | -0.1374 | 0.1273 | 0.2679 | 0.5092 |

^aOverall Kaiser-Meyer-Olkin (KMO) measures of sampling adequacy is **0.5349**

Table 4.9 provides information on factor analysis of long-term obstacles to the success of their business. Each firm (n=69) was asked to rank long-term obstacles to the success of their business from 1=most important to 5 = not important. Seven principal component factors are extracted and labelled 'recruitment', 'skills of employees', 'staff issues', 'competition', 'taxation', 'regulations' and 'finance'.

Column 1 shows the list of 15 obstacles which are subdivided into seven factors with higher factor loadings (shown in bold italic values). The first obstacle 'economy' has higher factor loading and negative correlation with factor 1 (i.e. -0.6916). This suggests that poor economy would have a negative impact on the firm's recruitment process. 'Obtaining finance' as a long-term obstacle is also negatively correlated with the same factor 1 and implies that lack of access to external finance may reduce firm quality of recruitment process. The third obstacle 'taxation' has a positive correlation with factor 5. It suggests that overall taxation problem could affect the performance of firm. The next two obstacles such as 'keeping staff and transport issues' with higher factor loadings suggest that they could affect overall staff performance. The column labelled 'uniqueness' which represents the proportion of each variable, is not shared with other variables in the factor model. This means the higher the uniqueness value of a variable the lower the importance of that variable in the factor model. For instance, the first variable 'economy' has a unique value of 0.4580; which means 45.80% of this variable is not associated with other variables in the factor model. Recruiting staff has a comparatively higher uniqueness value. In comparison obstacles such as 'shortage of managerial skills and expertise', 'lack of financial understanding' and 'political and energy crisis' have lower uniqueness values. This suggests that the greater proportions of these variables are shared with other variables in the factor model. The Kaiser Meyer Olkin (KMO) measure of sampling adequacy is 0.4600 which is a low value compared to previous factor models, and suggest the weak outcome of this factor model.

Table 4.9 Long term obstacles to the success of their business using factor analysis

| Obstacles | Factor 1 Recruitment | Factor 2 skills | Factor 3 Staff | Factor 4 Competition | Factor 5 Taxation | Factor 6 Regulation | Factor 7 Finance | Unique | KMO |
|---|-------------------------|--------------------|-------------------|-------------------------|----------------------|------------------------|---------------------|--------|--------|
| Economy | -0.6916 | 0.0352 | 0.0883 | -0.1254 | -0.0105 | 0.1966 | -0.0140 | 0.4580 | 0.5674 |
| Obtaining finance | -0.4015 | -0.3020 | -0.3598 | -0.1376 | -0.1645 | -0.3981 | 0.2190 | 0.3658 | 0.5492 |
| Taxation | 0.0234 | -0.2850 | 0.0975 | 0.0302 | 0.7495 | -0.1551 | -0.0617 | 0.3183 | 0.4231 |
| Recruiting staff | 0.7277 | -0.1032 | 0.0201 | 0.0256 | 0.0748 | -0.0032 | -0.0342 | 0.4519 | 0.5817 |
| Keeping staff | 0.0705 | 0.1150 | 0.7678 | -0.0937 | -0.0253 | 0.1264 | -0.0376 | 0.3655 | 0.3867 |
| Transport issues | -0.1927 | -0.1859 | 0.6874 | 0.1596 | 0.0259 | -0.2034 | -0.0043 | 0.3883 | 0.5181 |
| Regulations | -0.2973 | -0.0856 | -0.0629 | 0.0392 | 0.0177 | 0.7489 | 0.1204 | 0.3231 | 0.4307 |
| Keeping up with new technology | -0.0944 | 0.7186 | 0.2037 | 0.0555 | -0.1118 | -0.1111 | -0.2685 | 0.3332 | 0.4606 |
| Availability/cost of suitable premises | 0.1283 | -0.3666 | 0.3379 | 0.0048 | -0.4448 | 0.4480 | -0.0225 | 0.3359 | 0.5397 |
| Competition in the market | 0.1406 | 0.1160 | 0.2010 | 0.7017 | 0.0294 | -0.3057 | 0.1933 | 0.3023 | 0.3934 |
| Shortage of managerial skills/expertise | 0.3292 | -0.1229 | -0.0750 | -0.5276 | -0.3764 | -0.2646 | 0.3124 | 0.2832 | 0.4718 |
| Shortage of skills generally | -0.0591 | 0.7634 | -0.1809 | -0.0373 | -0.0311 | 0.0024 | 0.2708 | 0.3054 | 0.4358 |
| Lack of financial understanding | 0.0545 | -0.0263 | 0.0269 | -0.0865 | -0.0651 | -0.0718 | -0.8874 | 0.1913 | 0.4899 |
| Crime and Security | 0.2218 | 0.1093 | -0.0868 | -0.1470 | 0.6539 | 0.2728 | 0.2260 | 0.3566 | 0.4347 |
| Others (i.e. political/energy crisis) | 0.1984 | -0.1373 | -0.1656 | 0.7435 | -0.2108 | 0.2571 | 0.0177 | 0.2507 | 0.3781 |

Now we measure the firm's absorptive capacity (i.e. a firm's ability to internalise external knowledge); and Table 4.10 shows the factor analysis of firm absorptive capacity. A number of questions have been asked related to the firm internal and external knowledge processes and knowledge acquisition on Likert scale. Their replies were recoded as 2 = strongly agree 1= agree 0 = neutral -1 = disagree and -2 = strongly disagree. Six principal component factors (with Eigen value equal or greater than one) are retained and these are labelled as 'sharing knowledge', 'job knowledge', 'internal knowledge', 'external knowledge', 'linkages' and 'innovation'. For a better correlation between these variables and factors, variance maximising orthogonal rotation is used.

Factor 1 shows higher factor loadings (shown in bold italic values) which are positively correlated with the firm sharing knowledge. This implies that managing employees, knowledge incorporation and management role could improve the firm's knowledge sharing across the organisation. Factor 3 is related to the internal knowledge of the firms such as knowledge transformation; lessons learned from daily experiences, would be likely to improve the internal knowledge flows. Frequent market research, licensing and knowledge of competitor strategies are also positively correlated to the external sources of knowledge information (see higher factor loadings of factor 4). The last two questions in Table 4.10 present higher factor loading (in bold italic values) and have positive correlation with linkages of the firm (see factor 5). This suggests that a firm's networks with private and public sector organisations would improve the firm's performance through knowledge transformation. Factor 6 has two higher factors loading values connected to firm innovation.

Overall, for this factor model we saw lower uniqueness values; this suggests that most of the variables are connected with each other. To test the factor model appropriateness, KMO measure of sampling adequacy is 0.5146; so far there have been lower KMO test

values (less than 0.8) for most of the factor models, which this suggests that few observations (n=69) might be one of the reasons for weak factor models. Possibly a larger number of respondents would provide more information related to these variables and there would be higher KMO test values.

Table 4.10: Questions relating to the firm absorptive capacity using factor analysis

| | Factor 1 Sharing Knowledge. | Factor 2 Employ's Knowledge. | Factor 3 Internal knowledge. | Factor 4 External Knowledge. | Factor 5 Linkages Innov. | Factor 6 uniqueness | KMO | |
|---|-----------------------------------|------------------------------------|------------------------------------|------------------------------------|--------------------------------|------------------------|--------|--------|
| Everyone is in possession of the information/knowledge necessary to do their job | 0.0817 | 0.8508 | -0.1215 | 0.0602 | 0.0501 | 0.0069 | 0.2485 | 0.4986 |
| Knowledge that employees hold in their heads (i.e. tacit knowledge) is managed and captured effectively | 0.6196 | 0.5530 | 0.1604 | 0.1435 | -0.0601 | 0.0251 | 0.2597 | 0.6356 |
| Efforts are made to share information/knowledge across the organisation | 0.2983 | 0.3139 | 0.5968 | 0.1617 | -0.1195 | 0.3962 | 0.2589 | 0.6523 |
| Lessons learned from daily experiences and projects are captured and disseminated | 0.1108 | -0.0824 | 0.8810 | 0.0056 | 0.0957 | -0.1187 | 0.1815 | 0.6085 |
| New information/ knowledge is effectively incorporated within the process and routines within the organisation | 0.5967 | -0.2031 | 0.5483 | 0.0858 | -0.0117 | 0.1001 | 0.2722 | 0.6008 |
| Active management of information/knowledge produces a range of business benefits | 0.8666 | 0.0902 | 0.1279 | -0.1021 | 0.1412 | 0.0596 | 0.1906 | 0.5676 |
| We conduct frequent market research so that we are aware of customer needs | -0.1275 | 0.3892 | 0.1571 | 0.6530 | 0.1534 | 0.0698 | 0.3527 | 0.6200 |
| Licensing is a method we often use to obtain information/knowledge or technology | 0.0857 | 0.0551 | -0.0154 | 0.7959 | 0.1503 | -0.1006 | 0.3232 | 0.6315 |
| We have developed new products/services/ or processes in collaboration with other firms | -0.3426 | 0.3990 | 0.2164 | -0.0234 | -0.0516 | 0.6131 | 0.2975 | 0.4999 |
| We are well aware of the information/technology being developed by our competitors | -0.0231 | -0.2704 | 0.0249 | 0.6339 | -0.3246 | 0.3350 | 0.3063 | 0.4104 |
| We have become an information and technology supplier to other firms in the sector | 0.2594 | -0.1257 | -0.1267 | 0.0548 | 0.1904 | 0.8320 | 0.1693 | 0.4078 |
| We usually go to outside private sector bodies (e.g. consultants) to find out about fresh opportunities for introducing new products and services | 0.0621 | -0.2534 | -0.2313 | 0.2675 | 0.7481 | 0.1026 | 0.2366 | 0.3793 |
| We usually go to outside public sector bodies (e.g. universities) to find out about fresh opportunities for introducing new products/services | 0.0196 | 0.2217 | 0.1924 | -0.0483 | 0.8219 | 0.0432 | 0.2338 | 0.5127 |

Finally, Table 4.11 reports the factor analysis of firm entrepreneurship abilities. Firms were asked a set of three questions related to their firm risk taking and proactive abilities.

Table 4.11: Factor analysis of entrepreneurship abilities

| statements | Factor 1 entrepreneurship | Uniqueness | KMO |
|--|------------------------------|------------|--------|
| Our firm has a strong proclivity for low risk projects (with normal and certain rates of return) rather than in our firm has strong proclivity for high risk projects (with chances of very high return) | 0.8935 | 0.2016 | 0.5229 |
| Most people in this organisation are willing to take risk regarding competitive strategies (marketing abilities, cost control) | -0.6918 | 0.5213 | 0.5572 |
| In our firm there is strong tendency to follow competitors in introducing new things and ideas rather than in our firm we always try to be ahead of our competitors in product novelty or speed of innovation and usually succeed | 0.7536 | 0.4321 | 0.5418 |

Kaiser-Meyer-Olkin measure of sampling adequacy is **0.5363**

One principal component factor is extracted and labelled as ‘entrepreneurship’ the first question related to firm risk taking abilities (whether high or low risk taking). The higher factor loading (shown in bold italic values) for the first question which is 0.8935 and has a positive correlation with the firm entrepreneurship. This suggests that firms with high risk taking abilities would have more entrepreneurial abilities and vice versa. However, the second question has a negative correlation with firm entrepreneurship performance. This suggests that overall; employees in these software firms take risks related to marketing and cost control. Firms are reluctant to take high risks and this high risk aversion reduces their labour productivity. The last statement related to firm proactive abilities shows a higher factor loading of 0.7536 which has a positive impact on firm performance. The third column uniqueness shows lower variance for each question, which implies that these three variables have more importance in the factor model. Overall this column suggests that the higher the uniqueness value the lower the relevance of the variable in the factor model.

Section 3

4.14. Regression analysis

Section 3 introduces stepwise multiple regression analysis using ordinary least squares method. Multiple regression analysis is important when many other independent variables simultaneously affect the dependent variable. It is an important method to use both for analysing economic theories and for policy implications (Wooldridge, 2003). Furthermore, the stepwise approach includes only significant results (probability values) in the model by choosing P-values ≤ 0.15 and ignoring insignificant results when P-values ≥ 0.2 . Table 4.12 provides information on the list of variables used in the regression model, their definitions, means and standard deviations (i.e. measure of dispersion).

Table 4.12: List of variables and their definitions and data

| Variable | Definitions | \bar{X}^a | σ^a |
|----------------------------------|--|-------------|------------|
| Labour productivity | Log (sales/employees) in 2009 | 9.204 | 0.957 |
| Labour productivity (t-1) | Log (sales/employees) in 2007 | 9.082 | 1.234 |
| Δ Log labour productivity | Log.(Sales/employees)2009 – log (Sales/employees) 2007 | 0.121 | 0.746 |
| Δ Log exports | Log (exports in 2009 / exports in 2007) | 0.531 | 1.470 |
| Exports | Dummy coded 1 if firm exports | 0.811 | 0.393 |
| Age10 | Dummy coded 1 if firm is 10 years old or more | 1.00 | 0.00 |
| Size 1 | Dummy coded 1 if employees between 1-10 | 0.202 | 0.405 |
| Size 2 | Dummy coded 1 if employees between 11-20 | 0.188 | 0.393 |
| Size 3 | Dummy coded 1 if employees between 21-30 | 0.202 | 0.405 |
| Size 4 | Dummy coded 1 if employees between 31-80 | 0.217 | 0.415 |
| Size 5 | Dummy coded 1 if employees between 81-500 | 0.188 | 0.393 |
| FOB | Dummy coded 1 if family-owned business | 0.217 | 0.415 |
| R&D | Dummy coded 1 if firm undertake R&D | 0.202 | 0.405 |
| Access to finance | Dummy coded 1 if firm applied for external finance | 0.115 | 0.322 |
| Outward FDI | Dummy coded 1 if firm has offshore sale office | 0.173 | 0.381 |
| Inward FDI | Dummy coded 1 if firm is foreign owned | 0.246 | 0.434 |
| Survival | Factor 1 from Table 4.2 measuring lifecycle of business | 0.000 | 1.00 |
| Expand | Factor 2 from Table 4.2 measuring lifecycle of business | -0.000 | 1.00 |
| New ideas | Factor 1 from Table 4. 3 measuring firm strategies | -0.000 | 1.00 |
| Creativity | Factor 1 from Table 4.4 measuring firm leadership | 0.000 | 1.00 |
| Goals | Factor 2 from Table 4.4 measuring leadership | -0.000 | 1.00 |
| Motivation | Factor 3 from Table 4.4 measuring leadership | -0.000 | 1.00 |
| Openness | Factor 1 from Table 4.5 measuring firm culture | -0.000 | 1.00 |
| Learning | Factor 2 from Table 4.5 measuring firm culture | -0.000 | 1.00 |
| Change | Factor 3 from Table 4.5 measuring firm culture | -0.000 | 1.00 |
| Performance | Factor 4 from Table 4.5 measuring firm performance | -0.000 | 1.00 |
| Total quality | Factor 1 from Table 4.6 measuring business improvement methods (BIM) | -0.000 | 1.00 |

^a represents the means and standard deviations of each variable

Table 4.12 (Cont)

| Variable | Definitions | \bar{X} | σ |
|---------------------------------|--|-----------|----------|
| Knowledge incorporation 1 | Factor 1 from Table 4.7 measuring firm knowledge incorporation | 0.000 | 1.00 |
| Knowledge incorporation 2 | Factor 2 from Table 4.7 measuring firm knowledge incorporation | -0.000 | 1.00 |
| Knowledge acquisition 1 | Factor 1 from Table 4.8 measuring firm knowledge acquisition | -0.000 | 1.00 |
| Knowledge acquisition 2 | Factor 2 from Table 4.8 measuring firm knowledge acquisition | 0.000 | 1.00 |
| Knowledge acquisition 3 | Factor 3 from Table 4.8 measuring firm knowledge acquisition | 0.000 | 1.00 |
| Knowledge acquisition 4 | Factor 4 from Table 4.8 measuring firm knowledge acquisition | -0.000 | 1.00 |
| Recruitment | Factor 1 from Table 4.9 measuring firm long-term obstacles | 0.000 | 1.00 |
| Shortage of skills | Factor 2 from Table 4.9 measuring firm long-term obstacles | -0.000 | 1.00 |
| Keeping staff | Factor 3 from Table 4.9 measuring firm long-term obstacles | 0.000 | 1.00 |
| Competition | Factor 4 from Table 4.9 measuring firm long-term obstacles | -0.000 | 1.00 |
| Taxation | Factor 5 from Table 4.9 measuring firm long-term obstacles | 0.000 | 1.00 |
| Regulations | Factor 6 from Table 4.9 measuring firm long-term obstacles | -0.000 | 1.00 |
| Lack of financial understanding | Factor 7 from Table 4.9 measuring firm long-term obstacles | -0.000 | 1.00 |
| Sharing knowledge | Factor 1 from Table 4.10 measuring firm absorptive capacity | 0.000 | 1.00 |
| Employees knowledge | Factor 2 from Table 4.10 measuring firm absorptive capacity | 0.000 | 1.00 |
| Internal knowledge | Factor 3 from Table 4.10 measuring firm absorptive capacity | -0.000 | 1.00 |
| External knowledge | Factor 4 from Table 4.10 measuring firm absorptive capacity | 0.000 | 1.00 |
| Linkages | Factor 5 from Table 4.10 measuring firm absorptive capacity | 0.000 | 1.00 |
| Innovation | Factor 6 from Table 4.10 measuring firm absorptive capacity | 0.000 | 1.00 |
| Entrepreneurship | Factor 1 from Table 4.11 measuring firm entrepreneurship abilities | 0.000 | 1.00 |

Before estimation the correlation matrix is used to show the correlation between two variables and indicates that any variable that is perfectly correlated with itself (i.e. see Table 4.13). The correlation matrix is used to investigate the problem of multicollinearity. Multicollinearity arises when some or all of the independent variables are highly correlated with each other and it is hard to tell which variable is influencing the predicted variable (Koop, 2004). Overall, two variables showed multicollinearity and this will be considered for analysis (see Table 4.13). However, in the majority of cases correlations between variables are lower than 0.5 and this suggest that multicollinearity is not an issue.

Table 4.13: Correlation matrix of all variables used for estimation

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|---------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1 LP in 2009 | 1 | | | | | | | | | | |
| 2 RD | 0.04 | 1 | | | | | | | | | |
| 3 FoB | 0.08 | -0.08 | 1 | | | | | | | | |
| 4 Finance | -0.05 | 0.03 | -0.21 | 1 | | | | | | | |
| 5 Outward FDI | 0.08 | -0.04 | 0.06 | -0.17 | 1 | | | | | | |
| 6 Inward FDI | 0.27 | 0.16 | -0.02 | -0.17 | -0.07 | 1 | | | | | |
| 7 Size1 | -0.28 | -0.11 | -0.11 | -0.03 | -0.08 | -0.13 | 1 | | | | |
| 8 Size2 | 0.07 | -0.08 | 0.21 | 0.19 | -0.14 | -0.02 | -0.22 | 1 | | | |
| 9 Size3 | -0.08 | 0.19 | -0.29 | -0.03 | -0.16 | 0.23 | -0.23 | -0.29 | 1 | | |
| 10 Size4 | 0.28 | 0.07 | 0.07 | 0.06 | -0.07 | -0.07 | -0.24 | -0.30 | -0.32 | 1 | |
| 11 Size5 | -0.04 | -0.11 | 0.12 | -0.22 | 0.52 | -0.03 | -0.18 | -0.22 | -0.23 | -0.24 | 1 |
| 12 Δexport | 0.00 | -0.08 | -0.03 | 0.11 | 0.19 | 0.01 | -0.18 | -0.01 | 0.02 | -0.03 | 0.20 |
| 13 Exports | 0.29 | -0.24 | 0.06 | -0.02 | 0.24 | 0.29 | -0.26 | 0.06 | 0.08 | 0.10 | -0.02 |
| 14 Survival | -0.08 | -0.25 | -0.13 | 0.10 | -0.04 | -0.19 | 0.11 | 0.12 | -0.16 | -0.10 | 0.07 |
| 15 Expand | -0.16 | -0.07 | -0.11 | -0.04 | 0.00 | -0.18 | 0.05 | -0.13 | 0.15 | 0.10 | -0.20 |
| 16 Ideas | -0.16 | 0.32 | -0.11 | 0.04 | -0.36 | 0.14 | 0.17 | -0.17 | 0.16 | 0.14 | -0.32 |
| 17 Creativity | -0.25 | 0.11 | -0.05 | -0.01 | -0.12 | -0.05 | 0.08 | -0.34 | 0.05 | 0.17 | 0.05 |
| 18 Goals | -0.16 | -0.09 | -0.22 | 0.25 | -0.05 | 0.06 | 0.14 | 0.15 | 0.02 | -0.21 | -0.08 |
| 19 Motivation | -0.06 | -0.11 | -0.02 | 0.19 | -0.04 | -0.22 | 0.08 | 0.14 | -0.19 | -0.05 | 0.05 |
| 20 Openness | -0.11 | 0.02 | 0.07 | 0.40 | 0.14 | -0.24 | -0.21 | 0.16 | -0.08 | -0.01 | 0.13 |
| 21 Learning | -0.10 | -0.01 | -0.31 | 0.28 | -0.31 | 0.01 | 0.19 | 0.16 | -0.03 | 0.04 | -0.39 |
| 22 Change | -0.19 | 0.16 | -0.20 | 0.14 | -0.04 | 0.01 | 0.07 | -0.41 | 0.24 | 0.06 | 0.04 |
| 23 Performance | -0.08 | 0.09 | 0.10 | 0.16 | 0.06 | 0.10 | 0.06 | 0.16 | -0.07 | -0.05 | -0.10 |
| 24 Qualities | -0.03 | 0.10 | -0.10 | 0.09 | 0.04 | 0.13 | -0.21 | -0.01 | -0.05 | 0.09 | 0.18 |
| 25 Know-Inc1 | -0.01 | 0.06 | -0.07 | -0.08 | -0.19 | 0.16 | -0.12 | 0.12 | 0.01 | 0.11 | -0.16 |
| 26 Know-Inc2 | 0.00 | 0.12 | 0.16 | 0.25 | 0.12 | 0.00 | -0.30 | 0.17 | 0.13 | -0.12 | 0.10 |
| 27 Know-acq1 | 0.18 | 0.29 | 0.38 | 0.02 | -0.01 | 0.26 | -0.19 | 0.14 | -0.01 | 0.10 | -0.07 |
| 28 Know-acq2 | -0.01 | 0.06 | 0.04 | -0.15 | 0.22 | 0.06 | -0.01 | -0.26 | 0.21 | -0.20 | 0.30 |
| 29 Know-acq3 | 0.04 | 0.18 | -0.08 | -0.17 | 0.00 | -0.12 | -0.03 | -0.01 | 0.18 | -0.01 | -0.16 |
| 30 Know-acq4 | 0.07 | 0.18 | -0.18 | 0.04 | -0.02 | 0.01 | -0.02 | 0.05 | 0.24 | -0.11 | -0.20 |
| 31 Recruitment | 0.02 | -0.07 | 0.15 | -0.04 | 0.21 | -0.09 | -0.17 | 0.05 | 0.02 | -0.07 | 0.16 |
| 32 Shortage skills | -0.05 | -0.03 | -0.11 | 0.11 | 0.26 | 0.00 | -0.09 | 0.15 | -0.22 | 0.11 | 0.04 |
| 33 Keeping staff | 0.23 | -0.13 | 0.23 | -0.14 | 0.32 | -0.12 | -0.09 | -0.17 | -0.14 | 0.23 | 0.18 |
| 34 Competition | -0.15 | 0.07 | -0.04 | 0.12 | -0.13 | -0.08 | 0.00 | -0.09 | -0.22 | 0.31 | -0.01 |
| 35 Taxation | 0.29 | 0.20 | 0.14 | -0.15 | -0.13 | 0.27 | -0.10 | 0.00 | 0.13 | 0.12 | -0.20 |
| 36 Regulations | 0.21 | 0.03 | -0.03 | 0.03 | -0.01 | 0.15 | -0.04 | 0.11 | 0.06 | -0.11 | -0.03 |
| 37 Lack of finance | 0.01 | 0.10 | -0.06 | -0.01 | 0.08 | 0.04 | 0.13 | -0.30 | 0.16 | 0.00 | 0.02 |
| 38 Entrepreneurship | -0.07 | 0.00 | 0.21 | 0.04 | -0.12 | -0.27 | 0.06 | 0.17 | -0.06 | -0.09 | -0.08 |
| 39 Sharing-know | -0.14 | -0.04 | 0.02 | -0.01 | -0.03 | 0.17 | -0.24 | 0.11 | -0.01 | 0.06 | 0.05 |
| 40 Employ's-know | 0.03 | 0.11 | 0.12 | 0.30 | 0.09 | 0.00 | -0.23 | 0.15 | 0.12 | -0.12 | 0.06 |
| 41 Internal - know | 0.09 | 0.08 | -0.09 | -0.01 | -0.19 | 0.02 | -0.01 | 0.08 | 0.01 | 0.09 | -0.18 |
| 42 External - know | 0.16 | 0.28 | 0.33 | -0.02 | 0.00 | 0.18 | -0.18 | 0.13 | 0.01 | 0.10 | -0.09 |
| 43 Linkages | 0.03 | 0.06 | 0.11 | -0.17 | 0.21 | 0.08 | 0.01 | -0.26 | 0.17 | -0.17 | 0.29 |
| 44 Innovation | 0.03 | 0.23 | -0.25 | -0.14 | -0.02 | -0.07 | 0.02 | -0.04 | 0.31 | -0.12 | -0.20 |
| 45 LP in 2007 | 0.80 | 0.14 | -0.03 | -0.17 | 0.01 | 0.33 | -0.21 | -0.04 | 0.03 | 0.27 | -0.09 |

'LP = labour productivity, 'finance = access to finance', 'know-inc1= knowledge incorporation-1', 'know-acq1 = knowledge acquisition1', 'lack-finance = lack of financial understanding', 'sharing-know=sharing knowledge' 'employ's know= employees knowledge'

Table 4.13: (Cont.) Correlation matrix of all variables used for estimation

| | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 |
|---------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 12 Δexport | 1 | | | | | | | | | | |
| 13 Exports | 0.18 | 1 | | | | | | | | | |
| 14 Survival | 0.09 | -0.09 | 1 | | | | | | | | |
| 15 Expand | -0.04 | -0.12 | -0.09 | 1 | | | | | | | |
| 16 Ideas | -0.19 | -0.13 | -0.28 | 0.14 | 1 | | | | | | |
| 17 Creativity | -0.02 | -0.21 | -0.07 | 0.14 | 0.30 | 1 | | | | | |
| 18 Goals | 0.06 | 0.08 | 0.01 | 0.19 | 0.09 | 0.03 | 1 | | | | |
| 19 Motivation | 0.23 | -0.22 | 0.07 | -0.19 | -0.08 | 0.03 | -0.02 | 1 | | | |
| 20 Openness | 0.24 | -0.08 | 0.00 | 0.08 | -0.09 | -0.05 | 0.27 | 0.21 | 1 | | |
| 21 Learning | -0.48 | -0.12 | -0.06 | 0.05 | 0.08 | -0.06 | 0.27 | 0.18 | -0.01 | 1 | |
| 22 Change | 0.00 | 0.02 | -0.24 | 0.20 | 0.17 | 0.56 | 0.34 | -0.12 | 0.03 | 0.00 | 1 |
| 23 Performance | 0.01 | -0.03 | -0.19 | 0.12 | 0.19 | 0.13 | 0.22 | 0.08 | 0.11 | 0.00 | 0.03 |
| 24 Qualities | -0.09 | 0.26 | 0.03 | -0.09 | -0.16 | 0.14 | 0.10 | -0.12 | 0.02 | 0.18 | 0.31 |
| 25 Know-inc1 | -0.19 | -0.06 | -0.05 | -0.02 | -0.06 | 0.07 | 0.14 | -0.03 | -0.25 | 0.08 | 0.07 |
| 26 Know-inc2 | 0.03 | -0.02 | 0.01 | 0.24 | -0.16 | 0.11 | 0.09 | -0.24 | 0.30 | -0.09 | 0.16 |
| 27 Know-acq1 | 0.07 | 0.31 | -0.25 | -0.07 | 0.32 | 0.00 | 0.02 | -0.25 | -0.04 | -0.12 | -0.05 |
| 28 Know-acq2 | 0.05 | -0.04 | -0.14 | 0.03 | 0.04 | 0.22 | -0.18 | -0.03 | -0.14 | -0.42 | 0.25 |
| 29 Know-acq3 | 0.10 | -0.01 | 0.10 | -0.02 | 0.03 | -0.01 | -0.13 | 0.08 | -0.24 | -0.12 | 0.02 |
| 30 Know-acq4 | -0.07 | 0.21 | 0.04 | -0.05 | -0.14 | 0.04 | -0.10 | -0.20 | -0.08 | 0.06 | 0.25 |
| 31 Recruitment | 0.06 | 0.07 | -0.23 | 0.00 | -0.21 | 0.07 | 0.05 | -0.11 | 0.07 | -0.15 | 0.09 |
| 32 Shortage skills | -0.14 | 0.02 | 0.10 | -0.17 | -0.21 | -0.07 | -0.01 | 0.02 | 0.03 | 0.19 | -0.05 |
| 33 Keeping staff | -0.09 | 0.10 | 0.06 | 0.00 | -0.24 | -0.01 | -0.38 | -0.07 | -0.25 | -0.12 | -0.14 |
| 34 Competition | 0.30 | 0.01 | 0.13 | 0.06 | 0.09 | 0.03 | 0.07 | -0.07 | 0.10 | -0.12 | -0.05 |
| 35 Taxation | -0.04 | 0.12 | -0.18 | -0.04 | 0.10 | 0.02 | -0.11 | -0.13 | -0.12 | 0.02 | 0.07 |
| 36 Regulations | 0.16 | 0.31 | 0.05 | -0.06 | -0.07 | -0.19 | 0.27 | -0.13 | -0.09 | -0.09 | -0.06 |
| 37 Lack of finance | -0.01 | -0.02 | -0.02 | -0.23 | 0.10 | 0.13 | -0.09 | -0.06 | 0.01 | 0.00 | 0.06 |
| 38 Entrepreneurship | 0.18 | -0.07 | 0.06 | -0.16 | -0.12 | -0.20 | 0.10 | 0.22 | 0.29 | 0.05 | -0.12 |
| 39 Sharing-know | 0.13 | -0.14 | -0.02 | 0.15 | -0.12 | 0.16 | 0.20 | -0.03 | -0.01 | -0.10 | 0.09 |
| 40 Employ's-know | -0.05 | 0.07 | -0.01 | 0.16 | -0.12 | 0.08 | 0.06 | -0.28 | 0.32 | 0.01 | 0.18 |
| 41 Internal-know | -0.40 | -0.04 | -0.02 | -0.10 | -0.02 | -0.02 | 0.04 | -0.03 | -0.19 | 0.20 | 0.03 |
| 42 External-know | 0.11 | 0.25 | -0.17 | -0.05 | 0.30 | -0.02 | 0.01 | -0.15 | -0.09 | -0.14 | -0.09 |
| 43 linkages | 0.01 | -0.02 | -0.19 | -0.02 | 0.08 | 0.19 | -0.21 | -0.06 | -0.12 | -0.41 | 0.21 |
| 44 Innovation | 0.01 | 0.08 | 0.10 | -0.02 | -0.07 | 0.05 | -0.15 | -0.02 | -0.31 | -0.05 | 0.21 |
| 45 LP in 2007 | -0.17 | 0.29 | -0.08 | -0.12 | -0.14 | -0.24 | -0.12 | -0.16 | -0.23 | -0.05 | -0.15 |

Table 4.13: (Cont.) Correlation matrix of all variables used for estimation

| | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | |
|----------------------------|-------|-------|-------------------------|-------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-----|----|--|
| 23 Performance | 1 | | | | | | | | | | | | | | | | | | | | | | | |
| 24 Qualities | 0.10 | 1 | | | | | | | | | | | | | | | | | | | | | | |
| 25 Know-inc1 | 0.20 | 0.36 | 1 | | | | | | | | | | | | | | | | | | | | | |
| 26 Know-inc2 | 0.05 | 0.24 | 0.00 | 1 | | | | | | | | | | | | | | | | | | | | |
| 27 Know-acq1 | 0.27 | 0.25 | 0.01 | 0.16 | 1 | | | | | | | | | | | | | | | | | | | |
| 28 Know-acq2 | 0.12 | -0.10 | 0.06 | 0.10 | -0.03 | 1 | | | | | | | | | | | | | | | | | | |
| 29 Know-acq3 | -0.01 | 0.07 | 0.19 | -0.06 | 0.08 | -0.01 | 1 | | | | | | | | | | | | | | | | | |
| 30 Know-acq4 | -0.02 | 0.30 | 0.07 | 0.29 | -0.06 | 0.00 | 0.06 | 1 | | | | | | | | | | | | | | | | |
| 31 Recruitment | 0.12 | 0.08 | -0.14 | 0.12 | 0.22 | 0.03 | -0.20 | -0.16 | 1 | | | | | | | | | | | | | | | |
| 32 Shortage skills | 0.00 | 0.21 | 0.07 | -0.05 | -0.14 | -0.14 | 0.01 | 0.11 | 0.01 | 1 | | | | | | | | | | | | | | |
| 33 Keeping staff | -0.23 | -0.20 | -0.23 | 0.07 | 0.00 | 0.06 | -0.09 | 0.07 | 0.03 | 0.15 | 1 | | | | | | | | | | | | | |
| 34 Competition | -0.01 | 0.02 | -0.02 | 0.00 | 0.10 | -0.04 | -0.10 | -0.11 | -0.23 | 0.03 | 0.04 | 1 | | | | | | | | | | | | |
| 35 Taxation | 0.12 | 0.17 | 0.21 | 0.09 | 0.35 | 0.08 | -0.07 | 0.26 | 0.02 | -0.03 | 0.07 | 0.01 | 1 | | | | | | | | | | | |
| 36 Regulations | 0.01 | -0.15 | 0.04 | -0.05 | 0.22 | -0.09 | -0.14 | 0.03 | 0.02 | -0.01 | 0.00 | 0.03 | -0.03 | 1 | | | | | | | | | | |
| 37 Lack finance | -0.19 | 0.01 | 0.00 | -0.03 | 0.15 | 0.09 | 0.13 | -0.13 | -0.02 | 0.00 | -0.03 | -0.06 | 0.00 | -0.03 | 1 | | | | | | | | | |
| 38 entrepreneurship | -0.19 | -0.12 | -0.13 | 0.04 | 0.08 | -0.23 | -0.01 | -0.08 | 0.11 | -0.03 | -0.10 | 0.05 | 0.07 | -0.03 | 0.18 | 1 | | | | | | | | |
| 39 Sharing-know | 0.11 | 0.22 | 0.63 | 0.39 | -0.08 | 0.11 | 0.20 | -0.24 | -0.04 | 0.01 | -0.20 | 0.14 | 0.05 | -0.14 | 0.05 | -0.08 | 1 | | | | | | | |
| 40 Employ's-know | 0.03 | 0.23 | -0.17 | 0.89^a | 0.17 | 0.05 | -0.37 | 0.50 | 0.14 | -0.02 | 0.13 | -0.02 | 0.17 | 0.02 | -0.09 | 0.05 | .03 | 1 | | | | | | |
| 41 Internal-know | 0.17 | 0.29 | 0.76^a | -0.16 | 0.05 | 0.01 | -0.08 | 0.27 | -0.10 | 0.06 | -0.11 | -0.15 | 0.23 | 0.14 | -0.05 | -0.08 | .03 | -0.06 | 1 | | | | | |
| 42 External-know | 0.24 | 0.21 | 0.05 | 0.09 | 0.94 | -0.08 | 0.38 | -0.18 | 0.15 | -0.15 | -0.04 | 0.07 | 0.24 | 0.15 | 0.18 | 0.09 | .01 | -0.02 | -0.02 | 1 | | | | |
| 43 Linkages | 0.14 | -0.15 | 0.00 | 0.00 | 0.05 | 0.98 | -0.09 | -0.05 | 0.07 | -0.14 | 0.07 | -0.04 | 0.12 | -0.06 | 0.10 | -0.21 | -0.01 | 0.00 | 0.04 | -0.03 | 1 | | | |
| 44 Innovation | -0.07 | 0.21 | 0.20 | 0.11 | -0.12 | 0.11 | 0.74 | 0.65 | -0.28 | 0.07 | -0.01 | -0.15 | 0.03 | -0.09 | 0.00 | -0.11 | .04 | 0.00 | 0.08 | .03 | .00 | 1 | | |
| 45 LP in 2007 | -0.21 | -0.06 | 0.05 | -0.09 | 0.04 | -0.08 | -0.01 | 0.10 | 0.03 | 0.05 | 0.15 | -0.13 | 0.17 | 0.21 | -0.03 | -0.17 | -0.14 | -0.03 | 0.14 | .02 | -0.06 | .06 | 1 | |

^aTwo variables 'employees' knowledge' and 'internal knowledge' shows high correlation with knowledge incorporation 1& 2. This would be considered while doing analysis.

4.14.1 Empirical results

Stepwise multiple regression analysis is used to investigate the relationship between labour productivity and drivers of firm growth such as: i) firm age & size; ii) R&D; iii) family-owned business; iv) access to finance; v) lifecycle; vi) firm strategic focus; vii) leadership; viii) culture; xi) business improvement methods; x) knowledge incorporation; xi) knowledge acquisition; xii) internationalisation; xiii) firm size and others (i.e. see Tables 4.1 and 4.12 for detail). The ordinary least square (OLS) results are presented in Table 4.14 based on stepwise multiple regression approach⁹⁰ to analyse the determinants of labour productivity. In the regression analysis the models confronted an issue of endogeneity due to limited data. This endogeneity of explanatory variables is simultaneity; it arises when one or more control variables jointly determined with the response variable (Wooldridge, 2003). This simultaneity issue can be resolved by introducing instrumental variables⁹¹ (IV) if there was enough data information on variables (*e.g.*, R&D, exporting, absorptive capacity).

Table 4.14 provides information on multiple regression analysis between firm labour productivity in 2009 (as dependent) and drivers of firm growth. Of the 60 observations⁹² the R-squared value which is 0.8819 shows that nearly 88.2% of the variation in labour productivity is explained by the model. This suggests that the model is well fitted. Furthermore, to examine the functional form of misspecification errors⁹³ in model, Ramsey reset test is useful in this regard. The Ramsey reset test is use to detect model misspecification error; if the *F*-statistics is significant this would suggest some sort of

⁹⁰ The robust standard error method is used to eliminate the effects of hetroskedasticity.

⁹¹ The method of IV used two stage least squares (2SLS) in the presence of endogeneity: this IV should be correlated with the endogenous variable, uncorrelated with error term (ϵ) and should not enter the main equation (i.e. does not explain response variable).

⁹² Of the 69 firms interviewed, 8 firms refused to provide financial information because of their company policy; and one firm very recently started exporting could not provide the export sales for 3 years ago.

⁹³ "Model suffers from functional form misspecification when it does not properly account for relationship between dependent and independent variables" Wooldridge (2003).

functional form of issue in the model. However, in this case the diagnostic test for model misspecification error adequately satisfied models-1 and accepted the null hypothesis.

Table 4.14: Stepwise multiple regression of the determinants of LP in 2009 (using OLS method)

| Log labour productivity 2009 - dependent | (Model-1) | Coefficients | t-values |
|---|-----------|--------------|----------|
| Log LP in 2007 | | 0.6158*** | 11.17 |
| R&D undertaking | | -0.8267*** | -4.10 |
| Size (11-20; employees) | | 1.0765*** | 4.75 |
| Size (31-80; employees) | | 0.7101*** | 3.17 |
| Access to finance | | 0.3285*** | 2.78 |
| Δ log exports | | 0.0870** | 2.06 |
| Outward FDI | | 0.6377*** | 3.17 |
| Exports (dummy) | | -0.8634*** | -3.24 |
| Inward FDI | | 0.6215*** | 2.65 |
| Lifecycle (survival) | | -0.1158 | -1.63 |
| Strategic focus (ideas) | | 0.1813** | 2.40 |
| BIM (quality improvement) | | 0.3860*** | 3.49 |
| Knowledge Incorporation-1 | | -0.8418*** | -3.99 |
| Knowledge Incorporation-2 | | 0.8533*** | 2.65 |
| Entrepreneurship | | 0.1373* | 1.74 |
| Absorptive capacity (employees knowledge) | | -1.0140*** | -3.03 |
| Absorptive capacity (internal knowledge) | | 0.5976** | 3.13 |
| Absorptive capacity (external knowledge) | | -0.1806** | -2.29 |
| Absorptive capacity (linkages) | | 0.1411** | 2.38 |
| Absorptive capacity (innovation) | | 0.2214*** | 2.92 |
| Obstacles (regulations) | | 0.2305*** | 3.42 |
| Obstacles (taxation) | | 0.2181*** | 2.92 |
| Obstacles (shortage of skills) | | -0.2699*** | -3.29 |
| Obstacles (lack of financial understanding) | | 0.1050** | 2.04 |
| Obstacles (keeping staff) | | 0.2228** | 2.47 |
| Constant | | 2.9110*** | 4.75 |

*/**/** indicates significant at 10/5/1% levels

Model-1

n = 60 R-squared = 0.8819

Ramsey Reset test value F = 2.02; significant level F = 0.1311

The elasticity⁹⁴ of LP in 2007 shows that 100% increase in labour productivity (in 2007) raises labour productivity in 2009 by approximately 62%. This suggests that there is

⁹⁴ Represents proportion change in Y divided by proportion change in X; used for all logged continuous variables.

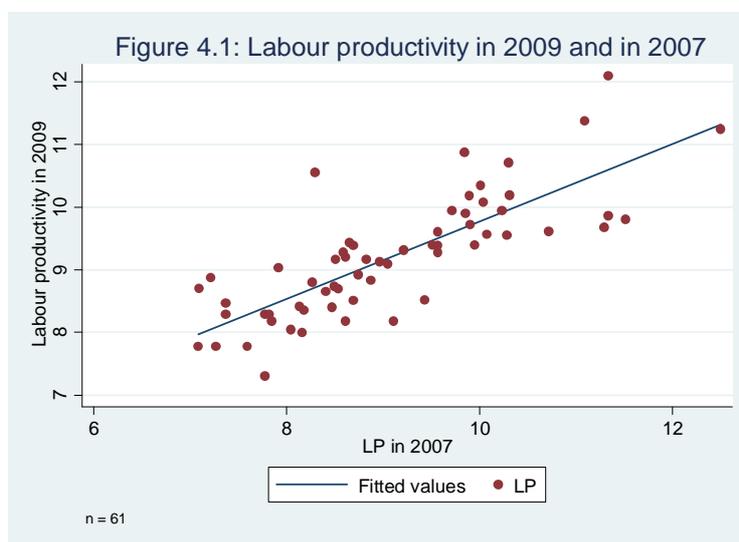
significant (over 60%) increase in the labour productivity of these software firms over 3 years time. Figure 4.1 shows the scatter plot of these two variables. However, for some firms this increase in labour productivity in 2009 is slower than 3 years ago. This implied that these software firms are facing large sunk costs⁹⁵ which make their progress slow in terms of labour productivity. This finding supports the argument of Farinas and Ruano's (2004) finding that higher sunk costs reduce the firm productivity. Additionally, firms (n=69) were asked question related to 'single most important factor for firm competitive edge' in the next 3-5 years; most of the firms placed 'cost effectiveness' as their important factor for success (see details in Chapter 3). Alternatively, this suggests that cost ineffectiveness affects their labour productivity. Firms undertaking R&D⁹⁶ have 56% lower labour productivity. This outcome has rejected the prior expectation of positive relationship between firm undertaking R&D and labour productivity based on previous empirical studies (*e.g.*, Harris, 2005; Harhoff, 1998). In this study only few firms (n=14) undertook R&D and this implies that these software firms have resource constraint. In other words, this finding suggests that firms undertook R&D devotes significant resources to this activity, while they are engage in innovative practices, such that they become resource constrained and productivity temporarily suffers⁹⁷. In addition, a large proportion of these software firms (nearly 75%) are relying on internal source of financing which is not sufficient to finance investment in R&D. Additionally, Kim's (2000) and Harris and Trainor (1995) empirical studies suggests that SMEs required greater R&D incentives (*e.g.*, grants) from government agencies to improve their labour productivity. These software firms have no public support (*e.g.*, R&D grants) for improving their productivity

⁹⁵ Sunk costs are costs that have already been incurred and cannot be recovered. Firms face slow productivity growth due to high sunk costs. This finding suggests that lack of infrastructure facilities (*e.g.*, costs of suitable premises and power supply) have lower impact on the firm labour productivity growth. The study of Sleuwaegen et al. (2002) suggests that in developing countries lack of facilities may raise the sunk cost of firm entry into the market. In particular, inefficient small firms exit the market due to their high transaction and information costs compared to large firms.

⁹⁶ All dummy variables need to be converted using $e^{\beta-1}$.

⁹⁷ Later on firms may reduce spending on R&D after obtaining the benefits of such innovative activity and that productivity recovers. However, this requires data on several points in time to see if there is this type of relationship between R&D and productivity at different points in innovation cycle. This indicates our limitation of the study and suggests future research.

performance. Interestingly, small firms have higher (193%) labour productivity compared to large firms and over 100% increase in labour productivity for medium-size firms (31-80). This suggests that these small software firms are less capital or intermediate-intensive and have higher technical and efficiency levels. This finding also supports the argument of Rothwell (1989), that small firms have higher productivity due to their internal flexibility. Small firms are more flexible in terms of their less centralised decision making, low formal production channels compared to large firms. This organisational flexibility provides an edge to SMEs despite their lack of resources.



Firms that applied for external finance have nearly 39% higher labour productivity (see Table 4.14). This suggests that firms require external finance to boost their labour productivity. However, most of the software firms (over 75%) are relying on internal sources of finance which are not sufficient to undertake R&D projects (see Chapter 3 for detail). Studies (*e.g.*, Abor and Biekpe, 2007) on access to finance discussed whether that lack of financial resources constrains the firm innovation and productivity performance. Overall, this finding suggests that access to credit improve the firm labour productivity. Additionally, firms change in exporting rises by 100% as labour productivity increased by 9%. This implies that exporting improves the firm labour productivity and supports the

initial hypothesis. The descriptive statistics in the previous chapter shows that software firms are predominantly (81%) exporting to international markets (for detail see Chapter 3). Wagner (2007) study suggested that exporting firms produced competitive and innovative products/services to survive in the international markets. However, firm's low level of R&D investment and incremental type of innovation output suggest that these software firms are selling their products and services to less innovative international markets⁹⁸. Further firms engaged in outward FDI have 89% higher labour productivity. This suggests that firms have overseas operation would be likely to have higher labour productivity. Nevertheless, few firms (n=12) have invested abroad and 42% of firms in the range of 5-12% generated sales from overseas operations compared to 25% of firms have over 60% sales from overseas activities . This implies that these software firms have lower outward FDI and depend more on export sales from local based operations. In summary, firm internationalisation has a positive impact on firm labour productivity: in particular this outcome implies that software firms have to improve their internationalisation activities. Surprisingly, the negative association between exports (used as dummy) and labour productivity would be found again in model-2.

Firms that are foreign owned have 86% higher labour productivity. This finding accepts the prior expectation and supported the argument of Aitken and Harrison (1999). This suggests that foreign owned firms (n=15) have higher labour productivity compared to local firms. The literature investigated whether foreign-owned firms are superior in technology and more productive than local firms. Further FDI spillovers may improve the local firm's labour productivity if local firms have higher absorptive capacity (i.e. knowledge based assets). So far, model-1 showed that these software firms have low

⁹⁸ In a face-to-face interview with owners, it was found that how these software firms export to international markets. Most of these software firms place their bids for online-projects (from US/European markets) and the winner of the bid (*e.g.*, by offering low bidding price) get the project. However, due to shortage of skills generally these software firms usually cannot offered their bids for highly-innovative projects (*e.g.*, innovative products may generate high revenues for them) and rely on incremental type of innovative products, which result in low sales volume.

investment on knowledge based assets (*e.g.*, R&D, IPR) and pointed to the weak collaboration between foreign-owned and domestic firms. In other words foreign owned firms have poor contacts⁹⁹ with local firms. However, the positive relationship between inward FDI and labour productivity suggest that local firms should improve their contacts in terms of joint innovative projects, help in exploring international markets and linkages as customer/supplier to foreign firms. In contrast, the elasticity of strategic focus shows that 100% rise in firm strategic ideas would have 18% higher firm labour productivity. This suggests that firms having better strategies related to products and market would be likely to have higher labour productivity. Furthermore, firm business improvement methods would increase the firm labour productivity by approximately 39%. This finding supports the argument of Chapman and Khawaldeh (2003) in the literature that business improvement methods have a positive impact on firm labour productivity and accept the prior expectation. This suggests that firms should maintain high quality standards/ methods by using scientific techniques for better labour productivity. Knowledge incorporation-1 decreases firm labour productivity by 84%. In comparison, 100% increase in knowledge incorporation-2 has 85% higher labour productivity. Overall, two different outcomes suggest that knowledge incorporation through internal and external sources have less impact on firm labour productivity. This finding rejects the initial hypothesis about knowledge management positive relationship to firm labour productivity. This would be further confirmed in model-2.

Firm's entrepreneurship abilities rise by 100% labour productivity increases by approximately 14%. This implies that firm entrepreneurial abilities (risk taking and pro-activeness) improve the firm labour productivity. In the literature, researchers (*e.g.*, Rangone, 1999 and Burns, 2007) suggested that entrepreneurs improve the firm innovation

⁹⁹ These local software firms have low forward and backward linkages with foreign owned firms (for detail see chapter 3 on inward FDI).

and productivity performance. However these software firms have strong proclivity for low risk projects rather than high risk projects (see Chapter 3). This high risk aversion has lower effect (*e.g.*, 14%) on firm labour productivity. Furthermore these software firms follow their competitor in terms of new ideas and innovations; this suggest that these firms are not very proactive related to innovation strategies. Overall, the positive relationship between entrepreneurship and labour productivity suggests that firm's with higher entrepreneurial abilities (*e.g.*, risk taking, proactive and innovative) increases labour productivity. In contrast, model-1 shows weak relationship between firm absorptive capacity and labour productivity (see Table 4.14). The elasticity of 'employee's knowledge' reduces firm labour productivity by 101%. Overall this outcome suggests that these software firms have poor abilities to internalise external knowledge. In particular low investment on knowledge based assets reduced the firm labour productivity. In literature a number of researchers (Fabrizio, 2009; Harris and Li, 2006) emphasised on the role of knowledge based assets for higher firm productivity. However this finding implies that these software firms required to improve their labour productivity through investing in knowledge based assets. This negative outcome would be further analysed in model-2.

Lastly a 100% rise in shortage of skills generally as a long-term obstacle would reduce the firm labour productivity by 27%. This suggests that these software firms are facing a shortage of skills generally and this obstacle affect their labour productivity. The shortage of skills implies that these firms have lower innovative abilities (*e.g.*, R&D related staff) to produce radical innovations. Surprisingly long term obstacles to the success of their business such as regulations, taxation, lack of financial understanding and keeping staff shows a positive relationship to firm labour productivity. This suggests a weak outcome and would be further estimated in model-2 for policy implication.

Table 4.15 reports the determinants of labour productivity growth using stepwise multiple regression analysis¹⁰⁰. Model-1 showed some unexpected findings such as exports (as dummy), knowledge incorporation-1, absorptive capacity negative association to labour productivity and long term obstacles (regulations, taxation and others) positive relationship to labour productivity. In model-2 three variables are dropped for analysis reasons; exports as discrete variable¹⁰¹ and two factors of absorptive capacity¹⁰² (i.e. employee's knowledge and internal knowledge). Model-2 R-squared value is 0.7425 and this shows that approximately 74% of variation in labour productivity growth explained by the model. This suggests that the model is good a fit. Again, the Ramsey reset test accepted the null hypothesis and shows that model-2 is adequately satisfied without functional form of misspecification errors.

¹⁰⁰ The dependent variable is change in labour productivity (in 3-years time). This catch-up model shows the impact of drivers of firm growth on labour productivity in 3-years time. Alternatively, this model suggest that how firms achieved their labour productivity growth in 3-years time. Figure 4.2 clearly indicates that not all firms made significant progress in terms of their labour productivity growth.

¹⁰¹ Change in exports is already used in the model to investigate the relationship between exports and labour productivity and give a better interpretation of the results.

¹⁰² These two factors are highly correlated with knowledge incorporation 1&2 (see correlation matrix). Further, if we include these two predictor variables in the model the model shows the functional form of misspecification error which rejects the null hypothesis.

Table 4.15: Regression analysis of determinants of Δ LP stepwise (using OLS method)

| Δ log labour productivity (dependent) | (Model-2) | Coefficients | t-value |
|--|-----------|--------------|---------|
| Log labour productivity in 2007 | | -0.4295*** | -6.80 |
| R&D undertaking | | -0.3804** | -2.33 |
| Access to finance | | 0.2450** | 2.15 |
| Size (11-20; employees) | | 0.7934*** | 3.64 |
| Size (31-80; employees) | | 0.4005** | 2.05 |
| Δ log exports | | 0.1417*** | 3.33 |
| Outward FDI | | 0.3866** | 2.17 |
| Inward FDI | | 0.3347 | 1.62 |
| Strategic focus (ideas) | | 0.1103 | 1.38 |
| BIM (quality improvement) | | 0.1856* | 1.73 |
| Knowledge incorporation 1 | | 0.2628** | 2.12 |
| Knowledge incorporation 2 | | 0.3466** | 2.66 |
| Knowledge acquisition 1 | | 1.6481** | 2.13 |
| Knowledge acquisition 3 | | 0.9215*** | 3.00 |
| Knowledge acquisition 4 | | -0.6674*** | -3.50 |
| Absorptive capacity (sharing knowledge) | | -0.6179*** | -3.69 |
| Absorptive capacity (external knowledge) | | -2.0762** | -2.49 |
| Obstacle (keeping staff) | | 0.1995 | 1.57 |
| Obstacles (taxation) | | 0.1964** | 2.09 |
| Obstacles (lack of financial understanding) | | 0.0881 | 1.59 |
| Obstacles (shortage of skills) | | -0.2225** | -3.0 |
| Constant | | 2.9690*** | 4.33 |

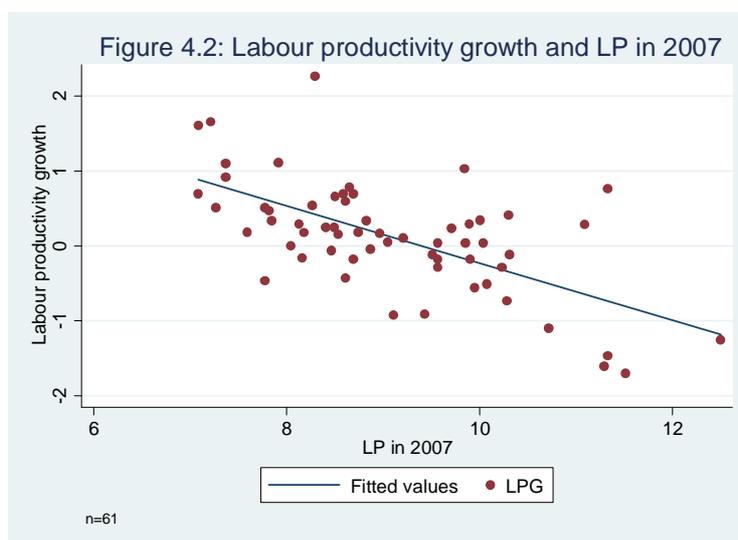
*** indicates significant at 10/5/1% levels

$N = 60$ R -squared = 0.7425

Ramsey Reset test value $F = 2.34$; significant level $F = 0.0899$

With a 100% increase in the elasticity of labour productivity in 2007, the firm labour productivity growth fell by nearly 43%. In other words, this shows that those firms had higher labour productivity in 2007 experienced lower labour productivity growth. Overall, this finding suggests that these software firms have lower labour productivity growth because of higher sunk costs. These high sunk costs reduce the firm labour productivity growth. Figure 4 shows the scatter plot of two variables. Firms undertaking R&D has nearly 32% lower labour productivity growth. This outcome confirms the previous finding in model-1 and rejected prior expectation again. Overall, this negative relationship between R&D and labour productivity growth implies that a low level of R&D, firm resource

constraint, lack of R&D grants reduced the firm labour productivity growth (for details see model-1 outcome).



Firm's access to credit has approximately 28% higher labour productivity growth. This supports the initial hypothesis and suggests that the availability of external finance improves the firm labour productivity growth. Similarly a positive relationship between firm size and labour productivity growth accepts the prior expectation. However, smaller firms have higher labour productivity growth compared to large firms because of their organisational flexibility and better technological/efficiency levels. In contrast, firm internationalisation (exporting and outward FDI) has a positive impact on firm labour productivity growth. Elasticity of firm exporting increases by 100% the firm labour productivity growth rise by 14%. This positive outcome confirms the findings of Delgado and Farinas *et al.* (2002) that firm exporting and productivity have a positive relationship. In comparison, firm engaged in outward FDI have 47% higher labour productivity growth. In summary, firm exports and outward FDI suggest that these software firms have to improve their internationalisation activities through searching new international markets and selling more innovative products and services. Model-2 shows no association between firm labour productivity growth and inward FDI, firm strategic, entrepreneurship compared

to model-1. Business improvement methods increase by 100% the firm labour productivity growth rise by nearly 19%. This positive relationship between business improvement methods and labour productivity supports the empirical finding of Chapman and Khawaldeh (2002) and prior expectation. This outcome also suggests that a firm with better quality standards would be likely to have higher labour productivity growth. However, looking into firm innovation activities such as: R&D undertaking or incremental type of innovation implies that these software firms should improve their total quality programmes for higher productivity.

Furthermore, Table 4.15 model-2 shows strong relationship between firm knowledge management and labour productivity growth compared to model-1. Knowledge incorporation 1 & 2 increases firm labour productivity growth by approximately 26% and 35%. Higher proportions (over 90 %) of labour productivity growth rise by firm knowledge acquisition abilities. Overall this finding suggest that these software firms have better knowledge management capabilities and have higher labour productivity growth. Nonetheless, the negative relationship between knowledge acquisition-4 and labour productivity growth suggest that these software firms have weak linkages to other firms related to development of new product and services (see factor analysis of knowledge acquisition). Model-2 confirms again the negative association between absorptive capacity and labour productivity growth and rejected the prior expectation. In summary these software firms have poor absorptive capacity, which suggests that firms require more investment on knowledge based assets. Previous empirical studies (Harris and Li, 2006) found that R&D undertaking improves firm absorptive capacity; but these software firms have lower R&D related capabilities. Finally, a long-term obstacle to the success of their business such as 'shortage of skills generally' reduce the labour productivity growth by 22%. This suggests that shortage of skills generally affect the firm labour productivity growth. The negative outcome supports the initial hypothesis and literature findings of

Minto (2006) and Reddy (2007). Surprisingly, the model found taxation as an obstacle having a positive impact on firm labour productivity growth. This finding suggests the other way around, that firms with higher productivity (*e.g.*, profitability) are more vulnerable to the taxation.

Section 4

4.15. Concluding remarks

Chapter 4 analysed the relationship between drivers of firm growth (independent variables) and labour productivity (dependent variable) using factor and regression analysis. This chapter discussed the summary of literature and had drawn hypotheses for empirical analysis. The data was collected from the two regions of Pakistan on software firms. Firms were interviewed (face to face) by using structured questionnaire. A total 69 firms responded to the interviews and only 8 firms refused to provide financial information. The firm business and management variables were measured through factor analysis. Factor analysis reduced the number of variables and provided the correlation between factor and each variable. To measure the appropriateness of factor models; Kaiser-Meyer Olkin test was used. Some factor models (*e.g.*, lifecycle, leadership, absorptive capacity) had lower Kaiser-Meyer-Olkin test values. This implied that lower number of observations affected the factor models in terms of appropriateness.

Before the regression analysis, the multicollinearity problem was examined in the models by using a correlation matrix. Overall the models showed no multicollinearity. However two variables of firm absorptive capacity ‘employee’s knowledge’ and ‘internal knowledge’ were highly correlated with firm knowledge incorporation. These two variables were dropped in model-2 to avoid multicollinearity problem. Two models were used to investigate the relationship between drivers of firm growth and labour productivity through stepwise multiple regression analysis. The robust standard error method was used

to eliminate the heteroskedasticity. The first model analysed the determinants of labour productivity and the second model used labour productivity growth as dependent variable. Overall both models showed higher R-squared values, which suggested that models were well fitted. Furthermore, a Ramsey reset test was used to examine the functional form of misspecification errors; models were adequately satisfactory. Model-1 identified a positive relationship between labour productivity in 2009 and labour productivity 3 years ago. In comparison model-2 showed negative association between labour productivity 3 years ago and labour productivity growth. This suggested that these software firms had slow labour productivity in 3 years time. Firms had lower labour productivity growth due to high sunk costs.

By comparing two models firm R&D undertaking had negative relationship to labour productivity. This outcome rejected the initial hypothesis drawn from the literature survey. This implied that firms had lower R&D capabilities such as employee's skills, lack of R&D grants/subsidies and financial constraints reduce the firm labour productivity growth. Firm size and labour productivity showed positive relationship and more strong association was found for smaller firms. This finding supported the initial hypothesis and suggested that software firms were more skill intensive than labour or capital intensive firms. It also implies that small firms had more flexibility compared to large and had higher labour productivity. Further, access to finance had a positive impact on firm labour productivity and supported prior expectation. However, few firms applied for external finance and most of the firms were relying on internal source of financing. This internal financing was not sufficient for firms to undertake innovative projects. Additionally, a positive relationship between firm internationalisation (exporting and outward FDI) and labour productivity supported the initial hypotheses from the literature. This implied that firms engaged in exporting had higher labour productivity growth. Similarly, outward FDI increased the firm labour productivity. However, low level of R&D, less innovative products/services

and few firms involved in outward FDI suggested that firms had to improve their internationalisation activities.

Model-1 showed a positive association between inward FDI and labour productivity. This suggested that foreign owned firms had higher labour productivity compared to local firms. However these local software firms had poor networks to foreign firms in terms of forward and backward linkages. Overall, models 1 & 2 showed that firms with business improvement methods had a positive impact on firm labour productivity. This finding supports the initial hypothesis. In comparison model-1 found positive relationship between firm strategic focus, entrepreneurship abilities and labour productivity. In particular these software firms had lower risk taking abilities and were less proactive in terms of speed of innovation. In summary, model-2 examined the positive relationship between knowledge management and labour productivity. This suggested that better knowledge incorporation through internal/external sources and knowledge acquisition abilities could improve the firm labour productivity growth. In contrast, both models showed a negative relationship between firm absorptive capacity and labour productivity, which rejected the prior expectation. This suggested that software firms had poor abilities to internalise external knowledge due to low investment on knowledge based assets such as low R&D, weak linkages, lack of IPRs. Lastly, long-term obstacles to the success of their business such as 'shortage of skills generally' showed a negative impact on firm labour productivity growth and supported initial hypothesis. Taxation as an obstacle showed a positive impact on firm labour productivity growth. This outcome might suggest firms with higher labour productivity growth were more vulnerable to taxation.

4.16. Policy implications

Overall these software firms make slow progress in terms of labour productivity growth. This implies that higher sunk costs reduced their productivity and that these firms require

more incentives from public sector organisations to reduce their sunk costs. For instance, cost of suitable premises, overall country energy crisis could be resolved on an urgent basis to boost up their labour productivity growth. Low investment in R&D and its negative association to labour productivity growth suggest that firms are not highly innovative and reluctant to invest on innovative projects. This implies that public and private sector organisations should encourage the IT industry by providing R&D grants, subsidies/incentives to local software firms for better productivity and innovation output. Furthermore, most of the software firms are relying on internal source of financing which is not sufficient to undertake innovative projects. The positive relationship between access to finance and labour productivity suggests that software firms should have access to borrowing with lower interest rates by means of less bureaucratic channels. In particular small firm's positive relationship with labour productivity growth suggests that policy makers should focus on firm's productivity rather than size of the firm. Alternatively, SMEs-oriented public policies should be reformed to improve their productivity and innovation performance.

In addition, most of the software firms are exporting and few firms are engaged in outward FDI. Overall, the positive relationship between internationalisation and labour productivity growth suggests that exporting and outward FDI increase the firm productivity. However, lack of radical innovation abilities and lower outward FDI implies that these software firms still need to explore new and competitive international markets for better export sales and thus outward FDI. In particular, policy makers should emphasise the importance of outward FDI and exporting to highly innovative markets. On the other hand, the government should encourage more foreign direct investment in the IT sector and also encourage firms to have forward & backward linkages to foreign firms. Shortage of skills having a negative impact on firm labour productivity growth suggests that these local software firms face problems in meeting customer's demands for innovative products.

This implies that policy makers emphasise the importance IT education in Pakistan. Similarly, profitable firms face taxation as more obstacle to the success of their business. Absorptive capacity having a negative association with firm labour productivity growth suggests the importance of knowledge based assets such as R&D investment, networks with universities and research institutes, human capital, quality programmes and others. Presently these software firms are externally constrained, low level of R&D and the lack of R&D grants/subsidies, shortage of skills and weak University-industry linkages reduce the firm's labour productivity growth. In summary, these software firms should improve their investment in intangible assets (*i.e.*, R&D, networks, and human capital) for better productivity and innovation performance. Policy makers should consider the need for such knowledge based assets and must involve public and private sector organisations to boost their productivity.

4.17. Limitations and future research work

This research faced certain issues related to empirical analysis. The first is the limited number of observations ($n=69$). A larger dataset may result in higher KMO test values for factor models appropriateness. In contrast, there are issues related to the dataset such as few firms being engaged in R&D ($n=14$), and this provided little information related to estimation of drivers of firm growth and innovation performance. For measuring firm innovation performance, information on IPRs (intellectual property rights) might be useful. In addition, information on return on assets and profitability would be useful for measuring the financial performance of these software firms'. Furthermore, the econometric models faced causality issues, which could be resolved by the use of larger dataset and having enough information on variables causing endogeneity. Additionally, a recommendation for future research would be to investigate the relationship between drivers of firm growth and innovation performance (*e.g.*, innovation input such as undertaking R&D) through a probit model. Probit model (nonlinear model) used binary dependent variable (*e.g.*, firm

undertaking R&D) and requires maximum likelihood estimation. This maximum likelihood function provides the probability of observing the sample data with lower variances. Nevertheless, large samples are needed for reliable maximum likelihood estimation. Unfortunately, in our case, the number of observations was too small to estimate the probit model. The survey analysis could be extended to other parts of the country such as Karachi and Lahore for obtaining a large dataset. Total factor productivity (TFP) could also be used as a dependent variable. Cross-section data analysis is limited in scope for the analysis of firm's long-term abilities and panel data analysis can be considered.

5. Conclusion

5.1. Findings

The literature survey in this thesis investigated the drivers of firm growth by looking into resource based-view of firm. This resource-based view of the firm stated that firm's intangible resources (*e.g.*, R&D, networks) improved the firm's sustained competitive advantage. In addition, a conceptual model was used to link the drivers of firm growth (mostly intangible resources) with firm performance. This conceptual framework had identified the drivers of firm growth such as absorptive capacity, R&D, networks, knowledge management, culture, access to finance and so forth and their causal relationship to firm performance. In the literature survey, several micro-level empirical studies identified the positive relationship between driver of firm growth and labour productivity growth. In comparison, other studies examined the negative relationship between long term obstacles (*e.g.*, economy, taxation, shortage of skills) and firm labour productivity growth. Overall, the literature survey focused on the determinants of firm labour productivity growth.

For empirical analysis, parametric and non-parametric tests as well as two stepwise multiple regression models were used to investigate the relationship between drivers of firm's growth and labour productivity growth. In the regression analysis, the R-squared values suggested that both models had good fit. Moreover, the Ramsey Reset test also showed that both models were adequately satisfied (*i.e.*, without omitted variable bias). The negative relationship between labour productivity growth and labour productivity in 2007 showed that that these software firms had slow progress in terms of labour productivity due to the presence of high sunk costs. In particular, this finding suggested that lack of infrastructure facilities (*e.g.*, cost of suitable premises) reduced the firm labour productivity growth. This outcome supported the previous empirical studies that in developing countries lack of infrastructure facilities (*e.g.*, energy crisis, poor

telecommunication) increased the firms' cost of entry into the market and reduced firm productivity. Additionally, most of the software firms had placed 'cost effectiveness' as their single most competitive factor for the success of their business in the next 3-5 years. This finding apparently suggested that cost ineffectiveness affect their labour productivity.

Both models examined the negative relationship between firm R&D undertaking and labour productivity and surprisingly, rejected the initial hypothesis. Overall, few firms undertook R&D (n=14) and most of these software firms were externally constrained. This outcome suggested that the firms that undertook R&D gave up significant amount of resources to this innovative activity and as a result their labour productivity suffered. Similarly, the innovative software firms had mainly produced incremental type of product/process innovations. Furthermore, when firms were asked for 'reasons for not undertaking R&D', firms replied that it was due to the low confidence on generating high returns and the greater risk involved while undertaking R&D. This finding clearly suggested that these software firms had poor innovation abilities due to resource constrain.

Interestingly, the positive relationship between small firm size and labour productivity growth supported the initial hypothesis. This suggested that small firms were more flexible in terms of their decision-making and had higher technical/efficiency levels. Additionally, access to finance had a positive impact on firm labour productivity growth. This finding is in line with the initial hypothesis derived from the literature. However, most of the software firms relied on internal source of finance due to lack of financing for this knowledge-intensive sector. Firms were refused for external funding because of lack of securities and lenders viewed this knowledge-intensive sector as risky (i.e., high uncertainty) for their investment. Nonetheless, this finding implied that if firms had had access to finance could have had a higher labour productivity growth. Additionally, the positive relationship between firm engaged in exporting/outward FDI and labour

productivity growth suggested that internationalisation had a positive impact on the firm labour productivity growth. This implied that firms involved in exporting and outward FDI had higher labour productivity growth because of intense competition for selling innovative products/services in the international markets. This outcome supported the prior expectation. However, few firms were engaged in R&D and produced mainly incrementally innovative products. This clearly indicated that these software firms were selling to less innovative international markets.

Model-1 in this thesis showed that foreign owned firms had positive impact on local firm labour productivity and accepted the initial hypothesis. In the literature, the empirical studies stated that local firm's linkages (customer and supplier relationships) to foreign firms improved domestic firm's labour productivity. However, the relationship between domestic and foreign firms and their nature of contacts (i.e., using non-parametric test) showed that these local software firms had poor linkages with foreign firms. This finding suggested that domestic firms should boost their labour productivity through joint innovative projects with foreign firms and established linkages (*e.g.*, customer-supplier links) to foreign firms. In addition, model-1 examined the positive relationship between firm's strategic focus and labour productivity. This outcome supported the initial hypothesis. This implied that firm with better strategies in terms of searching new market opportunities; developing new innovative products had higher labour productivity. However, the second model failed to show any relationship between inward FDI, strategic focus and labour productivity growth.

The regression models showed positive association between firm business improvement methods and labour productivity growth. This outcome is in line with economic intuition from the literature. This finding suggested that firm with better quality standards/methods had positive impact on the firm labour productivity growth. Model-1 examined the positive

relationship between entrepreneurship and labour productivity and supported the initial hypothesis. Several studies found that entrepreneurship abilities (*e.g.*, risk taking, proactive and innovative) improved the firm labour productivity. However, most of the software firms were engaged in low-risk projects, had lower product/process innovations, and were less pro-active in terms of speed of innovation. This finding implied that firms with entrepreneurial abilities (*e.g.*, risk-taking, pro-active) had higher labour productivity.

The literature survey identified that knowledge management as factor that improved the firm performance and competitive advantage. In particular, tacit knowledge (*e.g.*, employees knowledge sharing) could improve the firm labour productivity. Model-2 showed the positive impact of knowledge management on firm labour productivity growth and supported the initial hypothesis. This suggested that firm with better knowledge incorporation and acquisition from internal and external sources experienced higher labour productivity growth. However, knowledge acquisition (*i.e.* collaboration with other firms) investigated the negative relationship to firm labour productivity growth. This finding implied these software firms had lower internal capabilities (*e.g.*, entrepreneurial abilities) to establish linkages to other firms for knowledge acquisition. In other words, this outcome suggested that firms had weak linkages to other firms.

A number of empirical studies stated that firm investment in knowledge-based assets (*e.g.*, R&D, networks, IPRs) had higher firm labour productivity. In the literature, the researchers had used a concept called 'absorptive capacity' to denote a firm's ability to internalise external knowledge. These researchers argued that a firm with higher absorptive capacity had higher labour productivity growth. However, the regression models in this study showed the negative relationship between absorptive capacity and labour productivity growth and rejected prior expectation. Overall, this finding suggested that low investment in knowledge based assets such as low level of firm R&D undertaking; weak

linkages and lack of IPRs reduced the labour productivity growth of these software firms. Lastly, model-2 investigated the negative association between shortage of skills and labour productivity growth. This finding had supported the hypothesis and complements the previous empirical studies, which argued that long term obstacles reduced the firm productivity. This implied that these software firms had problem of skills shortage to meet the innovative demands of customers. The positive relationship between taxation and labour productivity suggested that firm with higher productivity (i.e., profitability) were more vulnerable to the changes in taxation.

5.2. Limitations

This research study has certain limitations in terms of empirical analysis. A small number of observations (n=69) result in lower KMO test values for factor model appropriateness. This research study failed to estimate the relationship between drivers of firm growth and firm innovation performance because of few firms were engaged in R&D (*e.g.*, use as an input for innovation). Similarly, information on IPRs (intellectual property rights) might be useful for measuring firm innovation performance. Additionally, information on return on assets (ROA) and firm profitability would be effective for measuring firm financial performance. Further, the conceptual model suggested the causal relationship between variables. This causality issue could be resolved by the use of larger dataset and having enough observations on variables (*e.g.*, absorptive capacity, R&D, exporting).

5.3. Contribution to research

This research has made a significant contribution to the literature by performing an empirical analysis of the Pakistani software industry. The difference from the previous studies is that those focused on the manufacturing industry and were also limited in scope with regard to long-term drivers of firm growth. Overall, this study developed a conceptual framework which shows the causal link between drivers of firm growth and firm

performance. The model is empirically tested by using cross-sectional data techniques. This study finds that knowledge based assets (*e.g.*, R&D, networks, absorptive capacity, entrepreneurship, knowledge management and so forth) are important determinants of labour productivity growth. In particular, these software firms require to invest in knowledge based assets for higher firm performance.

5.4. Policy implications

The outcome of the two regression model suggest that, due to high sunk costs these software firms have lower labour productivity growth. These sunk costs, such as availability/cost of suitable premises and the energy crisis, may affect their labour productivity growth. This implies that government should provide infrastructure facilities for higher performance of these software firms. In addition, firms with a low level of R&D undertaking, weak inter-intra firm linkages, the general shortage of skills, poor internal and external knowledge sources reduced the labour productivity growth of these software firms. Additionally, these software firms are externally constrained in terms of their access to finance. In summary, these findings clearly indicate that these software firms have weak knowledge-based assets. One very important implication from my study is that policy-makers both from public (*e.g.*, IT ministry, PSEB) and private sector organisations (*e.g.*, P@SHA, the banking sector) should consider financial (*e.g.*, R&D grants/subsidies, financing) and non-financial (*e.g.*, help in establishing networks) assistance related to firm investment in knowledge-based assets.

Additionally, most of the software firms are involved in exporting and have produced largely incremental type of innovations. This apparently suggests that these software firms are mainly exporting their products and services to lower innovative international markets. For higher firm performance, these software firms should produced radical innovations (*i.e.*, completely new) and patent their products and services. Furthermore, these software

firms need help in searching for new international markets for their products and services. Policy-makers should formulate SME oriented policies and focus on lowering the transaction costs of their internationalisation activities. Finally, the general shortage of skills in the IT sector suggests that this sector need robust policy-making for improving the quality of IT-education all over the country.

Appendix.1

Survey of Software Firms: Islamabad/Rawalpindi Regions, April-May, 2010

A. Firm Characteristics:

A.1: What is your position or job title? Prompt if necessary

| | |
|-----------------------|---|
| Owner/Sole proprietor | 1 |
| Partner | 2 |
| Director/Manager/CEO | 3 |
| Director/Shareholder | 4 |
| Others | 5 |

A.2: Is your business a company, a partnership or are you a sole proprietor?

| | |
|---------------------|---|
| Sole Proprietorship | 1 |
| Partnership | 2 |
| Private Ltd Company | 3 |
| Public Ltd Company | 4 |

A.3: Can you tell me when your business was established?

| |
|---------------------|
| Enter Year |
|---------------------|

A.4: Has there been a change of ownership of the business in the past three years?

| | |
|------------|---|
| Yes | 1 |
| No | 2 |
| Don't Know | 3 |

A.5: How many employees does your business currently employ worldwide?

| |
|-----------------------|
| Enter Number |
|-----------------------|

A.6: How many people does the business employ at this establishment?

| |
|-----------------------|
| Enter Figure |
|-----------------------|

A.7: How many people did the business employ 3 years ago (approximately)?

| |
|-------------|
| Enter here: |
|-------------|

A.8: Is your business a family-owned business? (A family is majority owned by members of the same family)

| | |
|---------------------|---|
| Yes | 1 |
| No | 2 |
| Unwilling to answer | 3 |

A.9: If yes, for how many generations has the business been in control of your family?

| | |
|------------------------|---|
| 1 | 1 |
| 2 | 2 |
| 3 | 3 |
| Other (please specify) | 4 |
| Don't know | 5 |
| Unwilling to answer | 6 |

A.10: Do you anticipate the closure or a full transfer of the ownership business in the next 5 years?

| | |
|------------|---|
| Yes | 1 |
| No | 2 |
| Don't know | 3 |

A.11: Over the next two or three years, do you aim to grow your business?

| | |
|-----|---|
| Yes | 1 |
| No | 2 |

A.12: Do you expect to fund your business growth using internal finances or from external finance providers?

| | |
|------------------|---|
| Internal Finance | 1 |
| External Finance | 2 |
| Both | 3 |
| Don't know | 4 |

A.13: So overall, which are the 5 Major Obstacles (by rank) to the long term success of your business?

Show Card A-13: 1st, 2nd, 3rd...

| | |
|--|---|
| The Economy | a |
| Obtaining finance | b |
| Taxation | c |
| Recruiting staff | d |
| Keeping staff | e |
| Transport issues | f |
| Regulations | g |
| Keeping up with new technology | h |
| Availability/Cost of suitable premises | i |
| Competition in the market | j |

| | |
|--|---|
| Shortage of managerial skills/ expertise | k |
| Shortage of skills generally | L |
| Lack of financial understanding | m |
| Crime/Security | n |
| Pensions | o |
| Other [Please Specify] | p |
| No obstacle | q |
| No Opinion | r |
| Unwilling to answer | s |

B. Access to Finance

B.1: Now I would like to ask you some questions about financing your business. Have you tried to obtain finance for your business in the past 12 months?

| | |
|---------------------|---|
| Yes, only once | 1 |
| Yes, More than once | 2 |
| No | 3 |
| Don't know | 4 |
| Unwilling to answer | 5 |

If No go to Part C

B.2: If yes, what did you try to obtain finance for?

Show Card B-2

| | |
|-----------------------------|----|
| Working capital cash flow | 1 |
| Buying land or building | 2 |
| Improving building/office | 3 |
| Acquiring capital equipment | 4 |
| Research and Development | 5 |
| Acquiring/Protecting IPR | 6 |
| Training/Staff development | 7 |
| Marketing | 8 |
| Buying another business | 9 |
| Others Please Specify | 10 |
| Don't know | 11 |
| Unwilling to answer | 12 |

B.3: Was the finance you sought related to specific programme of expenditure involving new products, markets, technologies?

| | |
|---------------------|---|
| Yes | 1 |
| No | 2 |
| Don't know | 3 |
| Unwilling to answer | 4 |

B.4: What type of finance did you seek? Please include all types of finance including even if you failed to obtain it.

Show Card B-4

| | |
|--------------------------------|---|
| Bank overdraft | 1 |
| Bank loan | 2 |
| Mortgage for property purchase | 3 |
| Lease or Hire Purchase | 4 |

| | |
|---|----|
| Loan from family/Business Partners/ Directors | 5 |
| Grant | 6 |
| Credit card finance | 7 |
| Other (Please specify) | 8 |
| Don't know | 9 |
| Unwilling to answer | 10 |

B.5: Did you have any difficulty in obtaining this finance from the first source you approached?

Show Card B-5

| | |
|---|---|
| Yes, was unable to obtain finance | 1 |
| Yes, obtained some but not all of the finance required | 2 |
| Yes, obtained all the finance required but with some problems | 3 |
| No, had no difficulty in obtaining finance | 4 |
| Don't know | 5 |
| Unwilling to answer | 6 |

B.6: Which type of finance did you have problems obtaining?

Show Card B-6

| | |
|---|----|
| Bank overdraft | 1 |
| Bank loan | 2 |
| Mortgage for purchase of property/Improvement | 3 |
| Leasing or hire purchase | 4 |
| Loan from family members/ partners/directors | 5 |
| Credit card finance | 6 |
| Grant | 7 |
| Other (Please specify) | 8 |
| Don't know | 9 |
| Unwilling to answer | 10 |

B.7: What reason were given for your application for finance being turned down/for receiving less finance than you sought/ having problems raising all finance?

Show card B-7

| | |
|--|----|
| No security | 1 |
| Insufficient security | 2 |
| Poor personal credit history | 3 |
| Poor business credit history | 4 |
| No credit history/ not in business long enough | 5 |
| Applied for too much | 6 |
| Applied for too little | 7 |
| To many outstanding loans/mortgages | 8 |
| Inadequate business plan | 9 |
| Business sector too risky | 10 |
| No reason given | 11 |
| Other (Please specify) | 12 |
| Don't know | 13 |
| Unwilling to answer | 14 |

B.8: Did you eventually go on to obtain the finance you need for your business, for example, from another source?

| | |
|---------------------|---|
| Yes | 1 |
| No | 2 |
| Unwilling to answer | 3 |

B.9: How much finance did you seek?

Show Card B-9

| | |
|-----------------------------|---|
| Less than PKR 50,000 | 1 |
| PKR50,000 to PKR 100,000 | 2 |
| PKR 100,000 to PKR 500,000 | 3 |
| PKR500,000 to PKR 1 Million | 4 |
| More than 1Million | 5 |
| Don't know | 6 |
| Unwilling to answer | 7 |

C. Sales Turnover

C.1: Can you please tell me the approximate annual Sales Turnover of your business last year (2009)?

| |
|---------------------------|
| Enter Figure -----PKRs |
|---------------------------|

C.2: By approximately how much did your turnover increase, decrease, compared with 3 years ago (2006)?

| |
|----------------------------|
| Enter percentage (0 -100%) |
|----------------------------|

C-3: By approximately how much do you expect your turnover increase, decrease compared to 2008-09?

| |
|---------------------------|
| Enter percentage (0-100%) |
|---------------------------|

Uncertain.....X
Refused/Unwilling to answer....Y

C.4: Would you say it, increased, decreased by up to 10% or by more than 10%

| | |
|-------------|---|
| Up to 10% | 1 |
| 10% or more | 2 |
| Don't know | 3 |

D. New Products/Services and Processes

D.1: Has your firm introduced any major product or process innovations in the last 3 years?

Product Innovation 1) Yes 2) No

Process Innovation 1) Yes 2) No *If No Go to E*

D.2: How many product innovations in the last 3 years? ----- (approx)

If unsure, best guess answer will do

D.3: How many process innovations in the last 3 years? ----- (approx)

D.4: How many of them were designed or developed mainly in Pakistan?

D.5: How many of these have been patented? Product ----- Process -----

D.6: Approximately, what percentage of your current sales turnover is accounted for by these products/ services introduced in the last 3 years?

D.7: Are these (products/process) new to your business, or completely new (i.e. not introduced by anybody before you)?

Show Card D-7

| | |
|---------------------|---|
| New to the Business | 1 |
| Completely new | 2 |
| Don't know | 3 |
| Unwilling to answer | 4 |

D.8: Could you tell me if any of the following are very important source(s) of knowledge and Information (K&I) for your Innovation activities? Tick as many apply

(Show Card D-8)

| | | |
|-----|--|----|
| K&I | From within the establishment (e.g. design, production, operational) | 1 |
| K&I | From within the enterprise | 2 |
| K&I | From other local company/ companies | 3 |
| K&I | From other Pakistan company/companies | 4 |
| K&I | From other foreign companies | 5 |
| K&I | From suppliers of equipment, materials | 6 |
| K&I | From customers | 7 |
| K&I | From consultants | 8 |
| K&I | From universities, govt research organisation | 9 |
| K&I | From private research institutes | 10 |
| K&I | From other public sector bodies | 11 |

E. Support for R&D

Looking at government support in Pakistan:

E.1: In the last 4 years has your business received any of the following forms of public support? Tick all that apply.

(Show Card E-1)

| | |
|--|--|
| a. Tax incentives such as the R&D allowance for capital spending | |
| b. Tax incentive such as R&D tax credits | |
| c. capital grants from govt (PSEB) | |
| d. Other grants from govt (e.g. R&D grants) | |
| e. Loans or Interest relief from Govt. | |
| f. Equity Investment by Govt. | |
| g. Advisory services | |
| h. Assistance in establishing networks with other organisations | |
| i. Encouraging links with Universities | |
| j. Training courses | |
| k. Other (please state) | |

E.2: What do you consider to be the most effective incentive that public sector can provide to encourage firms such as yours to increase their innovation activities?

Write here -----

F Firms with R&D

F.1: Is your business engaged in R&D activities in Pakistan?

| | |
|-----|---|
| Yes | 1 |
| No | 2 |

(If No go to Non- R&D questionnaire: Section-I)

F.2: In the next 3-5 years what single most important factor would you say will provide the competitive edge of your business here in Pakistan? Will it be?

(Show card F-2)

| | |
|---------------------------|---|
| Your product design | 1 |
| Your process technology | 2 |
| Your cost effectiveness | 3 |
| Your marketing | 4 |
| Your financial management | 5 |
| Other (please specify) | 6 |

F.3: Can you tell me the approximately R&D expenditures of your business in the last 3 years (PKR/\$)?

F.4: What proportion of total sales does your firm spend on R&D currently.....%?

F.5: What is the number of **employees in R&D** compared to total employees?
(Insert Figure)

Reasons for R&D

G.1 Does your business carry out R&D in order to -----? (Read out List)

Show Card G.1

| | |
|--|---|
| To develop new products | 1 |
| To improve existing products | 2 |
| To adapt existing products to meet market demand | 3 |
| To replace existing products | 4 |
| To reduce production cost | 5 |
| To increase speed of production | 6 |
| Other (Please specify) | 7 |

G.2: Relative to your market position, what are the reasons for carrying out R&D? Are they (Read out list from G-2 (b))

G.2: What is the main reason?

(Show Card G-2)

| | A | B |
|--|---------------------|-----------------------|
| | Tick All that apply | Tick Main reason only |
| To maintain market share | 1 | 1 |
| To increase market share in existing markets | 2 | 2 |
| To enter new markets | 3 | 3 |
| To satisfy customer / supplier requirements | 4 | 4 |
| Others | 5 | 5 |

G.3: Attitudes to R&D

G.3 (a): Which of the following statements best describe the importance of R&D to your business? Circle one

(Show Card G3-a)

- 1) R&D has always been vital to our business
- 2) R&D is becoming increasingly important to our business
- 3) R&D is important but not essential to our business
- 4) R&D is not important to our business

G.3 (b): Which if the following statements **best** describes your business plans for R&D?

(Show Card G3-b)

- 1) We expect to increase our involvement in R&D
- 2) WE expect to maintain our current level of involvement in R&D
- 3) We expect to decrease our level of involvement in R&D
- 4) We expect to cease our involvement in R&D

G.4: For each of the following statements that I read please tell me if you 1) strongly agree 2) disagree 3) neutral 4) disagree 5)strongly disagree .

(Show Card G-4)

| | Strongly Agree | Agree | Neutral | Disagree | Strongly disagree |
|---|----------------|-------|---------|----------|-------------------|
| We do not have problem in recruiting staff with the skills required to undertake R&D in Pakistan | 1 | 2 | 3 | 4 | 5 |
| It is difficult to retain staff with R&D expertise here | 1 | 2 | 3 | 4 | 5 |
| Lack of access to adequate funds restrict our ability to undertake R&D in Pakistan | 1 | 2 | 3 | 4 | 5 |
| we can access sufficient external funding to finance our R&D projects in Pakistan | 1 | 2 | 3 | 4 | 5 |
| We are not able to exploit our R&D because we do not have relevant in-house services e.g. marketing in Pakistan | 1 | 2 | 3 | 4 | 5 |
| It is hard to enhance R&D activity because we are unable to develop links with external bodies in Pakistan | 1 | 2 | 3 | 4 | 5 |
| Better protection of intellectual property would encourage us to undertake more R&D in Pakistan | 1 | 2 | 3 | 4 | 5 |
| We would undertake more R&D in Pakistan with greater availability of financial incentives from government | 1 | 2 | 3 | 4 | 5 |
| We lack clarity about evolving technologies in Pakistan | 1 | 2 | 3 | 4 | 5 |

H. Business and management factors relating to innovation effectiveness

H.1: Lifecycle

For each statement that I read out please tell me if you 1) strongly agree 2) agree 3) neutral 4) disagree 5) strongly disagree. Please circle one answer for each statement

(Show Card H-1)

| | Strongly Agree | Agree | Neutral | Disagree | Strongly Disagree |
|--|----------------|-------|---------|----------|-------------------|
| The main problem of the business are obtaining customers and delivering the product or service | 1 | 2 | 3 | 4 | 5 |
| The company has now developed with sufficient customers and satisfies them sufficiently with its products and services. | 1 | 2 | 3 | 4 | 5 |
| The decisions facing owners at this stage is whether to expand or keep the firm stable and profitable providing a base for alternative owner activities | 1 | 2 | 3 | 4 | 5 |
| The key problems facing the company are how to grow rapidly and how to finance growth. | 1 | 2 | 3 | 4 | 5 |
| The challenges are to consolidate and control financial gains brought on by rapid growth and to retain the advantages of small size, including flexibility | 1 | 2 | 3 | 4 | 5 |

H.2: Strategic focus

For each statement that I read out please tell me if you 1) strongly agree 2) agree 3) neutral 4) disagree or 5) strongly disagree.

Please circle one answer for each statement.

(Show Card H-2)

| | Strongly agree | Agree | Neutral | Disagree | Strongly disagree |
|---|----------------|-------|---------|----------|-------------------|
| The company has a narrow range of products and markets | 1 | 2 | 3 | 4 | 5 |
| The company continually searches for new market opportunities | 1 | 2 | 3 | 4 | 5 |
| The company watch their competitors closely for new ideas, and then rapidly adopt those which appear to be the most promising | 1 | 2 | 3 | 4 | 5 |
| The organisation seldom makes adjustment of any sort until forced to do so by environmental pressures | 1 | 2 | 3 | 4 | 5 |

H.3: Leadership

Moving on now to looking at the leadership style for supporting innovation related in activities in your firm.

For each statement that I read out please tell me if you 1) strongly agree 2) agree 3) Neutral 4) disagree 5) strongly disagree. Please circle one answer for each statement.

Show Card H-3

| | Strongly Agree | Agree | Neutral | Disagree | Strongly Disagree |
|--|----------------|-------|---------|----------|-------------------|
| The senior management team makes a point “being seen” around the organisation | 1 | 2 | 3 | 4 | 5 |
| Management fosters creative thinking and innovation in the company | 1 | 2 | 3 | 4 | 5 |
| Our top managers like to try new ways of doing things | 1 | 2 | 3 | 4 | 5 |
| Management spend adequate time planning change | 1 | 2 | 3 | 4 | 5 |
| If the company is performing well, change is still priority | 1 | 2 | 3 | 4 | 5 |
| The organisation is working to a clear business plan | 1 | 2 | 3 | 4 | 5 |
| Management encourages everyone in the organisation to come up with new ideas | 1 | 2 | 3 | 4 | 5 |
| The management team take time to think constructively/ creatively about the future | 1 | 2 | 3 | 4 | 5 |

H.4: Culture

Moving on now looking at the culture within the organisation for supporting innovation related activities in your firm

For each statement that I read out please tell me if you 1) strongly agree 2) agree 3)

Neutral 4) disagree 5) strongly disagree Please circle one answer for each statement

Show Card H-4

| | Strongly agree | Agree | Neutral | Disagree | Strongly disagree |
|--|----------------|-------|---------|----------|-------------------|
| There is strong team spirit at all levels of the organisation | 1 | 2 | 3 | 4 | 5 |
| The culture in this organization promotes change | 1 | 2 | 3 | 4 | 5 |
| Two way communication happens at all levels of the organisation | 1 | 2 | 3 | 4 | 5 |
| There is clear organisational structure which everyone understands | 1 | 2 | 3 | 4 | 5 |
| There are clearly defined roles and responsibilities | 1 | 2 | 3 | 4 | 5 |
| The structure of the organisation facilitates change | 1 | 2 | 3 | 4 | 5 |
| The organisation is not bureaucratic | 1 | 2 | 3 | 4 | 5 |
| There is feeling of openness in this organisation | 1 | 2 | 3 | 4 | 5 |
| Overall, employees have access to all the resources needed to get the job done | 1 | 2 | 3 | 4 | 5 |
| Employees are involved in setting and agreeing performance targets | 1 | 2 | 3 | 4 | 5 |

| | | | | | |
|---|---|---|---|---|---|
| Everyone in the company has a good grasp off how the organisation is performing | 1 | 2 | 3 | 4 | 5 |
| Employees get useful feedback about their work | 1 | 2 | 3 | 4 | 5 |

H.5: Business Improvement methods

Moving on now looking at the business improvement methods within the organisation for supporting innovation related activities in your firm

For each statement that I read out please tell me if you 1) strongly agree 2) agree 3)

Neutral 4) disagree 5) strongly disagree Please circle one answer for each statement

Show card H.5

| | Strongly agree | Agree | Neutral | Disagree | Strongly disagree |
|---|----------------|-------|---------|----------|-------------------|
| The organisation has formal/informal total quality-continuous improvement programme | 1 | 2 | 3 | 4 | 5 |
| Responsibilities for the TQ/CI programme are clearly defined | 1 | 2 | 3 | 4 | 5 |
| Successful TQ/CI problem solving teams are spread throughout the organisation | 1 | 2 | 3 | 4 | 5 |
| The programme is adequately resourced | 1 | 2 | 3 | 4 | 5 |
| There is clearly defined reward and recognition scheme for TQ/CI activity | 1 | 2 | 3 | 4 | 5 |
| Greater than 50% of the workforce are involved in TQ/CI | 1 | 2 | 3 | 4 | 5 |
| The TQ/CI programme is used to improve processes | 1 | 2 | 3 | 4 | 5 |
| The TQ/CI programme has clear goals, objectives, and measure of success | 1 | 2 | 3 | 4 | 5 |
| A number of quality improvements have been achieved from the programme | 1 | 2 | 3 | 4 | 5 |

H.6: Internal and External Knowledge processes (Knowledge Incorporation)

I will now read out a set of statements that will help us understand how your organisation incorporates or uses knowledge and information internally

For each statement that I read out please tell me if you 1) strongly agree 2) agree 3)

Neutral 4) disagree 5) strongly disagree Please circle one answer for each statement,

Please circle one answer for each statement

Show Card H.6

| | Strongly agree | Agree | Neutral | Disagree | Strongly disagree |
|--|----------------|-------|---------|----------|-------------------|
| Everyone is in possession of the information/knowledge necessary to do their job | 1 | 2 | 3 | 4 | 5 |
| Knowledge that employees hold in their heads (i.e. tacit knowledge) is managed and captured effectively | 1 | 2 | 3 | 4 | 5 |
| Efforts are made to share information/knowledge across the organisation | 1 | 2 | 3 | 4 | 5 |
| Lessons learned from daily experiences and projects are captured and disseminated | 1 | 2 | 3 | 4 | 5 |
| New information/ knowledge is effectively incorporated within the process and routines within the organisation | 1 | 2 | 3 | 4 | 5 |
| Active management of information/knowledge produces a range of business benefits | 1 | 2 | 3 | 4 | 5 |

H.7: Knowledge Acquisition

For each statement that I read out please tell me if you 1) strongly agree 2) agree 3) Neutral 4) disagree 5) strongly disagree Please circle one answer for each statement, Please circle one answer for each statement

(Show card H.7)

| | Strongly agree | Agree | Neutral | Disagree | Strongly disagree |
|---|----------------|-------|---------|----------|-------------------|
| We conduct frequent market research so that we are aware of customer needs | 1 | 2 | 3 | 4 | 5 |
| Licensing is a method we often use to obtain information/ knowledge or technology | 1 | 2 | 3 | 4 | 5 |
| We have developed new products/services/ or processes in collaboration with other firms | 1 | 2 | 3 | 4 | 5 |
| We are well aware of the information/ knowledge and technologies being developed by our competitors | 1 | 2 | 3 | 4 | 5 |
| We have become an information/knowledge or technology supplier to other firms in the sector | 1 | 2 | 3 | 4 | 5 |
| We usually go to outside private sector bodies (e.g. consultants) to find out about fresh opportunities for introducing new products and services | 1 | 2 | 3 | 4 | 5 |
| We usually go to outside public sector bodies (e.g. universities) to find out about fresh opportunities for introducing new products/services | 1 | 2 | 3 | 4 | 5 |

H-8: Linkages

H.8 (a): In relation to R&D, do you have linkages to other organisations such as universities?

i) Yes ii) No If No skip H.8 (b)

H.8 (b): Please list the organisation(s) and the nature of linkages (e.g. informal/formal information sharing; collaborative partnership).

Part: G for that firm which do not conduct R&D

I. No R&D at Firm Level

I.a: Is your business currently engaged in R&D activities in Pakistan?

| | |
|-----|---|
| Yes | 1 |
| No | 2 |

(If yes go to R&D questionnaire i.e. part:F)

I.b: In the next 3-5 years what single most important factor would you say will provide the competitive edge of your business here in Pakistan? Will it be?

(Show card I-b)

| | |
|---------------------------|---|
| Your product design | 1 |
| Your process technology | 2 |
| Your cost effectiveness | 3 |
| Your marketing | 4 |
| Your financial management | 5 |
| Other (please specify) | 6 |

Previous/Future Involvement in R&D

I.1: You said earlier that your business is not engaged in R&D activities. Has your business been engaged in R&D activities at any time in the last 5 years?

| | |
|-----|---|
| Yes | 1 |
| No | 2 |

If No go to I-3

I.2: Why did you stop the involvement of R&D activities in your business? Read out the list of possible factors.

(Show Card I-2)

| | |
|--|----|
| Of the completion of specific project | 1 |
| Of the lack of funding | 2 |
| Lack of adequate machinery/ technology | 3 |
| Departure of key staff | 4 |
| Change in business priorities | 5 |
| No likelihood successful outcome | 6 |
| Change in product range | 7 |
| Of the activities of the competitors | 8 |
| Insufficient R&D grants/tax incentives | 9 |
| R&D activities moved outside | 10 |
| Other please specify | 11 |
| Don't know | 12 |

I.3: Do you expect your business to engage in R&D within next 3 years?

| | | |
|-----------------------------|-----------|---|
| Yes - Definite Plans exist | | 1 |
| Yes – but no definite plans | Go to I-5 | 2 |
| Possibly | Go to I-5 | 3 |
| No | Go to I-5 | 4 |

I.4: What are your reasons for planning to undertake R&D within the next 3 years?

Are they (Read out list and tick as many as apply)

(Show Card I-4)

| | |
|--|---|
| To develop new products | 1 |
| To improve existing products | 2 |
| To adapt existing products to meet market demands | 3 |
| To replace existing products | 4 |
| To reduce production cost | 5 |
| To increase speed of production | 6 |
| Because senior management regards R&D as strategy priority in future | 7 |
| Other please state | 8 |

I.5: Reasons for not undertaking R&D please tell me if you a) agree b) neither agree nor disagree c) disagree d) the statement does not apply to our business

Show card I.5

| | Strongly agree | Agree | Neutral | Disagree | Strongly disagree |
|---|----------------|-------|---------|----------|-------------------|
| The nature of our product does not require or justify expenditure on R&D | 1 | 2 | 3 | 4 | 5 |
| The nature of our production process do not require justify expenditure on R&D | 1 | 2 | 3 | 4 | 5 |
| It is corporate decision not to invest in this sector | 1 | 2 | 3 | 4 | 5 |
| External economic/market conditions prevent us from undertaking R&D | 1 | 2 | 3 | 4 | 5 |
| Lack of access to internal finance restricts our ability to undertake R&D | 1 | 2 | 3 | 4 | 5 |
| We are unable to secure the external funding that would be required if we were to undertake R&D | 1 | 2 | 3 | 4 | 5 |

| | | | | | |
|--|---|---|---|---|---|
| There is limited competition in the market for our products, so we do not engage in R&D | 1 | 2 | 3 | 4 | 5 |
| Our product is highly price sensitive, so we are unable to pass on the cost of R&D | 1 | 2 | 3 | 4 | 5 |
| We are unable to engage in R&D due to lack of appropriate skills within the business | 1 | 2 | 3 | 4 | 5 |
| If we were confident of generating a high rate of return and or a low level of risk we would invest in R&D | 1 | 2 | 3 | 4 | 5 |
| There is too long a time lag between undertaking R&D and generating financial returns | 1 | 2 | 3 | 4 | 5 |
| It makes more sense to wait and copy the innovations of competitors than undertake the R&D ourselves | 1 | 2 | 3 | 4 | 5 |
| We have lack of clarity on potential markets for any R&D output | 1 | 2 | 3 | 4 | 5 |
| We have lack of clarity about evolving technologies | 1 | 2 | 3 | 4 | 5 |
| Senior management do not regard R&D as a strategic priority | 1 | 2 | 3 | 4 | 5 |
| We are unable to develop links with external bodies/organizations that would stimulate R&D as strategic priority | 1 | 2 | 3 | 4 | 5 |
| There are insufficient govt. grants or tax incentive to make R&D spending worthwhile | 1 | 2 | 3 | 4 | 5 |

I.6: Which of the following factors might encourage your business to undertake R&D activities in Pakistan (Software Industry) in the future? Read out the list tick all that apply...

(Show Card I-6)

| | Relevant | Most Important |
|---|----------|----------------|
| A change in economic/market conditions | | |
| An improvement in the financial performance of the business | | |
| The recruitment of staff with appropriate skills | | |
| A change in management attitudes to R&D | | |
| A greater demand for innovative products | | |
| Stronger competition in the market | | |
| Less price sensitivity for products | | |
| Technological developments in the Industry | | |
| Improved tax incentives for R&D | | |
| Increased availability of govt grants for R&D | | |
| Increased availability of govt loans for R&D | | |
| Increased availability of govt advice/training in relation to R&D | | |
| The nature of our business means that R&D would never be considered | | |
| Other (please state) | | |

J. Business and management factors relating to innovation effectiveness

J.1: Lifecycle

For each statement that I read out please tell me if you a) strongly agree b) agree c) neither agree nor disagree d) disagree e) strongly disagree. Please circle one answer for each statement

(Show Card J-1)

| | Strongly Agree | Agree | Neutral | Disagree | Strongly Disagree |
|--|----------------|-------|---------|----------|-------------------|
| The main problem of the business are obtaining customers and delivering the product or service | 1 | 2 | 3 | 4 | 5 |
| The company has now developed with sufficient customers and satisfies them sufficiently with its products and services. | 1 | 2 | 3 | 4 | 5 |
| The decisions facing owners at this stage is whether to expand or keep the firm stable and profitable providing a base for alternative owner activities | 1 | 2 | 3 | 4 | 5 |
| The key problems facing the company are how to grow rapidly and how to finance growth. | 1 | 2 | 3 | 4 | 5 |
| The challenges are to consolidate and control financial gains brought on by rapid growth and to retain the advantages of small size, including flexibility | 1 | 2 | 3 | 4 | 5 |

J.2: Strategic focus

For each statement that I read out please tell me if you 1) strongly agree 2) agree 3) neutral 4) disagree or 5) strongly disagree. Please circle one answer for each statement.

(Show Card J-2)

| | Strongly agree | Agree | Neutral | Disagree | Strongly disagree |
|---|----------------|-------|---------|----------|-------------------|
| The company has a narrow range of products and markets | 1 | 2 | 3 | 4 | 5 |
| The company continually searches for new market opportunities | 1 | 2 | 3 | 4 | 5 |
| The company watch their competitors closely for new ideas, and then rapidly adopt those which appear to be the most promising | 1 | 2 | 3 | 4 | 5 |
| The organisation seldom makes adjustment of any sort until forced to do so by environmental pressures | 1 | 2 | 3 | 4 | 5 |

J.3: Leadership

Moving on now to looking at the leadership style for supporting innovation related in activities in your firm.

For each statement that I read out please tell me if you 1) strongly agree 2) agree 3) Neutral 4) disagree 5) strongly disagree,

(Show Card J-3)

| | Strongly Agree | Agree | Neutral | Disagree | Strongly Disagree |
|--|----------------|-------|---------|----------|-------------------|
| The senior management team makes a point "being seen" around the organisation | 1 | 2 | 3 | 4 | 5 |
| Management fosters creative thinking and innovation in the company | 1 | 2 | 3 | 4 | 5 |
| Our top managers like to try new ways of doing things | 1 | 2 | 3 | 4 | 5 |
| Management spend adequate time planning change | 1 | 2 | 3 | 4 | 5 |
| If the company is performing well, change is still priority | 1 | 2 | 3 | 4 | 5 |
| The organisation is working to a clear business plan | 1 | 2 | 3 | 4 | 5 |
| Management encourages everyone in the organisation to come up with new ideas | 1 | 2 | 3 | 4 | 5 |
| The management team take time to think constructively/ creatively about the future | 1 | 2 | 3 | 4 | 5 |

J.4: Culture

Moving on now looking at the culture within the organisation for supporting innovation related activities in your firm For each statement that I read out please tell me if you 1) strongly agree 2) agree 3) Neutral 4) disagree 5) strongly disagree Please circle one answer for each statement

Show Card J.4

| | Strongly agree | Agree | Neutral | Disagree | Strongly disagree |
|--|----------------|-------|---------|----------|-------------------|
| There is strong team spirit at all levels of the organisation | 1 | 2 | 3 | 4 | 5 |
| The culture in this organisation promotes change | 1 | 2 | 3 | 4 | 5 |
| Two way communication happens at all levels of the organisation | 1 | 2 | 3 | 4 | 5 |
| There is clear organisational structure which everyone understands | 1 | 2 | 3 | 4 | 5 |
| There are clearly defined roles and responsibilities | 1 | 2 | 3 | 4 | 5 |
| The structure of the organisation facilitates change | 1 | 2 | 3 | 4 | 5 |
| The organisation is not bureaucratic | 1 | 2 | 3 | 4 | 5 |
| There is feeling of openness in this organisation | 1 | 2 | 3 | 4 | 5 |

| | | | | | |
|---|---|---|---|---|---|
| Overall, employees have access to all the resources needed to get the job done | 1 | 2 | 3 | 4 | 5 |
| Employees are involved in setting and agreeing performance targets | 1 | 2 | 3 | 4 | 5 |
| Everyone in the company has a good grasp off how the organization is performing | 1 | 2 | 3 | 4 | 5 |
| Employees get useful feedback about their work | 1 | 2 | 3 | 4 | 5 |

J.5: Business Improvement methods

Moving on now looking at the business improvement methods within the organisation for supporting innovation related activities in your firm

For each statement that I read out please tell me if you 1) strongly agree 2) agree 3)

Neutral 4) disagree 5) strongly disagree Please circle one answer for each statement

Show Card J-5

| | Strongly agree | Agree | Neutral | Disagree | Strongly disagree |
|---|----------------|-------|---------|----------|-------------------|
| The organisation has formal/informal total quality-continuous improvement programme | 1 | 2 | 3 | 4 | 5 |
| Responsibilities for the TQ/CI programme are clearly defined | 1 | 2 | 3 | 4 | 5 |
| Successful TQ/CI problem solving teams are spread throughout the organisation | 1 | 2 | 3 | 4 | 5 |
| The programme is adequately resourced | 1 | 2 | 3 | 4 | 5 |
| There is clearly-defined reward and recognition scheme for TQ/CI activity | 1 | 2 | 3 | 4 | 5 |
| More than 50% of the workforce are involved in TQ/CI | 1 | 2 | 3 | 4 | 5 |
| The TQ/CI programme is used to improve processes | 1 | 2 | 3 | 4 | 5 |
| The TQ/CI programme has clear goals, objectives, and measure of success | 1 | 2 | 3 | 4 | 5 |
| A number of quality improvements have been achieved from the programme | 1 | 2 | 3 | 4 | 5 |

J.6: Internal and External Knowledge processes (Knowledge Incorporation)

I will now read out a set of statements that will help us understand how your organisation incorporates or uses knowledge and information internally

For each statement that I read out please tell me if you 1) strongly agree 2) agree 3) Neutral 4) disagree 5) strongly disagree Please circle one answer for each statement,

Show card J-6

| | Strongly agree | Agree | Neutral | Disagree | Strongly disagree |
|--|----------------|-------|---------|----------|-------------------|
| Everyone is in possession of the information/knowledge necessary to do their job | 1 | 2 | 3 | 4 | 5 |
| Knowledge that employees hold in their heads (i.e. tacit knowledge) is managed and captured effectively | 1 | 2 | 3 | 4 | 5 |
| Efforts are made to share information/ knowledge across the organisation | 1 | 2 | 3 | 4 | 5 |
| Lessons learned from daily experiences and projects are captured and disseminated | 1 | 2 | 3 | 4 | 5 |
| New information/ knowledge is effectively incorporated within the process and routines within the organisation | 1 | 2 | 3 | 4 | 5 |
| Active management of information/ knowledge produces a range of business benefits | 1 | 2 | 3 | 4 | 5 |

J.7: Knowledge Acquisition

For each statement that I read out please tell me if you 1) strongly agree 2) agree 3) Neutral 4) disagree 5) strongly disagree Please circle one answer for each statement,

(Show card J-7)

| | Strongly agree | Agree | Neutral | Disagree | Strongly disagree |
|---|----------------|-------|---------|----------|-------------------|
| We conduct frequent market research so that we are aware of customer needs | 1 | 2 | 3 | 4 | 5 |
| Licensing is a method we often use to obtain information/ knowledge or technology | 1 | 2 | 3 | 4 | 5 |
| We have developed new products/services/ or processes in collaboration with other firms | 1 | 2 | 3 | 4 | 5 |
| We are well aware of the information/ knowledge and technologies being developed by our competitors | 1 | 2 | 3 | 4 | 5 |
| We have become an information/knowledge or technology supplier to other firms in the sector | 1 | 2 | 3 | 4 | 5 |
| We usually go to outside private sector bodies (e.g. consultants) to find out about fresh opportunities for introducing new products and services | 1 | 2 | 3 | 4 | 5 |

| | | | | | |
|---|---|---|---|---|---|
| We usually go to outside public sector bodies (e.g. universities) to find out about fresh opportunities for introducing new products/services | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|

K. Internationalization

K.1: Does your business sell outside **Pakistan**?

| | |
|-----------|---|
| Yes | 1 |
| No | 2 |
| Uncertain | 3 |

If yes go to K.4

K.2: If no, do you have plan to start exporting or selling outside Pakistan in the next 2 years?

| | |
|-----|---|
| Yes | 1 |
| No | 2 |

K.3: Can you tell me what the barriers are to exporting outside Pakistan? Please rank from most important to least important, put numbers in right column 1, for most Important and so on?

Show Card K-3

| | |
|--|----|
| Currency/Exchange rates | 1 |
| Lack of Market Information | 2 |
| Language/Cultural Differences | 3 |
| Export Documentation | 4 |
| Payment Issues | 5 |
| Lack of bank support | 6 |
| Lack of trained staff | 7 |
| High import tariffs in target market | 8 |
| Products/Services unsuitable for exports | 9 |
| Legislation and standards | 10 |
| Setting competitive prices | 11 |
| No spare capacity | 12 |
| Warranty of service support | 13 |
| Transport cost | 14 |
| Others | 15 |

K.4: If Yes, Can you please tell me the approximate **Export** turnover (export sales/ Total sales) of your business in last year (**2009**)?

| |
|--------------------------|
| Enter Figure -----PKR |
|--------------------------|

K.5: By approximately how much did your **Export** turnover increase, decrease in this years (current year), compared with 3 years ago?

Enter percentage (0 -100%)

Uncertain.....X
 Refused/Unwilling to answer....Y

K.6: Would say it, increased, decreased by up to 10% or by more than 10%

| | |
|-------------|---|
| Up to 10% | 1 |
| 10% or more | 2 |
| Don't know | 3 |

K.7: Can you please tell me the major countries where you sell products?

| | |
|----|--|
| 1. | |
| 2. | |
| 3. | |
| 4. | |

K.8: Does your firm imports good and services for use in software development?

| | |
|------------|---|
| Yes | 1 |
| No | 2 |
| Don't know | 3 |

K.9: What type of products/equipments your business Imports?

| | |
|-------------------------|---|
| Software products | 1 |
| Technologies equipment | 2 |
| Others (please specify) | 3 |
| Don't know | 4 |

K.10: Have you invested abroad in the form of outward FDI and if so what was the nature of investment abroad?

(Show Card K-10)

| | |
|----------------------------|---|
| Offshore sale office | 1 |
| Joint venture | 2 |
| Any other (please specify) | 3 |
| Don't know | 4 |
| Unwilling to answer | 5 |

K.11: Please, could you tell me what proportion of your total sales (2008-9) would generate from overseas activities?

Show Card K-11

| | |
|--------------|--|
| Less than 5% | |
| 5%---15% | |
| 25%---40% | |
| 40%---60% | |
| Over 60% | |
| Don't know | |

L. FDI at Firm Level (Inward FDI)

L.1: Do you have Shared Capital owned by foreign Company/Companies in your business?

| | |
|---------------------|---|
| Yes | 1 |
| No | 2 |
| Don't know | 3 |
| Unwilling to answer | 4 |

If No go to L-3

L.2: If Yes, what proportion of Shared Capital owned by foreign company/companies in your firm?

| |
|---------------------------|
| Enter percentage (1-100%) |
|---------------------------|

L.3: If no, do you have contacts with foreign company/companies?

| | |
|---------------------|---|
| Yes | 1 |
| No | 2 |
| Unwilling to answer | 3 |

L.4: Please can you tell me the **nature of contact with foreign firms**? Do you strongly agree, agree, neither disagree nor agree, or disagree, strongly disagree wit following statement

Show card L-4

| | Strongly agree | Agree | Neutral | Disagree | Strongly disagree |
|--|----------------|-------|---------|----------|-------------------|
| We have joint innovative projects for software development | 1 | 2 | 3 | 4 | 5 |
| We received training and development (HR) regularly from foreign companies | 1 | 2 | 3 | 4 | 5 |
| We get help in exploring new international markets through exhibitions | 1 | 2 | 3 | 4 | 5 |
| We have strong linkages as customers to such foreign firms | 1 | 2 | 3 | 4 | 5 |
| We have strong linkages as supplier to such foreign firms | 1 | 2 | 3 | 4 | 5 |

M. Entrepreneurship

Now I would like to ask some questions about **entrepreneurship**.

M.1: Can I ask if you currently hold any qualification?

| | |
|---------------------|---|
| Yes | 1 |
| No | 2 |
| Unwilling to answer | 3 |

M.2: I will now read out a set of statements that will help us to find out about your business risk taking and proactive abilities.

For each statement that I read out please tell me if you a) strongly agree b)agree c) neither agree nor disagree d) disagree e) strongly disagree.

Show Card M-2

| | Strongly agree | Agree | Neutral | Disagree | Strongly disagree |
|---|----------------|-------|---------|----------|-------------------|
| Our firm has a strong proclivity for low risk projects (with normal and certain rates of return) versus In our firm has a strong proclivity for high risk projects (with chances of very high returns) | 1 | 2 | 3 | 4 | 5 |
| Most people in this organisation are willing to take risk regarding competitive strategies (marketing abilities, cost control) | 1 | 2 | 3 | 4 | 5 |
| In our firm there is strong tendency to follow competitors in introducing new things and ideas versus In our firm we always try to be ahead of our competitors in product novelty or speed of innovation and usually succeed | 1 | 2 | 3 | 4 | 5 |

M.3: If you don't mind, What is your age?

| |
|------------------------|
| Enter Number. |
|------------------------|

M.4: Have you received any formal/informal training?

| | |
|-----|---|
| Yes | 1 |
| No | 2 |

M.5: Is that formal or informal training related to.....Read out List, If more than one answer, one just tick/encircle?

(Show Card M-5)

| | |
|----------------------------|---|
| Related to IT sector | 1 |
| Related to Management | 2 |
| Related to Marketing | 3 |
| Related to Finance | 4 |
| Any other (please specify) | 5 |
| Don't know | 6 |

M.6: If I want to carry out further research in the future. Would you be willing to help with that research?

| | |
|-----|---|
| Yes | 1 |
| No | 2 |

M.7: Would you like to receive an email or letter to let you know when and where the results of this survey will be published?

| | |
|------------|---|
| Yes-Email | 1 |
| Yes-Letter | 2 |
| No | 3 |

M.8: Finally could you please confirm your postal address with contact number or email?

| |
|----------|
| Address: |
| Contact# |
| Email |

M.9: Record respondent's name

| |
|--|
| |
|--|

M.10: Ask for respondent's job title?

| |
|--|
| |
|--|

M.11: Interviewer to record whether Respondent is a man or woman?

| | |
|-------|---|
| Man | 1 |
| Woman | 2 |

M.12: Interviewer to categorise the mood of the respondent

| | |
|--------------|---|
| Angry | 1 |
| Depressed | 2 |
| Positive | 3 |
| Apathetic | 4 |
| Other Please | 5 |

THANK RESPONDENT AND CLOSE INTERVIEW

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