CUSTOMER-DRIVEN INNOVATION WITHIN U.S. BUSINESS SERVICES AND ITS IMPACT ON FIRM PERFORMANCE

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Abstract

This thesis examines the innovative performance of 206 U.S. business service firms. Undeniably, a need exists for better comprehension of the service sector of developed economies. This research takes a unique view by applying a synthesis approach to studying innovation and attempts to build under a proposed strategic innovation paradigm. A quantitative method is utilised via questionnaire in which all major types of innovation are under examination including: product and service, organisational, and technology-driven innovations. Essential ideas for this conceptual framework encapsulate a new mode of understanding service innovation. Basically, the structure of this analysis encompasses the likelihood of innovation and determining the extent of innovation, while also attempting to shed light on the factors which determine the impact of innovation on performance among service firms. What differentiates this research is its focus on customer-driven service firms in addition to other external linkages.

A synopsis of the findings suggests that external linkages, particularly with customers, suppliers and strategic alliances or joint ventures, significantly affect innovation performance with regard to the introduction of new services. Service firms which incorporate formal and informal R&D experience significant increases in the extent of new-to-market and new-to-firm innovations. Additionally, the results show that customer-driven service firms' experience greater productivity and growth. Furthermore, the findings suggest that external linkages assist service firm performance.

Key words: External Linkages, Synthesis Approach, R&D, Productivity, Growth

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بسم الله الرحمن الرحيم
Bismillah ir-Rahman ir-Rahim

This thesis is dedicated to my loving family:

My Moma
Daddy-gak
&
Alex

In addition, to all of my family members who have always unwaveringly
supported and genuinely believed in me,
especially my Grandma-jan

Also, the wonderful guidance & criticism from:

Professor Love

Lastly, I am appreciative to my amazing friends whose delightful optimism
made this journey unforgettable.

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Introduction

The aim of this research is to provide guidance for management of business service firms to improve the likelihood and extent of innovation, with regard to harnessing the potential role of the customer to increase firm performance. It is the purpose of this thesis to address all major forms of customer-driven innovation within business service industries and its impact on business performance.

Literature exist which states that innovating firms' experience an increase in performance (Tether, 1998; Chapman and Hyland, 2000; Kandampully, 2002; Silverberg, 2002; Chung and Kim, 2003; Evangelista and Savona, 2003; Hagedoorn and Cloodt, 2003). Kleinknecht (2000) states the real gap in statistical data collection and economic knowledge relates to product and service innovation. Also, Drejer (2004) states empirical studies of the development of services through innovation surveys are a relatively new phenomenon.

Recent literature addresses a need for more knowledge about service innovation (Bretani, 1995; Tax and Stuart, 1997; Hagedoorn and Cloot, 2003). A new mode of knowledge production in service literature shows the importance of integrating the customer into the production and innovation process (for example, Franke, 1991; Miles et al., 1994; Strambach, 1994). This research, under a synthesis approach, will fill a gap in research by addressing three forms of innovation: product and service, process or organisational and technological innovations, as defined by Joseph Schumpeter. Hertog (2000) believes, although not initially central research questions, a better appreciation and understanding of the issues of whether, to what extent, and how service firms innovate is needed. More specifically this research will address the extent to which innovations are customer-driven. However, as may be the case, if service firms are not customer-driven it is important to know what other sources for innovation are utilised. Thus, essentially six external linkages will be investigated (strategic alliances or joint ventures, suppliers, subsidiaries, consultancy firms, and competitors).

What makes this research unique is its view of the six external linkages with regard to U.S. business service firms. Much of what we know about service innovation derives from European research. In comparison, U.S. service firms have

not been investigated as much particularly in regard to their innovative efforts. Although the importance of the service industry for the U.S. economy may be common knowledge, conceptual ideas are lacking. Additionally, theories and approaches are greatly derived from a predominantly European point of view. Thus, it is important to attempt an understanding of innovation in U.S. service firms in light of what we already know about Europe's innovation.

Therefore, it will be of importance for this thesis to aid in better understanding service innovation and its impact on business performance. With that said, a conceptual framework has been constructed and hypotheses have been formulated in order to test all forms of innovation within service firms and the role of the customer. Hypotheses have been tested by quantitative means via a self-administered questionnaire.

At this time a synopsis of the chapters comprising this thesis will briefly be mentioned. Firstly, a literature review of relevant research in the field of innovation will conclude with the conceptual framework for this thesis. In chapter three the research method and descriptive statistics for the data will be presented. A uni-variate analysis will be provided in chapter four which will highlight initial findings. Furthermore, chapter five will address the determinants of innovation by means of probit and tobit models. The next analyses encapsulating the impact of innovation on performance will comprise chapters six, seven, and eight respectively. The performance factors for these analyses include the level of sales and employment growth and productivity. Finally, overall conclusions, recommendations for management, and a contribution to knowledge will be provided in chapter nine.

Literature Review

2.1 Introduction

This chapter will attempt to provide a review of the relevant literature for this thesis. It will first be important to understand services in light of their impact on the economy. Next, a discussion of the paradigms in which service research is conducted will provide reasons as to why a strategic innovation paradigm will be utilised. A review of numerous definitions of innovation in light of Joseph Schumpeter's (1934) definition will follow. Also, three innovation approaches (demarcation, assimilation, and synthesis) will be discussed with explanations as to why the synthesis approach suits this research. Joseph Schumpeter's (1934) definition of innovation as applied under the synthesis approach will be vital to the cornerstone of this research. Various aspects of innovation, particularly service innovation will be mentioned. Then customer-driven innovation will be introduced along with pertinent research. A conceptual framework will be presented in order to construct a logical approach to this research via essential linking of the above topics. First mentioning the rise of service concepts throughout the economy is important.

2.2 What are Services?

Modern studies have addressed the relationships between science, technology, and innovation while taking into consideration the practical application of new ideas to the economy. After immense economic growth in services, social scientists slowly began to study this phenomenon and analyse its groundwork. Despite the early works, which mentioned the importance of mapping service growth, from Fisher (1933) and Clark (1957) it was not until the 1960s that scholars such as Fuchs (1968) began to chart the long-run growth of service employment in the United States. while also speculating the interactions between productivity and growth and also the pattern of demand (Metcalfe and Miles, 2000).

The growth of the services sector, as traditionally defined, into a dominant position in the share of output of industrial economies, brings to the forefront the importance of innovation. Services now account for more than 70% of employment and GDP in most developed countries (Gallouj, 2002). It may also no longer be safe

to assume that service innovation is residual or that it follows the patterns found in a manufacturing context. Rather than viewing services sectors as demanding new methods of innovation analysis, the argument will instead state the service and service-like activities across all sectors of the economy demand new approaches (Coombs and Miles, 2000).

Thus, the key to service innovation, and also neglected elements of the whole economy, lies in the approaches taken. The rationale behind focusing on the quantitative rather than qualitative specificities of services is the more cost-effective way of identifying the elements of service innovations which have been neglected by the economy as a whole. Part of the difficulty in grappling with service innovation has been the difficulty in defining and measuring services. Traditionally speaking, scholars have defined primary and secondary manufacturing activities in a positive sense, while allocating, in a negative sense, everything else to a tertiary 'services' sector (Metcalfe and Miles, 2000). This bundling of activities of heterogeneity in application and production has definitely added to the difficulties of understanding the most rapidly growing sector in modern economies. With that said, services can be defined as activities directed at creating changes, transformations (of form, place or time of availability, and the entities involved may be material objects, goods, people, the natural environment or symbolic representations, data, text, etc.) in some entities (Metcalfe and Miles, 2000). This definition is valid due to its ability to transform the stereotypical definitions of services. It may be a matter of convention where the activities of a particular firm are classified and often times this convention is simply a question of the organisational structure of an industry. Services are widespread and serve a role in a vast majority, if not all, industrial societies. Therefore, it may be significant to view service 'functions' (such as R&D, design, delivery, after-sales, marketing, maintenance, etc.) as being performed, by specialised service firms and thus recognized to the service sectors, throughout the economy (Metcalfe and Miles, 2000).

The output from service firms takes the form of their service products or service commodities. It is important to add that such products can be created and delivered by firms in any sector, including the manufacturing sector. For example, many firms listed as computer manufacturing firms are actually making the bulk of their profits from the retail of computer services. Thus, firms in all sectors of the economy may perform service functions internally for their own employment rather

than contracting them out to specialised services firms. This simply shows that service occupations, including white-collar and other 'non-production' professions like cleaning and security appear in all sectors. In addition to growth in specialised service firms, there has also been growth in the white-collar industrial workforce and the service share of the manufacturing sector. Therefore, the widely used concept 'growth of the service sector' is actually quite complex as is the term 'service economy'.

2.2.1 Business Services

For the purpose of this thesis, the service economy will be viewed as being more prominent across the economy and specifically centring of the business service sector. Business services are effectively defined by the U.S. government as establishments primarily engaged in providing services, not elsewhere classified, for business establishments on a contract or fee basis. Perhaps the makeup of business services naturally allow for more opportunities for customer-driven innovation. For example, business services clients are often a part of the production and can be a source of innovation (Hertog, 2000; Brentani, 2001). In particular, oftentimes buyers of business services are experts and request specific requirements for the service (Brentani, 2001). Moreover, for business services the customer's participation in new service innovations is often a natural extension of the existing interactions during the production and delivery of the service (Gummesson, 1993; Jackson, et al., 1995; Terrill and Middlebrooks, 1996). This will nonetheless be further explored in the empirical chapters of this thesis. Important to note, business services differ from personal services which provide services generally to individuals. The Standardized Industrial Classifications (SIC) represent business services slightly differently from the newer North American Industry Classification System (NAICS), thus for adequate comparisons refer to Appendix I. In short, NAICS is a comprehensive system encompassing all U.S. economic activities presented via a hierarchical structure. At the highest level it divides the economy into twenty sectors meanwhile at lower levels it further distinguishes the different economic activities in which businesses are involved. Nonetheless, business services are classified as SIC 73.

The growth of business service firms represents the current stage in a continuing process of technological and organisational restructuring of production and labour skills (Bryson, 1997). Furthermore he states, this growth requires increasing managerial inputs, the expansion of the division of labour, and the development of

specialised management expertise in areas such as marketing, personnel, and market research. For example, business services in the U.S. represent substantial growth in employment since the late 90's (refer to Table 2.1) and is projected to continue with an upward trend for 2010 (refer to Table 2.2). In 2001, the U.S. Bureau of Labor statistics report services employment offset losses in the manufacturing sector contributing 81,000 new employments. Hence, business services are an economic sector offering tremendous potential growth and profitability thus there exists potential for firms to apply their competencies and resources in creative ways (Brentani, 2001). Therefore, it is safe to conclude that business services are definitely a worthwhile sub-sector for further investigation and this thesis will attempt an understanding of innovation within this sub-sector.

Table 2.1 Employment in Professional and Business Services
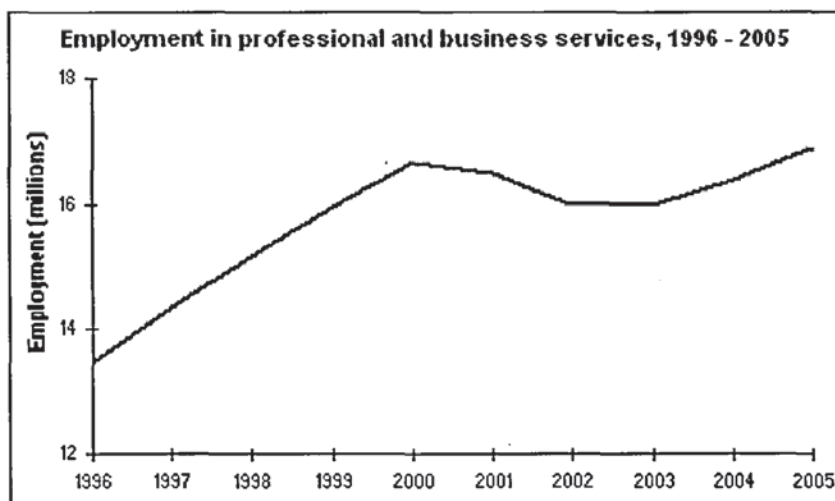
Source: U.S. Department of Labor

Table 2.2 All Employees: Professional and Business Services
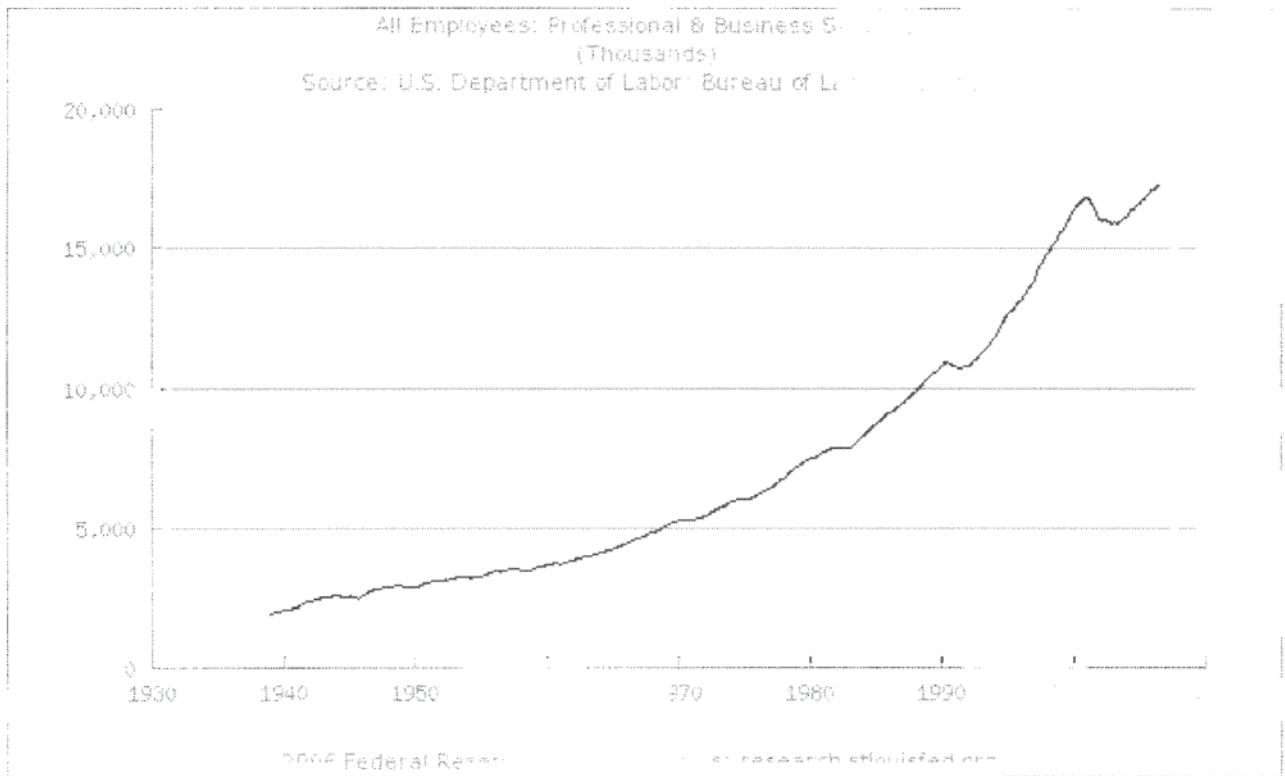
Professional business service (... ly comprise an important portion of the larger c....y business service firms. Patterson and Sp....ng (1997) state prof........ business se...ices are ...1 important but neglected are:] ...., for this rese...h, some of the respc.... to provide professional busin.... services such as computer systems consultants, for .... '. This brings about the topic of a specialised view of business services worth briefly mentioning.

Consequently, due to the importance of business services for the U.S. economy, it will be important to .... to ....f.. e are any unique f .. s of this sub-sector. Additionally, pr ..) c.. ioned the likelihood and exte .. of innovation, with regard to harnessing the ......ntial role of the customer to increase business se r..ice firm performance i th f .... 1 of this research. Γ (1997) states, inve......ng the role and ... b.. less services is of central .. portance for understanding economic change in advanced capitalist economies. Now that the impact of services and service-like activities and their role across all sectors has been mentioned, in addition to business services as will be presented in this thesis, the paradigms in which service innovation is studied will be addressed.

2.3 Paradigms

Sundbo (1997) devised three paradigms for service innovation which include: the technology-economic paradigm, the entrepreneur, and the proposed strategic innovation paradigm. Although the first two paradigms have possible exclusions of other types of innovation they each have their specific focus and justifications. On the other hand, the strategic innovation paradigm applies a more holistic view of innovation. For the purpose of this research, the strategic innovation paradigm will be applicable due to its ability to include all forms of innovation. At this time, a more detailed explanation of the paradigms will follow.

Within the traditional study of service innovation there are two proposed paradigms: the entrepreneur and the technology-economic paradigm. Economically speaking, innovation is a determinant responsible for growth. The first paradigm is the entrepreneur, which places the entrepreneurial act as the core innovation process (Sundbo, 1997). This paradigm is superior for understanding the establishment of new firms, which includes service firms. Although the entrepreneur theory is best for describing innovations realised by an individual, it leaves out an array of other external linkages. Likewise this paradigm assumes that innovation is an individual act, thus ignoring the inherent organisational process involved (Sundbo, 1997). It appears unlikely that an innovation stems from one person and is brought to fruition in a one-dimensional manner. Drejer (2004) states the involvement of multiple actors in the innovation process is important. This paradigm is not sufficient in explaining innovation in larger firms or technological innovation. In addition to innovations which involve technological aspects rarely involves one person. Innovation can occur within different departments, involving different people along the process. In short, innovation is complex involving many aspects that are overlooked with this paradigm. There was a shift in paradigms thus creating the technology-economic paradigm due largely in part to changes in economic activity.

The technology-economic paradigm emphasises technological development as the core innovation process. This paradigm is most adequate for explaining technological innovations, which is often a medium for new services (Sundbo, 1997). One major problem with this paradigm is the lack of inclusion of other sources of innovation such as non-technological innovations. Daft (1978) proposed that the technical aspect of innovation refers to products, services and production processes that are at the core of a firm's technical ability. Not all innovations involve technical

capabilities; therefore the technical aspect of this paradigm may be overly emphasised. For example, not all organisational innovations are directly related to technology (Quinn, 1992; Van der Aa and Elfring, 2002). Although technology can be associated with service innovations, it is generally not a defining factor for service innovations. Hence, having a paradigm that narrowly focuses on technological innovations does not capture other arrays of innovation. With the potential for exclusions of different forms of innovation a new paradigm will be brought in for discussion.

A new competing paradigm is on the rise signifying a change in research interests since the early 1980's. The strategic innovation paradigm is competing with the previous two paradigms mentioned above. Because the entrepreneur model is viewed as a simplistic view of innovation which ignored the organised and complex innovation systems, Sundbo (1997) coined the term 'strategic innovation paradigm' which emphasises the firm's strategy as the core innovation determinant. This paradigm addresses the dualism of corporate entrepreneurship of the employees and the management who bring about and control the innovation process within the framework of their strategy.

This paradigm, in comparison to the technology-economic paradigm and the entrepreneur paradigm, may appropriately explain the innovation process. This paradigm has a more holistic view with regard to innovation as compared to the technology and entrepreneur paradigms, which tend to focus on certain aspects of innovation. The strategic innovation paradigm may well be more dynamic and more valid than the technological research and development (R&D) model. Innovation is dependent upon much more than R&D and the accumulation of technology: it involves the identification and development of markets, the supply of finance and skilled human inputs, and the creation and operation of regulatory frameworks (Andersen et al., 2000). Because proper innovation systems have technology (support) systems, R&D, and technological learning and transmitting infrastructure as only one component it would unwise to focus on merely one aspect. The rise of the strategic innovation paradigm is attempting to bring together a consensus within the field of service innovation.

The strategic innovation paradigm best fits the attributes of medium to large sized firms called 'top strategic organisations' (Sundbo, 1997). However, these attributes may well be applicable to firms of any size (refer to Table 2.3). This

paradigm coincides with the synthesis theory, which will be discussed later (see section 2.5). Therefore, as mentioned above this thesis will build in the strategic innovation paradigm due to its holistic view of innovation. Additionally, this paradigm draws importance to this dual innovation organisation and the firm's strategy as the framework for the management's decision and inducement (Sundbo and Gallouj, 2000). Next, it will be of utmost importance to understand the term 'innovation' and provide a review of literature and its take on this renowned term.

Table 2.3 Attributes of Top Strategic Firms

> Innovation being a strategic task guided by top management

> Involvement in the innovation process by many individuals in numerous departments

> Innovation process follows a model with the following phases:

    o Idea generating

    o Transformation into an innovation project

    o Development

    o Implementation. This process is rarely linear and smooth instead it is intricate and unpredictable

> There is a tendency to modularise, develop standard elements that can be combined, thus being reproducible.

2.4 Definitions of Innovation

Innovation is a multi-faceted word, thus as a result, the term innovation is often used loosely. The challenge of innovation is found in its lack of a complete and comparable definition (Wan et al., 2003). Practitioners and investigators often treat innovation as an all-inclusive term, even though they refer to very different events or processes (Cooper, 1998). It would be fair to note that the focus of previous research has addressed specific aspects of innovation, thus many definitions are not all encompassing. Very often typologies and classifications of innovation are expressed with definitions that are tailor-made to highlight the specific features of that kind of innovation (Kolehmainen, 1997). Hagedoorn and Cloodt (2003) state, "Given the variety in constructs, measurements, samples, databases, industries and country settings and inconsistency in definitions, it is of no surprise that there appears to be hardly any clear understanding of the concept and measurement of innovative

performance". By not having a clear definition of innovation, both the management and study of innovation will continue to be encumbered with conflicting and inconclusive findings. Specifically, a definition of innovation is critical for establishing the validity of the findings, propositions, and policies that are consequential to any research study. Although countless definitions of innovation exist, the need to have a clear and multi-functional definition is intelligible. Thus, Schumpeter's (1934) fusion of various forms of innovation is still appropriate for defining innovation.

2.4.1 Joseph Schumpeter's Early Work

As seen above there is some misunderstanding and confusion with regard to defining innovation. This debate concerning the vast pool of definitions and characteristics appears from Joseph Schumpeter's (1934) early work on innovation. It was from his initial work that deviations have consequently been made. This section will illustrate the importance of Schumpeter's (1934) definition of innovation on the basis that it is all inclusive of different forms of innovation. Also, it will incorporate Schumpeter's latter work on innovation. It will first be important to delve into understanding the early work of Schumpeter.

The first emergence of innovation theory can be attributed to Schumpeter's Theory of Economic Development of 1911 (Schumpeter, 1934; developed further in 1939). Initially Schumpeter was interested in the individual entrepreneur's role in the economy thus generating socioeconomic growth. He refers to social and psychological factors as causes of the materialization of entrepreneurship (Sundbo, 1998). Therefore, Schumpeter's entrepreneur concept brings innovation into economic theory. Sundbo (1998) states Schumpeter was initially more concerned with economic development than the accuracy of definition. Also, Schumpeter (1934) was originally concerned only with completely unique innovations; incremental change or imitations of activities in other markets were not regarded as entrepreneurial conduct. According to Schumpeter (1934), an entrepreneur is the innovator. The foundation of Schumpeter's (1934) definition of innovation arises from one or more individuals who produce an economic gain, either reducing costs or creating extra income.

In relation to Schumpeter's entrepreneur concept, Drucker (1985) defines innovation as, "The means by which the entrepreneur either creates new wealth-producing resources or endows existing resources with enhanced potential for creating

wealth". Also, Kanter (1983) later expands Schumpeter's (1934) entrepreneur concept, thus he states entrepreneurs can also be found within large organizations, he called these individuals 'corporate entrepreneurs'. Also, Pinchot (1985) later expanded on Schumpeter (1934) and Kanter's (1983) work to term the phrase 'intrapreneur'. These two expansions on Schumpeter's (1934) work on entrepreneurship is an attempt to stay within the Schumpeter school of thought while making the concept more applicable to organisations.

In addition to the role of the entrepreneur, Schumpeter (1934) was also interested in factors of change such as changes in technology and changes in the organization of production. Schumpeter (1934) believes innovation comes from a qualitative change. Thus, his definition of innovation encompasses one or more of the following:

1. Introduction of a new good or a new quality of good.
2. Introduction of a new production method. This introduction need not be a new scientific invention, a new way of treating a product commercially would also be considered.
3. The opening of a new market.
4. A new source of raw materials or semi-finished products.
5. The constitution of new organisation.

Next, a distinction will be made contrasting invention and innovation with a Schumpeterian perspective.

2.4.2 Invention versus Innovation

To continue this definition of innovation discussion, the issue of invention and innovation will be discussed. Schumpeter (1934) addresses this issue by stating that invention derives from new knowledge, however this is irrelevant if it is not carried into practice. Or put another way, "Innovation is the commercialisation of an invention" (Rickards, 1985). Similarly, Twiss (1992) wrote, "For an invention to become an innovation it must succeed in the marketplace". Therefore, it is not enough to just develop an invention it should be accessible to consumers. Mole and Elliot (1987) state, innovation is a process of taking new ideas effectively and profitably through to satisfied customers. Also, in relation to Schumpeter's work on economic development, Herbig and Kramer (1993) state, "Innovation is the process

by which an invention or an idea is translated into the economy for use". Thus, a more production focused approach would share an agreed definition of innovation such as, the process of taking an invention forward into its first marketable form (Hollins and Hollins, 1991).

Cooper (1998) states, that firms achieve competitive advantage not by invention, but with the intelligent use of existing processes, products, or technologies, thus blurring the relationship between invention and strategy. To not differentiate between innovation and invention, is to associate both terms to creative processes involving the application of existing ideas to create a unique solution to a problem (Duncan, 1972).

In brief, there is a broad consensus in regard to the treatment of innovation versus invention being dissimilar. Staying true to Schumpeter, it is generally agreed upon that innovations stem from an idea or invention converted to use. Creating a distinction between innovation and invention is important; however, the remaining sections will focus only on innovation. Next, it will be important to address the issue of radical versus incremental innovation in light of Schumpeter.

2.4.3 Radical versus Incremental Innovation

To further the definition of innovation discussion, researchers differ with respect to radical versus incremental innovation. Abernathy and Utterback (1978) were among the first to formulate this division between incremental and radical innovations. Silverberg (2002) states, Schumpeter was responsible for bringing to light the role of radical innovations in economic change. The idea of innovation radicalness is essential to most debates found in the existing literature on innovation (Henderson and Clark, 1990; Tidd et al., 1998). Other researchers prefer to define radical innovations referring to products and processes that result from advances in knowledge, whereas incremental innovation refers to the continual process of improvement of techniques (Mole and Elliot, 1987).

2.4.4 Radical Innovations

Achieving a competitive advantage while realising extra profits is usually the driving force behind innovation, thus being the first supplier of a new product or the first user of a new technology is highly important. Schumpeter (1934) believes that innovation defined as an economic concept attaches innovation to economic development and is an important part of achieving this economic development. Radical innovations are, by definition, unique- one is rarely commensurable with

another (Kimberly and Evanisko, 1981; Van de Ven, 1986; Damanpour, 1987). Also, radical innovation implies a totally new direction for the organization (Zaltman et al., 1984). Innovation is an essential reconceptualization of what the business is all about that eventually leads to a dramatically different way of competing in an existing business (Constantinos, 1998). Dosi (1982, 1984) states radical innovations are qualitatively very new and different elements which change a whole field. Additionally, an innovation is viewed as an economic process which involves the transformation of a firm's knowledge into commercially successful products (artefacts, processes or services) that expand old markets or creates new ones (Mort, 2001). The former definitions more specifically relate innovation radicalness to the organisation, quite different from Schumpeter's view of radical innovation in a broad economic sense.

Broadly speaking, radical innovations which apply to economic development in a Schumpeterian sense are of importance. Definitions of innovation in a radical sense in relation to the firm manage to remain true to Schumpeter's (1934) early work. However, as these definitions imply radical innovations are not seemingly as common as incremental innovations, thus a discussion of the degree of radicalness will follow.

2.4.5 Degree of Radicalness

A distinction within radical innovations conveys highly radical and less radical innovations. For instance, an innovation that is first identified as the application of a new concept to an organization may be further differentiated based on its degree of radicalness (Damanpour, 1991). Innovation is not only about developing radical new products and services; it is also about improvements to existing products, services and processes as well as continuous improvements through the elimination of non-value adding activities (Oke, 2002). In other words, Henderson and Clark (1990) believe this degree of radicalness can be distinguished by looking at how new and competence-transforming the innovation is or if any new capabilities are needed to implement it. In addition, highly radical innovations are exceedingly different from what the organization has done previously, whereas less radical innovations are similar to that which has done before (Nord and Tucker, 1987). These ideas of innovation veer from Schumpeter's original work which was focusing on only completely unique innovations.

The authors above wrote of the degree of radical innovations coming from and/or impacting the organisation itself. Highly radical innovations force organizations to ask new sets of questions, to draw on new skills, and to use new approaches to solving problems (Anderson and Tushman, 1990; Tushman and Anderson, 1986). The delineation of this term radicalness into highly and less radical innovations allows for a more applicable use of the term. The rarity of radical innovations almost brings to the forefront the need for identifying less radical innovations in addition to incremental innovations. As seen above, radical innovations, in a strict sense of the definition are not very common; therefore in Schumpeter's (1939) latter work he addresses the issue of change. Prior to the discussion of incremental innovation, it will be important to delve into the aspect of change with regard to innovation.

2.4.6 Innovation or Change

In Schumpeter's (1939) later work he viewed innovation as entailing change from pre-existing practices. Katz and Kahn (1978) believe any phenomenon may be regarded as an innovation; however the span of its impact may vary thus suggests differentiating between change and innovation. Other writers have provided perhaps a more applicable interpretation of Schumpeter's (1939) definition of innovation thus stating, innovation becomes a break or variation from routine decision-making behaviour (Nelson and Winter, 1982; Lazonick, 1991). Meanwhile, staying true to Schumpeter, Drucker (1985) defines innovation as, "The effort to create purposeful, focused change in an enterprise's economic or social potential".

Importantly it has also been stated that while all innovation involves change, not all change involves innovation (Hargie and Tourish, 1996). These authors conclude that unintended or undesired change within an organization is not considered innovative. For example, many changes within an organization occur without intentionality of direct benefit but are merely adjustments that result from routine changes in internal or external environmental conditions (Hargie and Tourish, 1996). Additionally, innovation is conceived as a way of changing an organization, either as a reaction to changes in the external environment or as a preemptive action to influence the environment (Daft, 1978; Damanpour and Evan, 1984). Many authors generally agree upon the need to distinguish between change and innovation, thus viewing them as different events. Based on Schumpeter's (1939) statement that innovation requires change coupled with earlier work on economic development the

above authors attempt to remain true to his developments on innovation. Next, the issue of incremental innovation will follow as it relates to change.

2.4.7 Incremental Innovation

It will now be of importance to understand exactly what incremental innovations are as compared to radical innovations. Incremental innovations are small improvements, which occur continually through the introduction of small new elements (Dosi, 1982, 1984). With regard to incremental innovation, the exact definition of it is not actually self-evident; an improvement to a product or procedure may also be innovation (Gallouj and Weinstein, 1997). Some believe a large majority of successful innovations are based on the cumulative effect of incremental change in methods or ideas (Tushman and Nadler, 1986).

As previously mentioned, Schumpeter (1934) was originally concerned only with completely unique innovations; incremental change or imitations of activities in other markets were not regarded as entrepreneurial conduct. The issue of imitations with regard to innovation is worth mentioning. Marquis (1969) introduced the concept that only the first enterprise that executes innovation would be considered innovators and subsequent adopters are merely imitators. In a pure Schumpeterian sense, Herbig and Kramer (1993) state innovation is usually distinguished from imitation in that it is a change new to the economy as well as to a particular institution. Stated another way, an incremental innovation is smaller and may impact a limited portion of an organizational population, although the people concerned may observe it as quite radical (Larsen, 1993). This brings rise to the importance of innovation newness with respect to the individual, organisation itself, or to the world. With respect to radical and incremental innovation the degree of newness directly ties to these two forms of innovation. Incremental innovations differ from radical innovations in their subtle nature of inciting change, while radical innovations involve economic change. This next section will mention this additional characteristic of innovation.

2.4.8 Technology

Schumpeter's (1939) latter work, as compared to his original Theory of Economic Development of 1911, had less concern for the role of the individual entrepreneur in innovation. Schumpeter's (1939) emphasis on radical innovation became less important while the cumulative nature of knowledge came to the forefront. Technology was not the focus of Schumpeter's work on innovation;

however, he did attribute 'technological revolutions' to the underlying successive economic growth. These new technologies seen as the driving force underlying successive growth cycles started with Schumpeter's original formulation of 'technological revolutions' (Barras, 1986). There is minimal doubt that Schumpeter would have incorporated technological and service innovations into his 1934 definition had it been pertinent at the time of origination. Since the 1930's numerous changes have occurred which have directly impacted the economic structure of nations. It was during this time that technological progress was on the rise and so it was thought that this technological revolution should be understood with reference to the development that lead up to it (Drejer, 2004). Much of the technological advancement of economies throughout the world occurred after Schumpeter's (1934) development of his definition of innovation. This is important to note because these 'technological revolutions' have brought rise to the emergence of new 'technological paradigms", as discussed earlier (Dosi, 1982, 1984). Additionally, Schumpeter's (1934) work is the source of inspiration for both the entrepreneur theory and the technology-economics theory (Sundbo, 1998).

Another concern in defining innovations deals with the issue that innovations are known to vary immensely in their technological significance (Sahal, 1983; Galende and Fuente, 2003). The technological significance relates to the issue of radical versus incremental innovation. Similar to the above discussion, radicalness is a dimension of innovation that measures to which degree the innovation incorporates a technology that is an apparent departure from the organisation's existing practices (Ettlie et al., 1984). Examples of technological innovations include tracking and tracing systems which enable transport service providers to monitor the process or real-time sales monitoring to mention a few.

Although technology was not in the forefront of Schumpeter's (1934) work on innovation and entrepreneurship, numerous authors seek to remain true to Schumpeter's (1934 and 1942) work in their characterisation of radical innovations. For example, Nyström (1985) states radical innovations are truly novel or unique technological solutions, while Tushman and Nadler (1986) believe radical innovations involve the development of new technologies. A broad definition of innovation encompasses, "new products or services, new process technologies, new organizational structures or administrative systems, or new plans or programs pertaining to organizational members" (Damanpour, 1996). While Damanpour's

(1996) definition involves product, service, and process technologies, several authors focus on both the technical aspects of innovation and the introduction of new products into the market (e.g. Acs and Audretsch, 1989; Trajtenberg, 1990; Archibugi, 1992; Grupp, 1994; Freeman and Soete, 1997; Lanjouw and Schankerman, 1999; Stuart, 2000; Ahuja and Katila, 2001; Ernst, 2001). The advance of technology and its impact on new products is an important aspect of innovation. This mention of product innovations will lead to the next topic for discussion. Again, Schumpeter's (1934) definition of innovation involves: product innovation and process innovation.

2.4.9 Product and Process Innovation

This particular section will elaborate on process and product innovations. As seen above the aspect of newness ranges in the understanding of radical and incremental innovations. Meanwhile, the application of technology may effect the introduction of a product or process innovation. Elaborating on product and process innovations will be important, in light of Schumpeter's (1934) definition of innovation. As mentioned above, Schumpeter (1934) addresses both the introduction of a new good or quality of good and the introduction of a new production method. Again, this introduction need not be a new scientific invention; a new way of treating a product commercially would also be considered innovation.

Innovation can involve the creation of a new product, service, or process. However, much of the literature on innovation is described in one-dimensional terms, referring to a process or product offering as either a process innovation or product innovation. It is clear that innovations need not be simply an introduction of a new process or a new good, as both of these aspects are vital to understanding innovation. Economically speaking, product innovations are frequently emphasized when a firm pursues performance strategy and process innovations take precedence as the product life cycle evolves and the firm's strategy shifts to cost minimization (Utterback and Abernathy, 1975). While it is possible to address innovations in relation to a firm's strategy or the product life cycle, it would be naive to address innovation in an exclusive manner. Thus, to differentiate between product and process innovation in research is palpable, however to ignore one aspect of innovation is not remaining true to Schumpeter's (1934) definition.

2.4.10 Product

Product innovation, in a radical view, creates a totally new product consisting of characteristics unconnected with those of the old product. Cosh et al., (1996)

conveniently adopt an absolute definition of innovation such as 'new product introduction', are consequently over looking the concept of process innovation. Another definition states, a product innovation involves all new or improved products of commercial significance for the company (Love and Ashcroft, 1999). Meanwhile, process innovation involves an improvement in the production process; this next section will further discuss process innovation.

2.4.11 Process

With regard to a process view, innovation has been explicated as follows: first the initiation process leads to the implementation process, thus to the institutionalization process and lastly the routinization process (Zaltman et al., 1973; Zaltman and Stiff, 1973; Zaltman and Duncan, 1977; Kolehmainen, 1997). Other definitions of process innovation generally pay attention to the nature of innovation regarded as an activity and/or its outcome (Van de Ven, 1986, p. 590; Tushman and Nadler, 1986). More specifically, Hayes and Wheelwright's (1984) view of innovation focuses on aspects of technology and newness stating process innovation, with regard to newness, is the extent of change in customization and technology required.

To clarify, product innovation deals with the production of new products and services to create new markets or customers or satisfy current markets or customers, while process innovation is reflected in the improvements or introduction of new production process for products or services (Knight, 1967; Utterback, 1971). Once more, innovation can entail the advent of a new product, service, or process and may involve technology.

2.4.12 Combination

Many definitions are incorporating both product and process innovations thus staying in sync with Schumpeter's (1934) original definition. As previously noted Schumpeter (1934) believes a process to be a new production method and a product innovation as the introduction of a new good or quality of good. In a Schumpeterian sense, Rudman (2001) views innovation as encompassing not only process and product innovation, but also improvements in existing products and innovations in marketing, distribution, human resources management, globalization, and overall business strategy.

Meanwhile, Thompson (1965) mentions an innovation may result in an offering of a new service. Urabe (1988) states, "Innovation consists of the generation

of a new idea and its implementation into a new product, process, or service, leading to the dynamic growth of the national economy and the increase of employment as well as the creation of pure profit for the innovative business enterprise".

The Oslo Manual serves as a benchmark for European countries that participate in the voluntary survey. In accordance with the above definitions, the OECD's Oslo Manual clearly defines both product and process innovation. The Oslo Manual is useful for comparing innovation research due to its widely accepted definitions. It offers predetermined definitions for not only product and process innovations, but it also incorporates the use of technology. According to the Oslo Manual (1997), a product innovation is a product new to the business or a substantially improved product, while a process innovation is a new or substantially improved production process through new equipment or re-engineering. Within the Oslo Manual (1997), innovation was defined as new to the firm, rather than essentially new to the market. According to the common European framework, the Oslo Manual (1996) covers product and process innovations with regard to both manufacturing and services industries.

Two surveys, one for the manufacturing sector and one for the service sector, are administered. Within these two different surveys, there are frequent substitutions of the word `service' for the word `product' confined to the basic innovation questions. Both of the product and process innovation definitions focus on new to firm innovation and include incremental innovation. Generally speaking, the Oslo Manual strives to remain true to Schumpeter's (1934) definition of innovation. Not to mention the addition of technology within both manufacturing and service industries. By defining terms of innovation clearly the Oslo Manual allows for a proper analysis of cross-country comparisons.

2.5 Services

As mentioned above the impact of services on the economy is unprecedented. In the US, it was not until the late 1940's, when a movement toward a more service-oriented economy occurred (Fuchs, 1968). Therefore, one may assume that had the impact of service innovation existed during the time frame in which Schumpeter devised his (1934) definition, he may have also incorporated it. Given the differing forms of innovation during the 1930's, it is safe to concur that Schumpeter did not intentionally or unintentionally exclude any form of innovation. This assumption is based on the fact that Schumpeter was interested in market, organisational, and input

innovation and not only product and process innovation. He did not seem interested in devising distinctions within the term innovation; rather he exhausted the different types of innovation relevant at that time. In accordance with Schumpeter, regarding service innovation, the incentives for innovation are the same in all types of economic activities, particularly the creation of new possibilities for additional value added (Drejer, 2004).

With that said, numerous authors believe Schumpeter's (1934) original definition of innovation is sufficient for use in service innovation (Gadrey et al., 1993, 1995; Van Der Aa and Elfring, 1993; Sundbo, 1994; Sundbo, 1997; Gallouj and Weinsten, 1997; Gallouj, 1998; Marklund, 1998; Drejer, 2004). Also important to note, Preissl (2000) states that in Schumpeter's classical definition of innovation, the development of market economies, market and delivery innovation have been of minor importance in the innovation literature. More specifically, applying Schumpeter's (1934) definition of innovation to services could contribute to strengthening the theoretical and conceptual foundation for studying service innovation (Drejer, 2004). Therefore, this thesis will incorporate Schumpeter's definition of innovation, with the addition of his later work on technological revolutions, along with the addition of service innovation. With the definitions of innovation discussed it will now be imperative to delve into three approaches of innovation for services.

2.6 Conceptual Approaches to Innovation

Coombs and Miles (2000) distinguish three approaches to studying service innovation which include: a demarcation approach, assimilation approach, or a synthesis approach. The issue here concerns the treatment of service and manufacturing innovations being distinctively different as with the demarcation approach. The assimilation approach considers the similarities of service and manufacturing innovations, but focuses on technological innovation. Both the demarcation and assimilation approaches dominate the study of service innovation (Drejer, 2004). Meanwhile, a synthesis approach encompasses both manufacturing and services also applying technological and non-technological innovations. There are innumerable aspects which build the basis for these three innovation approaches. Again, as stated previously the synthesis approach will be practical to this research. A more detailed explanation of the demarcation and assimilation approach will be

mentioned prior to the synthesis approach. But, first an attempt to answer an existing debate concerning the role of innovation within services will be made.

As mentioned previously, researchers and policymakers have taken a brand new look at service activities given the surge of importance of service sectors. This includes inquiring into the received insight concerning the innovative capacity of the service firms. Certain services experienced changes which have made it evident that the pre-existing notions about this sector, such as being supplier-driven and relatively slow in the uptake of innovation are no longer valid. This research attempts to secure this belief that service firms are not totally supplier-driven and that other sources may well prove important, if not valuable for the firm.

Nevertheless, the question exists as to whether service firms do in fact innovate. However, based on empirical research, several authors agree that service firms do innovate (Barras, 1986; Gadrey et al., 1993, 1994, 1995; Miles et al., 1994; Sundbo, 1997; Andersen et al., 2000; Antonelli et at., 2000; Coombs and Miles, 2000; Ducatel, 2000; Hipp, 2000; Howells, 2000; Hughes and Wood, 2000; Kleinknecht, 2000; Nightingale and Poll, 2000; Preissl, 2000; Sundbo and Gallouj, 2000; Tether and Metcalfe, 2000; Gallouj, 2002; Kandampully, 2002). Service firms can be innovative in their own ways, even though the kinds and process of innovation may be different from traditional manufacturing innovation. An expansion of these ideas will follow in order to discuss the three service innovation approaches pertinent to this research.

2.6.1 Demarcation Approach

Existing research has largely focused on manufacturing industries (Hauknes, 1996; Lopes and Godinho, 2005). Consequently, this research further builds on theories exclusively aimed at manufacturing. Another problem exists with manufacturing innovation in which the importance of services is left behind (Anderson et al., 2000; Gadrey et al., 1995). Research built upon manufacturing innovation theories prompts the question as to whether innovation in services should be a distinct research area, thus having its own theories. Once more, the demarcation approach observes service and manufacturing innovations being distinctively different. The primary focus of studies under a demarcation approach is not to compare or test innovation in services directly with innovation in manufacturing, but instead to study distinctive features of service innovation (Drejer, 2004). Sundbo and Gallouj (2000) state the empirical research indicates that there are some common

characteristics of the innovation processes due to the specific nature of service production that is common to all service industries. With regard to the demarcation approach, this belief of demarcation argues that service innovation is distinctively different, following dynamics, and displaying features that require novel theories and instruments different from manufacturing innovation (Coombs and Miles, 2000). Research under this approach formulises a specialised view of innovation in services. Numerous key authors believe that service innovations comprise unique peculiarities which distinguish it from product or manufacturing innovations (e.g. Gradey et al., 1995; Sundbo, 1998; Sundbo, 2000; Sundbo and Gallouj, 1998; Sundbo and Gallouj, 2000; Gallouj, 2000; Djellal and Gallouj, 2001). Thus, studies under a demarcation approach utilise a 'dual approach' which adopts differing questioning styles for manufacturing and service firms.

Sectors and firms vary quantitatively in terms of the extent to which they engage in various service functions such as: marketing, transactions, design, delivery, and after sales to mention a few. Each of these named functions creates a potential opportunity for innovation alongside the conventional product-process distinction. Statistical constraints, which favour the understanding of the manufacturing sector, oftentimes conversely impact the understanding of processes of the service sector. Service innovation should no longer be viewed as a residual problem vastly overlooked or assumed to follow the patterns and be explained by concepts derived from manufacturing.

The demarcation approach addresses all forms of innovation; however it is a more specialised view of innovation depending on whether the innovation stems from manufacturing or services. With regard to unique peculiarities many authors state that the intangible nature, inseparable, and interactivity between client and firm distinguishes service offerings (Fuchs, 1968; Gallouj, 2002; Blind and Hipp, 2003; Chapman and Hyland, 2003). Services with intangible and relational aspects are important as the correspondence between competencies and other means brought to bear by the service provider and the 'product' is generally blurred and difficult to codify, due to the information asymmetry (Sundbo and Gallouj, 2000). For example, a manufacturing firm may introduce a process (e.g. TQM, ISO 9001, Six-Sigma) or technological innovation (e.g. utilising real time sales activity for e-commerce) that could ultimately be intangible.

Also associated with services is its immaterial nature, further defined as "an offering" or "a benefit" instead of a physical tangible object (Jiao et al., 2003). Hipp (2000) further highlights some peculiarities of service products which are commonly found in literature such as: heterogeneity of different service industries, close interaction between service provider and customer (integration of the external factor), and highly intangible content of service products and processes (information knowledge) and thus the need for knowledge-information creating and transforming processes. Meanwhile, Gadrey and Gallouj (1998) have substituted a new classification comprised of ad hoc innovation.

One form of service innovation in which the customer is involved includes ad hoc innovation. Ad hoc service innovation occurs most commonly in professional and/or highly knowledge intense industries. In the service professional pattern, the main driving force for innovation is individual expertise and competencies. Gadrey et al. (1995) states ad hoc innovations cannot be reproduced elsewhere in its totality, however some of its 'components' (knowledge, methods used to produce or transfer it) can be reproduced in part. Palpably the interaction with the service firm and the customer is an important locus, especially with ad hoc innovation. Thus, the client plays an active role along this mode of innovation, the steps shows that production, selling, and innovation take place simultaneously or are merged (Sundbo and Gallouj, 2000). Here, the client's problem is the starting point of the innovation process followed by the formalisation step, often achieved without the aid of the customer. These steps aim at going through the client's problem and the innovating final solution and than formalising and modifying them in order to re-appropriate some of their components and to capitalise on them. It is this client/service firm interaction that innovation is created and implemented. More specifically, in service industries the product is not consistently perfectly formatted and codified, thus each service can be considered unique as long as it is produced on demand. This tailor-made aspect of services creates a non-standardised product either via interaction with the client or as a response to a specific problem.

In some ways service innovations are moving in the direction of the manufacturing system for example it is becoming more systematic, more use of technology, and service innovations may be more push determined through R&D. This union of manufacturing and services concept states that service innovations, like

in manufacturing, are reproducible. On the contrary, the service innovation system does maintain some of its own elements:

- The customer encounter as the core driver
- Many small, non-reproduced changes
- Person-to-person contact (non-technological) will remain a core characteristic for much service innovation
- A relatively loosely-coupled organisation system, characterised by less R&D, more corporate entrepreneurship, strategic guidance, and service professional trajectories (Sundbo and Gallouj, 2000)

These points are extremely important to the demarcation approach. Under the demarcation approach, its focal point lies in the importance of these peculiarities. But, rather than grouping all forms of innovation, be it in the manufacturing or service sector, this approach studies innovation as being distinctively different. While it is inherently true that services are intangible, service innovation does not have to be distinctively different from manufacturing or product innovation. This demarcation argues that service innovation is distinctively different, following dynamics, and displaying features that require novel theories and instruments different from manufacturing innovation (Coombs and Miles, 2000). The rationale behind the demarcation approach thus isolating manufacturing and service innovation does not jointly capture or study all forms of innovation. Instead, research under this approach takes a more specialised view of innovation separating service innovation from product or manufacturing innovation. Next, the assimilation approach has points worth mentioning.

2.6.2 Assimilation Approach

The most common method for studying and measuring service innovation emerges under the assimilation approach. These studies group service and manufacturing firms together under one forum. The fundamental idea under this approach believes that services innovation is similar to manufacturing innovation and therefore it can be studied according to the methods and concepts developed for the manufacturing sector (Coombs and Miles, 2000). Innovations in services have largely been studied on the basis of theories of innovation in the manufacturing sector

(Gadrey and Gallouj, 1994; Gadrey et al., 1995; Gallouj and Weinstein, 1997; Sundbo, 1997; Coombs and Miles, 2000; Preissl, 2000; Gallouj, 2002; Van der Aa and Elfring, 2002; Drejer, 2004). Many researchers in the field of service innovation believe that an assimilation approach, which treats services similar to manufacturing, is useful (Sirilli and Evangelista, 1998; Gallouj, 2002). This approach states that there is little in the way of an ultimate rationale for strongly demarcating innovation analyses between manufacturing and service sectors (Coombs and Miles, 2000). In service firms, barriers to innovation comprise four categories recently developed by Preissl (2000) and include: market risks, financial restrictions, legal and bureaucratic barriers, and restrictions within the company. However, these barriers to innovation are not unique to services, as these conclusive findings may well pose adverse effects on manufacturing firms. In this case, a dual approach to studying service and manufacturing innovation is not utilised.

One aspect of the assimilation approach which is important to note, as mentioned under the demarcation approach, service firms are acquiring characteristics more typical of manufacturing sectors, so many manufacturing firms' activities are becoming more service like (Gershuny and Miles, 1983). This statement brings to the surface the features of services innovation which may be increasingly characterising manufacturing sector innovations which are however eluding capture by traditional instruments (Coombs and Miles, 2000). Again, research under this demarcation approach takes a more specialised view of services, possibly creating a problem inferring that particular attributes of innovation are unique for services. Drejer (2004) states that these particular features, assumed to be unique for services, may actually be characteristic of manufacturing, despite being ignored in the traditional product/process dichotomy. Gadrey et al. (1995) agree that the distinction traditionally made between industrial firm and service firm loses its meaning in certain situations.

Actually, there are some qualities of services which are similar to those of manufacturing innovation. Quite possibly, these unique peculiarities may not be so unique after all. To then decipher between these various forms of innovation, within service and manufacturing firms, ultimately creates unnecessary divisions and distinctions. It is no longer satisfactory to treat services and non-services as independent creators of innovations, because there is an existing mutual independence which is important to the creation of new service delivery activities (Andersen et al.,

2000). Many aspects of recent innovation theory, such as processes of appropriation of knowledge, learning organisations, and changing qualification needs, do not seem to present differences between the service and manufacturing sectors (Preissl, 2000). Even after the post-fordistic period, manufacturing innovations have traits similar to the service innovation system such as: a heavy market and customer orientation, less standardised and more flexible products and production organisation, predominantly incremental innovations.

Once more, service firms partnering with ones customer may create ad hoc innovations. On the other hand, it is possible for services not to be as unique as ad hoc innovations. Basically, the differences in service industries can be more influential for innovation dynamics than those between industries belonging to the manufacturing or to the service sector. The peculiarities of service production will be further analysed and the issue of whether it leads to the dynamics of innovation as compared to manufacturing industries. For example, Madsen's (1998) research, with regard to client interactivity, found collaboration on product development amongst Danish manufacturing firms. This research of product development actually found that innovating manufacturing firms often collaborated with suppliers of materials and components as often as they did with clients or customers. Madsen (1998) interestingly found that customers were identified by the innovating firms as the most important sort of collaboration partner. In conjunction with Madsen (1998), DeBresson et al. (1998) confirms that in 44% of the product developing firms a variety of partners were involved in product development. These findings demonstrate that innovation via interactivity is not unique for services.

Miles (1993) also disputes the differences between service and manufacturing when he mentions the industrialisation of service firms. One possible explanation for such activity centres on the need for service firms to also control the production process to decrease costs. Gallouj (2002) states that the manufacturing sector is becoming increasingly more service-oriented while the service sector is becoming more industrialised, but that there is room for mutual improvement. Services may develop features of 'industrialisation', such as utilising technology (mainly information technology), modularisation, and standardisation. Referring to the demarcation approach, modulization is the convergence between manufacturing and service organisations. Modulization, in short, attempts to combine this standard delivery mode with individual customer care. Thus, a service package is created

producing procedures and protocols as an 'act' thus providing a product for the customer. Additionally, the concept of modulization means that the service products are standardised, but as modules which can be combined by the customer (Sundbo, 1994; Tether et al., 2001). This modulization or standardisation tendency has made it more relevant to emphasize product innovations and innovations in general (Sundbo and Gallouj, 2000). However, they state that service innovations do occur, but mainly as delivery or process innovation. Preissl (2000) states modularisation appears to be an important trend with specific implications for the direction of innovation efforts. With regard to the convergence of manufacturing and service industries several differences exist which may involve characteristics which are service specific, thus a need for demarcation. Gallouj (2002) states services were once characterised by low productivity, low capital intensity, low skill levels, and lacking innovative capacity. However, based on the discussions above, these beliefs of services may be outdated. Sundbo and Gallouj (2000) state that service industries are also under pressure to reduce costs and thus the creation of the standardisation tendency occurs. This standardisation implies that service production is not unique in every delivery situation.

As simple as this approach seems, which treats service innovation akin to manufacturing innovation, it may have a few downsides. Services are often overshadowed by manufacturing innovation as there is difficulty in defining and measuring service sector activities (Anderson et al., 2000). Simply stated by Coombs and Miles (2000) minor modifications to conventional survey instruments and other instruments are required. In addition to these minor adjustments to the instruments, a more substantial change would entail the addition of services in the population sampled. This statement clearly demonstrates the focus of innovation studies towards the manufacturing sector, thus manufacturing innovation. Research under the assimilation approach unjustifiably focuses on a manufacturing based technology product-process approach to innovation, thus ignoring other pertinent forms of service innovation (e.g. organisational innovation). Additionally, from a research point of view, technology orientation based on new delivery concepts, organisational changes, and entry into new markets has been neglected (Preissl, 2000). A great deal of research has focussed on technological innovations (see Sanderson and Uzumeri, 1995; Barras, 1986), and a few studies have addressed organisational innovations (Van der Aa and Elfring, 2002). More specifically, in service firms, organisational

(process) innovations are important as there is a strong emphasis on the development and implementation of organisational formulas (Gadrey et al., 1995; Normann, 1984, 1991). In addition, organisational innovation research is relatively underdeveloped and the results have been inconclusive and inconsistent (Wolfe, 1994). Examples of organisational innovation may include a large-scale introduction of home shopping services, offering new tailored services, or the immediate and flexible availability of after sales services, etc.

Analytically useful, a distinction between product and process is widely accepted for manufacturing goods. The same does not hold true for services as the product mostly cannot be separated from the process. Specifically, as stated by numerous researchers, research via an assimilation method may pose a limited perception of innovation, especially with regard to technological innovation (Coombs and Miles, 2000; Djellal and Gallouj, 2000; Drejer, 2004).

In other words, this method of studying innovation jointly groups together manufacturing and service innovations with a bias towards technological innovation. A technology-focused view of innovation may be too narrow for understanding the dynamics of services as well as manufacturing (Drejer, 2004). While the assimilation approach solves the issue of dismissing the importance of unique peculiarities, it does little to tackle the importance of non-technological innovation. Technological and non-technological innovations may well be important to both service and manufacturing firms. As mentioned above, innovation may arise in numerous ways such as product, process, technological, organisational, or service. Both service and manufacturing firms may well innovate in each of these various aspects.

This assimilation approach, as compared to the demarcation approach, does allow for similar treatment of services and manufacturing as a whole, but the research focuses too strictly on technological innovation. Due to the potential concerns the demarcation approach may create, an assimilation approach may alleviate some of the issues raised previously by grouping both sectors together for research purposes. As stated, the comparable treatment of services and manufacturing may be advantageous; however, with the assimilation approach, the focus on manufacturing and technology are underlying aspects of innovation which are highly regarded. Gadrey et al. (1993) suggest that a specific, new service innovation theory is not necessary, because the manufacturing theories may be applied to services. However, they propose that the innovation concept should extend to include the development of a new service idea or

concept. This development of a new service idea or concept allows for a 'dual approach' to studying innovations as the demarcation approach follows which adopts different questioning styles for manufacturing and service firms. Again, both the demarcation and assimilation approaches, which are commonly utilised, have potential issues as mentioned above. Thus, a particular view of extending innovation in a fair manner to capture both service and manufacturing innovation directly relates more to an all inclusive approach. A more comprehensive approach, thus the third approach of innovation may well be the answer.

2.6.3 Synthesis Approach

The final approach remains to be fully developed. Coombs and Miles (2000) state, the synthesis approach suggests that service innovation brings to the vanguard neglected aspects of the innovation process which are widely distributed across the economy. More specifically, service innovation, under the synthesis approach, brings to the forefront neglected elements of manufacturing innovation relevant to services as well (Drejer, 2004). Additionally, the synthesis approach is an integrative approach to innovation which encompasses both manufacturing and services and also applies to technological and non-technological innovations (Gallouj and Weinsten, 1997; Preissl, 2000).

By combining the addition of technological and non-technological innovation, this approach allows for all forms of innovation to be accounted for without creating distinctions as does the demarcation approach. Therefore, this approach attempts to addresses the missing aspects or concerns of both the demarcation and assimilation approaches. Again, in comparison to the demarcation approach which separates manufacturing or product innovations from service innovations, this approach is all-encompassing. Simply addressing product or manufacturing innovations and service innovations, as does the demarcation approach, leaves out other types of innovation. Additionally, as compared to the assimilation approach, the synthesis approach allows for the inclusion of non-technological innovations which are more pertinent in service firms. This addition of the terms technological and non-technological is imperative for understanding and studying innovation, particularly service innovation. Again, what is importantly different with the synthesis approach, as compared to the assimilation approach, is that it allows for a non-technological approach to innovation.

Product, service, technological, and organisational or process innovations should all be accounted for equally as they each provide firms opportunities to innovate. In other words, with this dynamic approach a vast array of organisational activities and processes within services and manufacturing are taken into consideration. With that said, there are obvious marks service firms have left throughout the developed economies of the world and may increase significantly across the board while others are more prevalent activities whose involvement in innovation processes remains largely unstudied (Coombs and Miles, 2000). As previously mentioned, these neglected aspects of manufacturing innovation may hamper the advancement of more general innovation studies. Therefore, for the purpose of this research, it is of utmost importance to take a holistic view of innovation, thus avoiding any possible exclusion. By focusing on all the different aspects of innovation directly links to the strategic innovation paradigm mentioned above. Although this empirical research concentrates on service firms, all major forms of innovation will be accounted for. To not decipher among different types of innovation may well strengthen the overall understanding of innovation. Clearly, the issue of creating noticeable distinctions of innovation is solved if the synthesis approach is employed. Additionally, by applying a more broad view of innovation allows for a more comprehensive study of innovation. The synthesis approach will undeniably provide the basis of the conceptual framework for this empirical research.

2.6.4 Measures of Innovation

In light of the synthesis approach, this research will enquire into three main types of innovation: service and product, organisational, and technological. As previously mentioned there are numerous factors incorporated with innovation. For example, existing research has largely focused on manufacturing (Hauknes, 1996) and numerous authors express a need for more knowledge about service innovation (Bretani, 1995; Tax and Stuart, 1997; Hagedoorn and Cloot, 2003). Regarding process and organisational innovations, Wolfe (1994) states organisational innovation research is relatively underdeveloped and the results have been inconclusive and inconsistent. Typically organisational innovations have been referred to as non-technological as firms are more often reporting this type of innovation (Drejer, 2004). Preissl (2000) states it would not seem appropriate to distinguish between 'processes and 'organisation' in services as her research found that if both types of innovation are taken together, the results differences are insignificant. Nevertheless, this research

enquires into organisational innovations which do not include technology. Although manufacturing firms have traditionally utilised technology in their innovations, it would be impractical to assume service firms do not also. There is a consensus that economic growth and technological advances have aided in the rapid growth of the service sector (Mattsson, 1995; Patterson, 1995). Thus, this research will integrate three different types of innovation and will ultimately build upon the synthesis approach.

2.7 Customer-driven Innovation

More than 20 years ago internal marketing was proposed as a solution to the problem of delivering high service quality (Berry et al., 1976). As writers later recognised the relationship between buyer and seller as providing a marketing opportunity attention turned toward the co-ordination between staff and customer. Gronoroos (1981) views the internal marketing concept as a means of integrating the different functions that are vital to the customer relations of service companies.

Thus, the term customer orientation stems from internal marketing and this term has been explained in different ways in the literature (Kohli and Jaworski, 1990; Narver and Slater, 1990; Rafiq and Ahmed; 2000). For example, Rafiq and Ahmed (2000) define it as, "A planned effort using a marketing-like approach to overcome organizational resistance to change and to align, motivate and inter-functionally co-ordinate and integrate employees towards the effective implementation of corporate and functional strategies in order to deliver customer satisfaction through a process of creating motivated and customer-oriented employees."

This term customer orientation is important as it defined a new way for a firm to view the customer. More specifically, this definition of customer orientation directly relates to the role of the employee in delivering customer satisfaction. This concept of customer orientation involves the perception of the firm's employees and how they treat their customer. Previous marketing research has addressed the importance of the employee/client relationship (Narver and Slater, 1990; Donaldson, 1993). Instead of firms harnessing a one-way relationship, a more dynamic approach to the employee/customer relationship is important. Nevertheless, this marketing approach may well be a one-way view of the employee/customer relationship. The customer orientation emphasis is internally on employees, on the other hand this research is interested in the role of the customer, not the employee per se. Although,

the firm must facilitate the relationship with the customer in order to gather ideas and/or suggestions.

As previously mentioned, research has shown that firms that are customer oriented, along with other attributes experience an increase in performance (Narver and Slater, 1990; Donaldson, 1993; Meeus and Oerlemans, 2000; Bougrain and Haudeville, 2002; Tether, 2002; Caloghirou et al., 2002). This research on customer orientation, while beneficial to the field of marketing, does not directly relate to this research as this research is interested in customer-driven innovation. Innovations involve interdependences as well as interaction, collaboration, and competition.

Research is lacking which isolates the aid of the customer with respect to general service innovation. This research will take this marketing concept one step further into a more strategic and innovative direction. With that said Pratali (2003) states innovation strategy arises from the need to establish a link between customer needs and the needs satisfied by a new or modified product translating into a competitive advantage. Von Hippel (1998) was one of the first to draw attention to the role of users for the innovation process. The innovation process in services is to a large degree an internal and external interaction process. External actors may well include customers, thus making the service firm focus on bringing customer satisfaction with the total encounter. Customer satisfaction, in terms of service quality, has become more important to service firms than innovation (Sundbo and Gallouj, 2000).

A new mode of knowledge production in service literature shows the importance of integrating the customer into the production and innovation process. It is not uncommon for a service firm's client to initiate and stimulate innovations and oftentimes customer participation is a necessary condition for success (Preissl, 2000). The close interaction between service provider and customer participation comes in various forms while creating service innovation. Basic characteristics of service activities, particularly knowledge intensive ones may well involve the customer. Numerous concepts have been developed in order to account for this client participation (co-production, servuction, service relationship, the moment of truth, presumption) (Sundbo and Gallouj, 2000). Considering the different types of interaction between the service provider and the customer, various elements are being exchanged: information and knowledge, emotions, verbal and gesture signals of

civility. It is via informal or formal modes of communication that service innovation can ultimately be created.

Sundbo and Gallouj (2000) state customers are important sources of information and can also contribute more actively to the innovation process. Cooper (1994) reports having a quality relationship with customers provides valuable information to new product developments for services. Also, Kandampully (2002) states that among other networks, internal and external customers have become an essential perquisite to achieve the capabilities and knowledge required to serve the needs of customers. Miles et al., (1994) and Strambach's (1994) research focused on the customer's role in knowledge-intensive business services. Meanwhile, Franke's (1991) research was concerned with the role of the customer in process innovation. In addition, a significant difference was previously found between successes and failures in service innovations with greater customer participation in successful offerings compared to those that were unsuccessful (Martin and Horne, 1993). Meanwhile, Maidique and Zirger (1984) state that informal, continual, and in-depth contact with leading customers, throughout the development process, is a factor for success.

From product innovation literature the implication is clear that the customers' role may be critical (Martin et al., 1999). Particularly, in product innovation literature, Feldman and Page (1984) found a high involvement of the customer in the evaluation phases of the innovation process. Cooper and Kleinschmidt's (1988) research found testing with customers in 2/3 of the 252 product innovation projects. Previous research has provided similar findings which relate to service firms and the customer encounter in terms of their innovation. Many firms emphasise the client interaction (sociologically: primary interaction) as an important parameter in the innovation process (Edvardsson et al., 1994). Additionally, Preissl's (2000) research on German service firms looked at sources of innovation, one source being stimulated by clients (possibly with the help of a service provider). As stated, "The impulse for the innovation thus came from the customer, whereas the innovation itself is carried out by the service provider" (Preissl, 2000, p. 129). However, the research above does not offer findings that this customer encounter impacts business performance.

A specific form of co-operation in services involves the participation of clients in the conceptualisation and realisation of the innovation. This aspect is important with regard to the customisation and individualisation of services. The concept of modualisation differs from this ad hoc, customised service offering. Services are

created often times while they are being provided, thus facilitating the involvement of the customer along the process. The intensity of the interaction depends on the endowment of both the provider and the client with relevant knowledge and the willingness of the client to see the service as a co-operative product (Preissl, 2000). The success of this co-operation relies on good personal relationships between the service providers and their clients.

Empirical evidence from German manufacturers suggests that the lack of customer participation can make a project fail (Preissl, 2000). Pinto and Slevin (1988) identify two major factors which lead to success: "active client consultation" and "client commitment". While Von Hipple (1984) supports concept generation and testing with major clients. Additionally, Hipp (2000) conducted research which looked at the co-operation of vertical (suppliers) and horizontal (competitors) as partners for external knowledge sources. Hipp's (2000) research did not address the customer's potential role as an external knowledge source, but rather as socialisation in which tacit 'know how' or subjective knowledge is shared. Briefly, to divide knowledge into dimensions, explicit 'knowing about' or objective knowledge is articulated in recognized language while tact knowledge can scarcely be formalised.

Also, Hughes and Moore's (1998) research inquired into external sources, which included many sub-groups: suppliers of material and components, competitors in the same line of business, consultancy firms, universities or higher education institutes, technical institutes, patent disclosures, professional conferences, meetings, professional journals, fairs/exhibits, trade associations, chambers of commerce. Clients and customers were also listed as one of the external sources for innovation for this empirical research. Their results show that for both manufacturing and business service firms the most important external sources of information for innovation are clients or customers. Bryson (1997) adds SMEs have limited management resources and are more likely to require services of outside experts, but are less likely to be able to afford them. Thus, linkages with external sources may well be an imperative alternative. Interestingly enough, when technology is involved, smaller service firms are afraid that they may loose out in co-operation with larger partners. Thus, SMEs may be protective of their technological developments and less likely to partake in co-operative arrangements with larger firms. Additionally, Preissl's (2000) research found others think that benefits from commonly generated

innovations might not be shared fairly. This aspect of technological innovation is interesting and it will be addressed in more depth later in this thesis.

Even so, literature has neglected to generate data specifically relating to what this research coins as customer-driven innovation. This thesis' research is important because utilising the customer's input to influence and or create service innovation may well benefit business performance. This analysis will attempt to emphasise some important factors which impact the performance of service firms. This research will further enhance the previous research by conducting research from U.S. service firms by not only inquiring if customers are a source for innovation but also the impact this has on business performance. Therefore, as it will be applied to this research, the definition is as follows: customer-driven innovation occurs when a firm harnesses the direct or indirect input derived from the customer, thus creating an innovation that is perceived as new to the firm and/or the customer.

2.8 Linking Innovation and Performance

On a grand scale, innovation is regarded as fundamental to the competitiveness of advanced economies (European Commission, 2000). Deshpandé et al. (1993) report a positive link between degree of innovation and economic performance. Innovation is the most important factor in the future growth of any business and innovative companies have the potential to increase future profitable growth and build long-term investments (Kuczmarski, 1996). Empirically there is a link between innovation, growth, and profitability (Cooper and Kleinschmidt, 1996; Cooper, 1993). As mentioned previously, other literature states that innovating firms' experience an increase in performance (Tether, 1998; Chapman and Hyland, 2000; Kandampully, 2002; Silverberg, 2002; Tether, 2003; Chung and Kim, 2003; Evangelista and Savona, 2003; Hagedoorn and Cloodt, 2003). Furthermore, Subramanian (1997) reports a positive significant effect between innovation and firm performance in the banking industry.

Throughout literature there are various ways to measure performance often times involving productivity and growth. Grupp and Maital (2000) researched links among innovativeness, sales revenue, the growth in sales revenue and profitability and found innovation is neither a cause nor an effect of growth in sales revenue. Also, empirical analysis by Leiponen (2005) examined business service firms and addressed the share of sales revenue derived from new service innovations. Although, research has shown that measuring performance by means of profit margin is not

always a true measure of performance. Nevertheless, the performance variables for this analysis include: value-added per employee (V.A.P.E.), sales growth, and employment growth.

Addressing one measure of performance, previous research has provided evidence of a positive relationship between innovation and productivity. For example, Mairesse and Mohnen's (2003) research from CIS II data report a positive relationship between product innovation and the level of productivity while no significant impact of process innovations on productivity. Meanwhile, Conceição et al. (2003) found a positive relationship between innovation and the level of productivity, but a negative effect of innovation on productivity growth. Additionally, Evangelista and Savona (2003) report most innovative service firms, who spend more on innovation per employee, and those introducing service innovation are more likely to report a positive impact of innovation on total employment. The above research addresses the importance of productivity for innovative results. However, Love and Roper (2005) found among manufacturing firms, innovation has a strong positive effect on growth, and has a negative effect, although positive lagged effect, on productivity.

As noted above, growth measurements are also used in empirical research to understand firm performance. For example, Johne (1999) states improved and radically changed products are important for long-term business growth. The power of product innovation in helping companies retain and grow competitive position is indisputable (Hart, 1996). Also, Tether's (2003) research on services attempted to link CIS II data with the relationship between innovation and wealth and employment creation. Campbell and Kleiner (1991) offer similar findings for the positive impact of innovation on growth. Freel (2000a) reports innovative SMEs experience greater growth in employment than non-innovators and a positive relationship between product innovation and sales growth. Not only is innovation imperative, but Malewicki and Sivakumar (2004) found innovation management is crucial for growth of firms. Further discussion of these performance topics will be detailed in chapter six. It will be important to connect this review of the literature in order to create a conceptual framework for this thesis' approach.

2.9 Conceptual Framework

The development of the conceptual framework is an important aspect of theory building. As Miles and Huberman (1994) state, a conceptual framework

explains the key factors, constructs, or variables- and the presumed relationships among them. The key to understanding the conceptual framework and its inner workings will build the basis for this thesis. Again, the link between the strategic innovation paradigm, the synthesis approach, and Schumpeter's definition of innovation builds the basis of this conceptual framework. These pertinent aspects of the conceptual framework will now be linked to additional features which will comprise the underlying purpose of this empirical research. This conceptual framework centres on these topics as they relate to business service firms. For a graphical representation of this thesis' conceptual framework refer to Diagram 2.4.

The graphical design will now be explained in a narrative manner. Starting at the top, the diagram begins with the strategic innovation paradigm with an arrow to the synthesis approach. As mentioned above there are numerous benefits to utilising both of these approaches. This entire thesis will ultimately build under this proposed strategic innovation paradigm. Again, the synthesis approach incorporates all major forms of innovation and in this case they will include service and product, organisational, and technological innovation. Next, there is an arrow from these innovations to the term customer-driven, this proposed relationship between the customer and service firm is vital to this research. As previously mentioned, interest is in the either direct or indirect contact between service firms and their customer. Then the diagram shows, once this linkage is achieved it is hypothesised to lead to the creation of service innovation. Once more, innovation as defined by Schumpeter with two additions: technology from his latter work and also service innovation.

The diagram then offers three unique aspects essential for understanding innovation. Firstly, it is vital to understand which factors influence the likelihood of innovation in addition to understanding what impacts the extent of innovation for service firms. Not only is it of relevance whether the customer aids in the creation of service innovation, but also the impact on firm performance. This interaction between the service firm and customer is hypothesised to create service innovation which should potentially lead to an increase in performance. It was noted that prior research had not yet developed a definitive measure of innovation (Nohria and Gulati, 1996). Innovation output has been measured by productivity growth, turnover from new products and patents, however difficulties in measuring service output and service quality contribute to the difficulty to measure the impact of innovation in a service firm (Preissl, 2000). She also notes that empirical research on service innovation

shows that these indicators might give an insufficient and misleading picture of how innovation achievements and potentials of the sector. Nevertheless, performance measures for this research will comprise of three dimensions: productivity (value added per employee), and growth (sales growth and employment growth) (see Murphy et al., 1996).

As the literature shows innovating firms perform better than non-innovating firms and also firms that are customer-oriented, in addition to other aspects, perform better. Additionally, recent literature addresses a need for more knowledge about service innovation; thus, several hypotheses were formulated on the basis of this conceptual framework. Therefore, with the explanation of the diagram almost fully complete, the hypotheses for this empirical research are as follows:

✤ <u>Hypothesis 1a:</u>

> Service firms that are customer-driven in innovation will be more innovative than other service firms.

✤ <u>Hypothesis 1b:</u>

> Service firms that harness customer-driven innovation will be more innovative than service firms who innovate without the aid of customer input.

✤ <u>Hypothesis 2:</u>

> Service firms that harness innovation will perform better than non-innovating service firms.

✤ <u>Hypothesis 3:</u>

> Service firms that harness customer-driven innovation will perform better than non-innovating service firms.

✤ <u>Hypothesis 4:</u>

> Service firms that are customer-driven in regards to innovation will perform better than other service firms that innovate.

At first sight there may appear to be no need for hypothesis three: clearly if support is found for hypotheses two and four then there must also be support for hypothesis three. However, the three performance hypotheses are logically and conceptually, distinct, and it is important to include hypothesis three for completeness

and for data triangulation purposes. In practice, as will become apparent in the empirical chapters, the samples for hypotheses three and four are almost identical; however, this is simply because of the pattern of respondents (specifically the high proportion of innovators in the sample), and does not alter the logical distinctiveness of the hypotheses. Lastly, at the bottom of the diagram, the paradigm in which this research will ultimately build is the strategic innovation paradigm (Sundbo, 1997).

In short, this conceptual framework begins with the synthesis approach under the strategic innovation paradigm. Next, the customer aids in the likelihood and/or extent of innovation for service firms. The suggested outcome of this relationship between firm and customer should ultimately aid in the creation of service innovations. Upon the service innovation coming to fruition, it is hypothesised that this will lead to an increase in firm performance. The next chapter will address the research method and descriptive statistics for this thesis.

Diagram 2.4 The Conceptual Framework

Customer-driven Innovation within U.S. Business Services and its Impact on Firm Performance
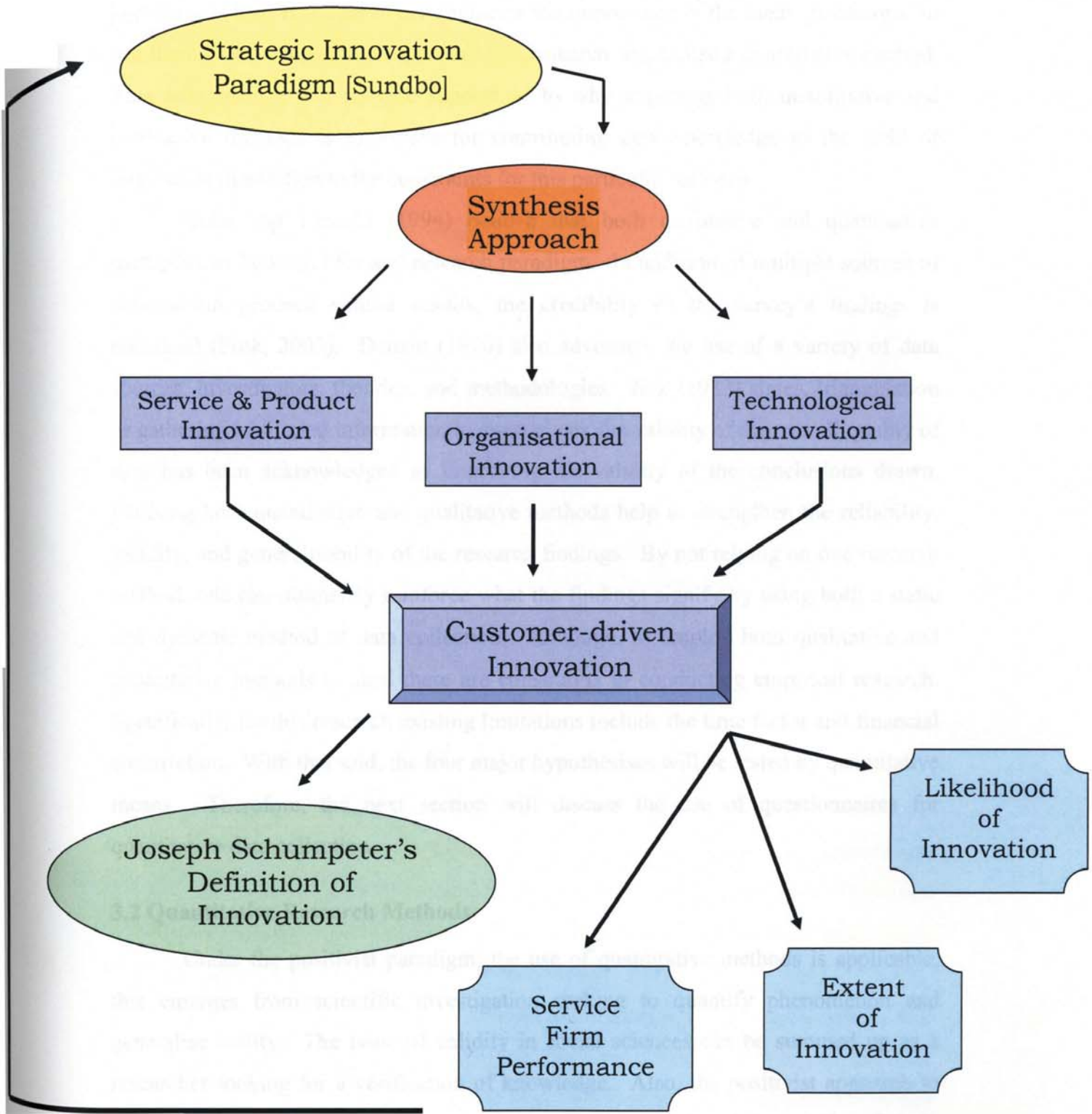
3.1 Introduction

This chapter will introduce the quantitative approach for this research. Later, this chapter will also introduce the descriptive statistics for this data-set. With these hypotheses clear, it is vital to communicate the importance of the methods essential to test them. Under a positivist approach this research will utilise a quantitative method. This next section will provide support as to why exploring both quantitative and qualitative methods is important for contributing new knowledge to the field of innovation in addition to the constraints for this particular research.

Guba and Lincoln (1994) believe that both qualitative and quantitative methods can be useful for any research paradigm. In addition, if multiple sources of information produce similar results, the credibility of the survey's findings is enhanced (Fink, 2003). Denzin (1970) also advocates the use of a variety of data sources, investigators, theories, and methodologies. Jick (1983) states, triangulation or gathering additional information to cross-check the validity of the overall quality of data has been acknowledged as improving the validity of the conclusions drawn. Utilising both quantitative and qualitative methods help to strengthen the reliability, validity, and generalisability of the research findings. By not relying on one research method, one can ultimately reinforce what the findings signify by using both a static and dynamic method of data collection. Although, to employ both qualitative and quantitative methods is ideal there are constraints to conducting empirical research. Specifically, for this research existing limitations include the time factor and financial constriction. With that said, the four major hypothesises will be tested by quantitative means. Therefore, the next section will discuss the use of questionnaires for quantitative data collection.

3.2 Quantitative Research Methods

Under the positivist paradigm, the use of quantitative methods is applicable, this emerges from scientific investigation seeking to quantify phenomenon and generalise reality. The issue of validity in social sciences can be summed up as a researcher looking for a verification of knowledge. Also, the positivist approach to gathering data takes a realist view, meaning that there is less interpretation than in

qualitative research. The aim of quantitative research is to offer generalisability of findings primarily with the use of statistics. The ability to make broader inferences is due to the degree of representativeness of the sample under investigation. Guba and Lincoln (1994) critique the strengths and weaknesses of quantitative methods (refer to Table 3.1). With that said, under a positivist approach, the most appropriate means of collecting primary data for this research will now be discussed in greater detail.

Table 3.1 Strengths and Weaknesses of Quantitative Research

- Disjunction of grand theories with local contexts: the ettic/emic dilemma, in which the outsider (ettic) theory may have little meaning for the insider(emic)

- Exclusion of the discovery dimension in inquiry as hypotheses are determined in advance leads to less creative input

- The theory-ladenness of facts can occur while using the same terminology in hypothesis testing; they can be un-objective as facts are proven within a particular theoretical window.

- Value-ladenness of facts due to using a specific set of values for determining theories leads to theories only being appropriate in a particular value window.

- The un-determination of theory may lead to the problem of induction as the same facts support different theories.

- The interactive nature of the inquirer-inquired into dyad, meaning that the researcher cannot be totally objective and can influence the phenomenon.

3.2.1 Questionnaires

This research utilised self-administered questionnaires, which is a system for collecting from or about people to describe, compare, or explain their knowledge, attitudes, and behaviour (Bourque and Fielder, 2003). The single greatest advantage of self-administered questionnaires is their lower cost as compared with other methods (e.g. telephone or in-person interviews) (Bourque and Fielder, 2003). Nonetheless, there were financial limitations to conducting this research. Thus, this research employed postal surveys as they are the most common form of self-reported data collection (Fink, 2003). Due to the advantages of utilising a questionnaire, the specifics for this research will be further elaborated upon.

3.2.2 The Basis of the Questionnaire

This survey's questions stem from a pre-existing questionnaire from on-going research for Northern Ireland Tradable Services (NIERC) concerning new service and product development initiative (Love and Roper, 2005). The existing self-administered questionnaire has been modified in order to properly test the hypotheses for this empirical research (see Appendix II). For example, the inclusion of organisational and technological developments was important for this research. Questions such as: have you introduced any significant new or improved organisational practices (changes in work practices) that did not include technology and have you introduced any significant new or improved technological driven developments at this business since 2000? were necessary to decipher between the three major types of innovation.

Subsequently, this research is interested in external links; six sources of ideas and/or suggestions are listed and include: strategic alliances or joint ventures, subsidiaries, suppliers, customers, consultancy firms, and competitors. The relevant question here asks: what percentage of new products and services came from ideas and/or suggestions from each of the six external linkages? Important to note is that the percentages under this question grouping did not have to sum to 100 per cent. Under all three sections of innovation, a follow-up question asks, to which extent are the following involved in the development of your business's new or improved developments? Again, the same six links are provided, however, under this question a five-point Likert scale is used (1= very little, 5= very much). Also, two sections of the original NIERC questionnaire were removed including government and EU assistance and the section on e-business. Minor changes were also made in order to better suit the United States respondent such as word usage.

3.2.3 The Questionnaire

In total the questionnaire is three pages long and addresses all three major forms of innovation within service firms. It will be important to address the process and organisational in this innovation research. The question asks: have you introduced any significant new or improved organisational practices (changes to work practices), that did not include technology, at this business since 2000? Although this research is addressing three major forms of innovation under a synthesis approach, one must be aware of the nature of services, as previously mentioned above. More

specifically, there seems to be a predicament when distinguishing between process and organisational innovation. Preissl (2000) states, "In manufacturing 'processes of production' refer to the technical side of what happens in the factory along the assembly line, whereas 'organisation' refers to administration, departmental structures, marketing and logistics" (p. 132). Typically organisational innovations have been referred to as non-technological as firms are often reporting these forms of innovation (Drejer, 2004). Also, organisational innovation is highly firm specific, thus to differentiate between innovations as does the demarcation approach may impede further understanding of all innovation. For example, Helper et al. (2000) illustrates in their study of Japanese manufacturing firms, organisational innovation, closely related to process innovation, was pertinent and included external relational innovation. Other research states that discrepancies exist due to different definitions of process and organisational innovation (Preissl, 2000). Her research found that if both types of innovation are taken together, the results differences are insignificant. Therefore, this questionnaire addressed process and organisational innovation concurrently based on the fact that in services 'organisational' settings are basically 'processes of production'. In accordance with Preissl (2000), it would not seem appropriate to distinguish between 'processes and 'organisation' in service organisation. Thus the research instrument will only inquire about significant new organisational innovation and not new process innovation. Examples of organisational innovation include, but are not limited to: employee proposals, profit/gain sharing, skill-based pay, team based pay, self-managed work teams, and job rotation/cross training. Additionally, a specific question regarding technology driven developments followed. A continuation of the questionnaire utilised in this research will follow.

The survey consists of straightforward questions which asks for responses in an unambiguous way and extracts accurate and consistent information (Fink, 2003)[1]. Questions are primarily close-ended, however a few are open-ended (probing)

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[1] Questionnaires may offer higher reliability if properly designed and implemented, thus they can be an efficient and accurate way of determining information for a given population. Reliability, or the gathering of consistent information by a survey, yields the same information each time it is administered (Fink, 2003). Therefore, the questions for this research are uniform, thus making comparing and contrasting answers easier, ultimately increasing reliability (Kirk and Miller, 1986). It will also be important to avoid leading, catch all, and or double-barrelled questions (Fink, 2003).

depending on the type of data the question is attempting to gather (Fink, 2003). An example of a probing question includes, what is the principal business activity of your company?

Also, this questionnaire has built in cross checks which allow for internal triangulation. Also known as alternate-form reliability, this involves the use of differently worded questions scattered throughout the survey to measure the same attribute. In order to build a richer more reliable picture of data, testing for internal consistency may involve using a range of differently worded questions and then comparing the results. For example, regarding customers, for each of the types of innovation, each section of questions offers a two-tier questioning mechanism. One question is asking what percentage of new developments derives from suggestions and/or ideas from customers. The following question inquires as to what extent customers are involved in the new developments utilising a five-point Likert scale (refer to Appendix II). With the explanation of the research instrument complete, these next sections will address pre-testing and pilot testing the questionnaire.

3.2.4 Pre-testing

An initial pre-test was conducted prior to the pilot test. Pre-testing helps to determine the potential effectiveness of the questionnaire and also identify fundamental problems (Diamantopoulos et al., 1994). Because the questionnaire stems from a pre-existing source, there was a brief pre-test of the newly altered questionnaire. The revised edition of the questionnaire, as it specifically relates to this research, was pre-tested with six colleagues who are currently doing research at Aston Business School. Minor suggestions were provided, thus adequate changes were made. Minor changes to the questionnaire included changing a few of the wordings that are more common in the United Kingdom and not so common in the United States. Once the grammatical changes were made, questionnaire was ready for the pilot test. The pilot test allows for further refinement of the research instrument.

3.2.5 Pilot Testing

In the next stage of pre-testing, a pilot test of the questionnaire was conducted in order to identify any discrepancies thus formalising a more reliable measurement instrument. A pilot test of the questionnaire was administered with ten or more

people who are similar to those who will be participating in the survey (Bourque and Fielder, 2003).

Therefore, upon returning to the United States, the questionnaire was administered to twenty-five different service firms. These firms were conveniently and locally selected within the Dallas/Fort Worth metropolises. After two-and-a-half weeks fourteen of the questionnaires were returned. The total number of responses returned represented a 56 per cent response rate. Although the pilot test was administered as a convenience sample, the response rate was used as a rough guide for the actual launch of over 3,000 questionnaires. The specific details of this launch will be discussed in the next section, however changes made after the pilot test will be mentioned first.

After the pilot test results were analysed, again, minor revisions of the survey instrument were made. One specific example which stems from the pilot testing phase of this research comes from a warehousing organisation. This questionnaires' respondent did not have an R&D department or undertake any R&D activities; however he or she was capable of answering all of the other questions. The R&D section of the questionnaire, which consists of only five questions, the first one asking if there was any R&D undertaken in 2003, could possibly come back blank due to the nature of many service organisations. It was only after the fourteen responses were returned that this possibly reoccurring aspect of the questionnaire was brought to the surface.

Aside from the R&D portion on the questionnaire, all of the respondents were able to answer the questions. It was fairly clear that the questionnaire was capable of gathering the needed information. Again, the questionnaire has three areas which possess questions with a five-point Likert scale answering devise. The Likert 1-5 scale seemed easily understood by respondents as the answers were not centrally concentrated. Lastly, simple punctuation errors were corrected and it was at this point in the development of this research, after a two-stage pre-testing process, the questionnaire was ready for launch. Additionally, since almost the entire questionnaire had already been utilised, by NIERC, greatly strengthens the reliability. Thus, it was decided that further pre-testing of the questionnaire would not bring any new changes.

3.2.6 Implementation

Thus, after the pre-testing and pilot testing were complete, it will be important to address various topics relating to quantitative data collection. Clear and definite eligibility criteria, rigorous sampling methods, justifiability of sample size, and adequate response rate are all essential when administering a questionnaire (Fink, 2003). Each of these aspects will now be addressed.

Mail surveys offer three sampling related advantages such as: wider geographic coverage, larger samples, and wider coverage within the sample population (Bourque and Fielder, 2003). Sampling essentially refers to the process of selecting a group or a subgroup from a larger population with similar characteristics. The purpose of sampling is to then apply the findings to the general population. For the purpose of this particular research non-probability sampling will not only be appropriate but feasible.

3.2.7 The Database

Dunn & Bradstreet obtains their information from impartial third-party businesses and government sources. They then supplement the database with the information obtained through millions of interviews with business owners and managers. A few Dunn & Bradstreet information resources include: all federal bankruptcy filing locations, all U.S. secretaries of state, millions of trade experiences telling us how individual businesses are paying their bills, millions of bank experiences, public utilities, The U.S. Postal Service, over 2,500 state filing locations, daily newspapers, publications and electronic news services. Also, Dunn & Bradstreet is the only global business information provider that collects financial statements on both publicly and privately held companies.

U.S. businesses are arranged by Standardized Industrial Classifications (SIC) codes, for example SIC 73 specifically isolates business service firms. Within this SIC grouping firms are then allocated a number for more detailed sectoral information. Most commonly, a four-digit SIC code is used to differentiate between firms within the main SIC. In other words, all business service firms will begin with the two-digit number starting with 73. Thus, the sample deriving from the Dunn & Bradstreet database is representative of the United States service industry. Important to quickly note the United States government changes, in 1997, from SIC to NAICS

(North American Industry Classification System), thus they will be used interchangeably.

Nevertheless, respondents to this questionnaire were selected from SIC code 73 from the purchased Dunn & Bradstreet database. Under SIC code 73 there are 32 different groupings. Dunn & Bradstreet provides information for all of the 32 different sub-sectors under business services. Returned responses from three categories proved to be the most numerous and include:

- Computer Services and Products
- Business Services (not included elsewhere)
- Advertising Services

The database provides detailed information for each customer such as: organisation's name, address, contact name, contact title, line of business, Dun & Bradstreet number, primary SIC number, etc. In total the sample from Dunn & Bradstreet, for those business service firms with a SIC code of 73, is 3,909. Almost all of the business service firms were contacted via the postal survey as over 3,000 questionnaires were mailed. From a total of 32 groupings, in total the returned questionnaires represented 24 different SIC codes. Therefore, eight SIC categories were not represented in the returned sample and include: (7313) radio, television, and publishers' advertising representatives, (7334) photocopying and duplicating services, (7335) commercial photography, (7338) secretarial and court reporting services, (7377) computer rental and leasing, (7378) computer maintenance and repair, (7383) news syndicates, and (7384) photofinishing laboratories. These eight SIC categories only represent 2.94 per cent of the Dunn & Bradstreet database. In other words, 97.06 per cent of the entire Dunn & Bradstreet's SIC 73 business services were represented in this sample.

The category with the largest number of returned responses was computer services and products, with 32 per cent of the total number, and contains seven different categories: (7371) computer programming services, (7372) pre-packaged software, (7373) computer integrated systems design, (7374) computer processing and data preparation and processing, (7375) information retrieval services, (7376) computer facilities management services, and (7379) computer related services.

3.2.8 Conducting Research with Validity

The target responder includes upper to senior level management as they will be knowledgeable in answering all of the questions. A very professional launch of this research was essential. A cover letter on Aston University stationary and letterhead accompanied the questionnaire in order to increase the credibility of the project thus the response rate (Bruvold and Comer, 1998). The cover letter provided pertinent information regarding the study's purpose, instructions, and contact information (refer to Appendix III). Of course the issue of confidentiality or anonymity has also been addressed in the cover letter (Bourque and Fielder, 2003). Also, each cover letter was personally hand signed. Furthermore, envelopes were stamped with a second class postage stamp (sixty cent) and also the questionnaire will come with a self-addressed and stamped envelope (thirty-two cent). No monetary incentive was given for participation in this study.

With regard to external validity, a drawback to administering industrial mail questionnaires is the relative low response rate (Erdogan and Baker, 2002; Jobber et al., 2004). No single response rate for mail questionnaires is set as a standard; however, no greater than a 20 per cent response rate can be expected (Bourque and Fielder, 2003). Due to an anticipated low response rate, a sample of over 3,000 business service companies was selected from the database. Often the larger the sample size the greater the results will be statistically significant and reliable. In order to control for non-response bias obtaining a large sample may help, although many times the accuracy of the sample is more important than the sheer number of respondents. The issue of increasing response rate is critical and is further discussed in Table 3.2. Each of the suggested factors for influencing response rate were utilised in this thesis and will be further discussed below (Churchill, 1999; Diamantopoulos and Schlegelmilch, 1996).

Table 3.2 Factors Influencing Response Rate

Personalised (e.g. hand-signed letter and post card)
Assurance of anonymity and confidentiality
Interesting topic and not sensitive or controversial in nature
Appeals (e.g. social utility, altruism)
Non-monetary incentive (e.g. brief summary of findings)
Simplicity of questions and layout
Stamped address return envelope
Follow-ups

Spector (1992) states that at least 100 to 200 cases are necessary to adequately assess the reliability and validity of the measures. Initially, there was an estimated response rate above 10 per cent, however the actual response rate for the service and product initiative questionnaire ended up being 6.56 per cent from a total number of 3,140 mailed surveys. There was a preset aim for slightly over 200 responses due to the fact that every one of them will not be usable, possibly due to numerous blank answers. This was the case as seven questionnaires were not suitable for analysis and were discarded. So, in essence the response rate including both usable and unusable returned questionnaires was 6.78 per cent (or 6.56 per cent for only the usable questionnaires). In total 206 useable responses were received.

Again due to the possibility of lowered or delayed responses received from distributing questionnaires by postal mail, a follow-up method was utilised. After administering the questionnaire, to follow-up with potential non-respondents, a post card reminder was mailed nine days after the questionnaire was posted (Diamantopoulos and Schlegelmilch, 1996; Harvey, 1987). Again, the post cards summarised the criticalness of their response and was also be personally signed (see Appendix IV). This particular method did not prove successful as many times the questionnaire was thrown away and thus the postcard reminder did not aid in increasing the response.

Oftentimes undeliverable or 'return to sender' envelopes were received. A total of 32 were returned. In order to verify for non-response error from the various business services under SIC code 73, a through check of the actual responses received were compared with both the unusable responses and the undeliverable questionnaires. It is important that the returned questionnaires are representative of the population. Table 3.3 displays a sub-sectoral distribution of population and sample. After completion of this analysis no sectoral bias was found concerning the Dunn & Bradstreet SIC 73 database and the responses to the questionnaire. As noted in Table 3.3, the four categories are: computer services and products, business services (not included elsewhere), advertising services, and other. It is apparent that the sectoral breakdown of the sample is very close to the Dunn & Bradstreet population.

Table 3.3 Population Distribution

Industry Indicators-SIC/NAICS codes	Dunn & Bradstreet (% of firms)	Actual Responses (% of firms)
Computer Services & Products	27.9	32.0
Business Services (NEC)	15.9	19.9
Advertising Services	8.2	7.8
Other	47.9	40.3
Total	100	100
χ^2 (3 df)	6.01	
p-value	0.111	

Additionally, in order to counter balance for non-response error, a comparison was made to evaluate those who did respond with those who did not. Each questionnaire was explicitly marked with a firm identification number on the back corner in small print, containing a direct link back to the Dunn & Bradstreet database. This numbering devise was utilised in order to later identify respondents. The next topic of interest is data analysis.

3.2.9 Data Analysis

Once the questionnaires were received, data was entered and cleansed with the addition of a codebook (Fink, 2003). More specifically, steps in describing data

include: ranking and sorting into categories, grouping data, defining sub-groups, graphs and other diagrams, measures of central tendency, and measures of dispersion and variability. Also, important is validity which refers to the survey instrument's ability to measure what it is intended to measure while providing correct information (Litwin, 1995). Therefore, preliminary steps for data validation and cleaning include simple frequency counts or simple descriptive analysis and checks for outliers will also be performed (Blaikie, 2003).

Additionally, statistical tests aid in checking for validity and include concurrent or predictive validity. Data was subject to cross comparisons, multiple regressions, and a proper analysis of the responses to the open-ended questions will take place. Quantitative data, with the aid of statistical techniques such as uni-variate regression, Probit and Tobit with truncation analysis were utilised in order to predict the probability of a firm being innovative in addition to predict the likelihood of being innovative (see chapter 4). The remaining hypotheses dealing with performance will use ordinary least squared (OLS) regression. It will now be appropriate to discuss the descriptive statistics for this research.

3.3 Introduction: Descriptive Statistics

This section describes new data-set, basic descriptive indicators of business service firms are shown in Table 3.4. A brief mention of the findings for this stage of the analysis will follow. Firstly, there is considerable variation in terms of size, so for comparison purposes, the total of all firms which responded to the questionnaire are shown. The total number of respondents who replied to the new service and product development initiative is 206. Then the sample is split into small-to-medium sized enterprises SMEs, (for this purpose firms with less than 500 employees) and large firms (those with more than 500 employees). The distribution is fairly equal as SMEs make up 46 per cent of the respondents while large firms are 54 per cent.

3.3.1 Internal Resource Indicators

It will first be imperative to note that due to a low response rate and the use of sub-samples will nevertheless have some implications on the findings. Referring to Table 3.4, the internal resource indicators will be discussed first. Average firm size is 13,611 employees, while SMEs have an average of 113 and large firms 25,042 respectfully. Overall, 40 per cent of the service firms have a workforce with a bachelor's degree or higher. Also, when associates degree is combined with

bachelor's degree, the percentage is 51. Similarly, for SMEs and large firms, the level of qualification for employees is quite high.

Next, regarding R&D activity, over half of all firms do participate in either formal or informal R&D. Of those service firms that did partake in R&D, 93 per cent did introduce new or improved service and product, 55 per cent did introduce organisational changes, and 70 per cent introduced significant new or improved technological developments. For large firms' participation in R&D is 69 per cent while SMEs participation is lower at 40 per cent.

More specifically, service firms with a formal R&D department are 34 per cent. More than twice as many large firms, in comparison with SMEs, have an in-house R&D department. Specifically, of the service firms with a formal R&D department, 94 per cent introduced new or improved services and products since 2000, 57 per cent did experience organisational changes, and 69 per cent did introduce technological developments. These findings are not surprising as technology driven developments usually are R&D intensive.

Regarding intensity, measured as a percentage of employment, SMEs are reporting a higher level of intensity than large firms. Not surprisingly, SMEs have considerably less R&D employees in comparison with large firms; however R&D expenditures for SMEs are drastically higher (see Table 3.4). Overall, six per cent of service firms do outsource R&D; large firms' buy-in R&D expenditure is over twice that of SMEs. Continuing with the descriptive statistics, other plant characteristics will follow.

3.3.2 Other Service Firm Characteristics

The average age of the firms is 36 years, not unexpectedly large firms' average age is higher than SMEs. Only one per cent of the service firms are owned by firms outside of the United States. Thus, the findings from this data-set are predominantly for generalisations in support of US service firms. Next, Table 3.4 shows the type of business offering and includes: services and products customised to individual customers (39 per cent), tailored to specific customer groups (35 per cent), suitable for large customer groups (30 per cent), or standardised services and products (25 per cent). The percentages for each of the four categories of offerings are fairly evenly distributed. Also, note the total does not sum to 100 per cent, as 16 per cent of the service firms did tick more than one type of offering. Innovative activity is an important aspect of this research thus the descriptive statistics will follow.

3.3.3 Innovative Activity

Again, this research, under a synthesis approach, is addressing three types of innovation, namely service and product, organisational changes (without technology), and technology driven developments.

Firstly, 34 per cent of all service firms did report innovative efforts in all three areas of innovation since 2000. Innovative efforts are found equally in SMEs and large service firms as 40 per cent did innovate in one (or more) of the three innovative categories.

Specifically addressing service and product innovation, 79 per cent of the service firms did introduce new or improved services or products (refer to Table 3.4). The inclination to innovate for SMEs and large firms are quite close in proximity.

Regarding the introduction of organisational innovations slightly less than half (45 per cent) of all service firms did so. Again, there is little difference in the results for SMEs and large service firms.

Sixty-two per cent of the service firms did introduce new or improved technological innovations. Here, 54 per cent of SMEs report the introduction of new or improved technological innovations while large service firms report 69 per cent.

As mentioned previously, six external sources of ideas and/or suggestions are listed and include: strategic alliances or joint ventures, subsidiaries, suppliers, customers, consultancy firms, and competitors. As an open-ended question, respondents were asked to allocate the percentage of ideas and/or suggestions that were developed by these six options. The percentages could range from zero to 100 per cent. The sum of the involvement did not have to equal 100 per cent as other sources of innovation do exist, for example a service firm's internal sources. Additionally, for each of the three types of innovation, a follow-up question asks, to which extent are the following involved in the development of your business's new or improved developments? Again, the same six links are provided, however, under this question a five-point Likert scale is used (1= very little, 5= very much). This aspect will become more significant when addressing hypothesis four.

3.3.4 External Linkages

It will be important to discuss the initial findings concerning the six external linkages. Bryson (1997) states ideas and innovations flow horizontally within the firm as well as from either formal or informal relationships with external agents. Firstly, when addressing all service firms, customers clearly are the most utilised

external linkage on average 23 per cent of ideas and/or suggestions come from customers (see Table 3.4). The next most common external link is strategic alliance or joint ventures with 13.3 per cent for all service firms. Clearly large service firms undergo strategic alliance or joint ventures more frequently than SMEs. Competitors are the third most popular external linkage representing 10.5 per cent for all innovative service firms. The next external linkage of interest is suppliers; interestingly SMEs report significantly higher links with suppliers as compared to large service firms. The findings for this research support those of Bourgrain and Haudeville (2002) who report access to external linkages for innovation is believed to be crucial for SMEs competitiveness. Consultancy firms are utilised more by large innovative service firms, although comparing this link to the others it is less frequently utilised. With that said, subsidiaries are the least frequent external linkage used by innovative service firms. Not surprisingly large innovative service firms' link on average more with subsidiaries as compared with SMEs. This is interesting as subsidiaries, unless wholly-owned, share the same corporate management scheme. The particular order of all of these findings holds true for SMEs in addition to large service firms. The extent of these external linkages will follow.

3.3.5 Extent of Involvement

The extent of the six external linkages' involvement will now be briefly discussed. In this aspect, the modes in Table 3.4 stem from the five-point Likert scale provided for each of the external linkages. Regardless of service firm size, it is apparent that innovative service firms, regardless of size, are highly involved with their customers. This finding is interesting considering the extent of innovative service firms which maintain highly involved relations with customers. Thus, the findings do support being to some extent involved with all external linkages.

3.3.6 Performance Indicators

Performance indicators are an important aspect of the descriptive statistics. Beginning with export propensity, as a percentage of sales, for service firms is 13 per cent. For SMEs their export propensity is nine per cent and for large service firms it is twofold at 17 per cent. Service firms with exports outside of the US equates to 48 per cent. Not to mention, of these service firms, 18 per cent report half or more of their total sales a result of exporting.

Next, profit margin brings about some interesting findings for SMEs as they report nearly a 23 per cent profit margin. Meanwhile, for large service firms their profit margin was significantly lower at approximately three per cent.

Another performance indicator in this analysis is employment and sales growth. Firstly, SMEs did experience a much greater employment growth in comparison to large service firms (see Table 3.4). Similar results for SMEs' sales growth are present as their growth is 45 per cent. Large service firms did experience a 26 per cent sales growth. Additionally, value-added per employee (V.A.P.E) results for SMEs show a considerable amount at 7 per cent, meanwhile large firms only experienced a .1 per cent V.A.P.E. The final aspect of Table 3.4 relates to the representativeness of the various sectors under the SIC code 73.

3.3.7 Industry Indicators

Again, the respondents to this questionnaire were selected from SIC code 73 from the Dunn & Bradstreet database. After the data-set was constructed, three main sectors were devised along with an 'other' category to encapsulate the remaining sectors. To begin with, responses were highest from computer services and products with 32 per cent. Next, responses from business services equal slightly more than 20 per cent and advertising equals 5.3 per cent.

Lastly, not included in Table 3.4, is the section of the questionnaire enquiring whether the service firm has a formal plan for the development of their business over the next three years. Of the total responses, 64 per cent of the respondents do have a formal development plan. More specifically, of these service firms that do have a formal plan, 88 per cent did introduce new or improved services or products. Additionally, 56 per cent introduced organisational change while 46 per cent introduced significant new or improved technological driven developments.

Table 3.4 Descriptive Statistics

Findings from the United States (Year 2003)

Number of Observations	206		SMEs^ 95		Large Firms^^ 111	
Internal Resource Indicators						
Plant Size (employment mean)	13,611	(39864.36)	113	(137.90)	25,042*	(51571.44)
Workforce with Bachelor's Degree (% mean)	40.3	(32.52)	44.2	(35.73)	37.1	(29.26)
Workforce with Bachelor's & Assoc. Degree (% mean)	50.6	(32.99)	52.3	(35.72)	49.1	(30.55)
Workforce with no post education (% mean)	6.3	(15.98)	7.2	(18.80)	5.6	(13.14)
R&D Activity in 2003 (% of firms)	55.6	(0.498)	40.4	(0.493)	68.5*	(0.467)
R&D Dept. in Firm (% of firms)	34.3	(0.476)	17.2	(0.379)	48.7*	(0.502)
R&D Intensity (% employment)	3.6	(11.49)	4.7	(12.64)	2.6	(10.24)
R&D Employees (number)	43.1	(133.32)	2.6	(6.83)	82.0*	(178.45)
Total R&D Expenditure (mean)	$53M	(296950300.78)	$257K	(973629.96)	$99M*	(39802000.0)
R&D Expenditure (% of sales revenue)	13.0	(140.48)	26.4	(206.52)	1.4	(6.31)
Buy-in R&D Expenditure (% of firms)	5.5	(15.69)	3.1	(11.21)	7.6*	(18.49)
Other Service Firm Characteristics						
Age (in years)	36.3	(39.26)	17.2	(14.18)	52.7*	(45.96)
Owned Outside U.S. (% firms)	1.0	(0.154)	1.0	(0.144)	1.0	(0.163)
Customised Offerings for Individuals	39.3	(0.490)	38.0	(0.488)	40.5	(0.493)
Tailored Offerings for Groups	35.4	(0.479)	34.7	(0.479)	36.0	(0.482)
Suitable for Large Customer Groups	30.0	(0.460)	24.2	(0.431)	35.1	(0.480)
Standardised	25.4	(0.435)	19.0	(0.394)	30.6*	(0.463)
Other	16.2	(0.368)	11.6	(0.322)	19.8*	(0.400)

Number of Observations	206		SMEs^ 95		Large Firms^^ 111	
Innovative Activity						
Service & Product Innovation (% firms)	79.1	(0.407)	71.6	(0.453)	85.6*	(0.353)
New S&P Introduced for the 1st time	13.0	(19.80)	12.5	(21.58)	13.3	(18.22)
Newly Introduced S&P (previously provided by other firms)	8.7	(16.01)	10.0	(19.45)	7.7	(12.35)
Improved Service or Product	19.6	(26.29)	17.0	(26.88)	21.8	(25.69)
Unchanged Service or Product	59.0	(37.02)	61.0	(38.70)	57.6	(35.63)
Organisational Innovation (% firms)	44.7	(0.498)	42.1	(0.496)	46.9	(0.501)
Technological Innovation (% firms)	61.7	(0.487)	53.7	(0.501)	68.5*	(0.467)
External Linkages						
Percentage of ideas and/or suggestions (Service & Product)						
- Strategic Alliance or Joint Venture	13.3	(22.95)	11.3	(22.62)	15.0	(23.19)
- Suppliers	8.0	(16.00)	9.5	(18.05)	6.7	(13.97)
- Subsidiaries	4.0	(10.63)	1.5	(4.84)	6.0*	(13.48)
- Customers	23.0	(27.05)	23.2	(29.85)	22.8	(24.54)
- Consultancy Firms	4.6	(10.33)	2.9	(7.91)	6.0*	(11.87)
- Competitors	10.5	(18.34)	11.0	(19.34)	10.4	(17.52)
Percentage of ideas and/or suggestions (Organisational)						
- Strategic Alliance or Joint Venture	13.1	(21.92)	10.6	(20.50)	15.1	(22.96)
- Suppliers	7.0	(11.81)	10.8*	(14.60)	3.8	(8.01)
- Subsidiaries	9.0	(20.16)	6.0	(17.13)	11.3	(22.11)
- Customers	22.1	(24.00)	21.0	(21.13)	23.0	(26.16)
- Consultancy Firms	14.0	(20.70)	11.3	(18.94)	16.1	(21.90)
- Competitors	11.0	(17.56)	15.6*	(22.41)	7.5	(11.73)

External Linkages (continued)

	206	SMEs^ 95	Large Firms^^ 111
Number of Observations			
Percentage of ideas and/or suggestions (Technological)			
- Strategic Alliance or Joint Venture	13.8 (22.97)	12.3 (25.13)	14.9 (21.51)
- Suppliers	11.1 (18.57)	13.3 (24.37)	9.6 (13.33)
- Subsidiaries	6.3 (14.72)	1.86 (6.08)	9.3* (17.80)
- Customers	23.3 (27.50)	19.2 (25.37)	26.1 (28.66)
- Consultancy Firms	11.7 (21.79)	12.6 (27.63)	11.1 (16.96)
- Competitors	13.2 (18.07)	14.7 (20.65)	12.2 (16.20)

Extent of Involvement

Service & Product Innovation (mode)	206	SMEs^ 95	Large Firms^^ 111
- Strategic Alliance or Joint Venture	1	1	1
- Suppliers	1	1	1
- Subsidiaries	1	1	1
- Customers	5	5	5
- Consultancy Firms	1	1	1
- Competitors	1	1	1

Organisational Innovation (mode)	206	SMEs^ 95	Large Firms^^ 111
- Strategic Alliance or Joint Venture	1	1	1
- Suppliers	1	1	1
- Subsidiaries	1	1	1
- Customers	4	4	4
- Consultancy Firms	1	1	1
- Competitors	1	1	1

	206		SMEs^ 95		Large Firms^^ 111	
Number of Observations						
Extent of Involvement (continued)						
Technological Innovation (mode)						
- Strategic Alliance or Joint Venture	1		1		1	
- Suppliers	1		1		1	
- Subsidiaries	1		1		1	
- Customers	4		4		5	
- Consultancy Firms	1		1		1	
- Competitors	1		1		1	
Performance Indicators						
Export Propensity (% sales)	13.1	(23.31)	9.0	(23.30)	16.7*	(22.83)
Profit Margin (%)	11.8	(159.33)	22.7	(78.67)	2.6	(2.04)
Employment Growth	19.0	(51.23)	22.9	(63.04)	15.6	(38.35)
Value Added Per Employee (V.A.P.E.) (%)	3.5	(8.67)	7.4*	(11.52)	0.1	(0.072)
Sales Growth (%)	35.0	(81.61)	45.2*	(102.70)	26.0	(56.82)
Industry Indicators- SIC/NAICS codes (% firms)						
Computer Services & Products	32.0					
Business Services (NEC)	19.9					
Advertising Services	7.8					
Other	40.3					

Notes: ^Firms with less than 500 employees (not necessarily independently owned), ^^ Firms with 500 or more employees
* Indicates statistical significance at 0.05
Standard deviations presented in parentheses

4.1 Introduction

This chapter will provide a uni-variate analysis of the hypotheses. This uni-variate analysis only enquires about the correlation between variables, thus this analysis is unable to say anything about the direction of causality. Thus this introduction into the innovative analysis is merely a step toward multi-variate analyses. A brief mention of the structure of this research will aid in understanding this stage of the analysis. The analysis is divided into three groups, for comparison purposes, the total of all firms which responded to the questionnaire and then into small-to-medium sized enterprises SMEs, (for this purpose firms with less than 500 employees) and large firms (those with more than 500 employees). Important to note here is that for the purpose of this research SMEs are not necessarily independently owned. There are a total of 95 SMEs which responded to the questionnaire and 111 large firms. Since there are three types of innovation: service and product, organisational, and technological each type is isolated for examination.

4.2 The Hypotheses

The hypotheses primarily focus around two key areas: predominantly business performance in addition to the degree of innovativeness. Johne (1999) states a fundamental purpose of innovation is to improve business performance; therefore three distinct hypotheses will further enquire into business performance. As stated in chapter two, for the purpose of this initial analysis, performance measures will include: value-added per employee (V.A.P.E.), profit margin, sales growth, and employment growth. The table below clearly displays the various hypotheses for this research.

Table 4.1 The Hypotheses

Hypothesis 1a	Service firms that are customer-driven in innovation will be more innovative than other service firms.
Hypothesis 1b	Service firms that harness customer-driven innovation will be more innovative than service firms who innovate without the aid of customer input.

Hypothesis 2	Service firms that harness innovation will perform better than non-innovating service firms.
Hypothesis 3	Service firms that harness customer-driven innovation will perform better than non-innovating service firms.
Hypothesis 4	Service firms that are customer-driven in regards to innovation will perform better than other service firms that innovate.

Again, these hypotheses stem from the conceptual framework which was presented in the literature review chapter. An understanding of what exactly customer-driven innovative firms are will be essential (refer to section 2.7 and 2.8). It will now be important to discuss the questionnaire, as noted above, is divided into three segments for each type of innovation. Under each type of innovation the questionnaire enquires: what percentage of your business's new services or products derive from suggestions and/or ideas from the following: strategic alliances or joint ventures, subsidiaries, suppliers, consultancy firms, competitors, and/or customers? The latter aspect of the customer is of substance pertaining to this research. Those respondents which denote any percentage of suggestions and/or ideas stemming from their customer are consequently customer-driven service firms. The percentages allocated to these external sources did not have to sum to one hundred per cent as it was acknowledged that other sources could also be utilised, although not applicable for this particular research. Subsequently, the same question is also enquired for organisational practices in addition to technology based developments. Additionally, for each innovation type, a follow up question enquires into the extent of association with the subsequent external links. Unlike above, this section is interested in the extent of involvement providing a Likert five-point scale (1= very little, 5= very much). Now an explanation of any patterns of effects described using relative t-test and means of the uni-variate findings will begin with hypothesis one.

4.3 Hypothesis One

This particular hypothesis concentrates on the degree of innovativeness, while the remaining hypotheses are interested in the impact of innovation on firm performance. Hypothesis one is two-fold in order to attempt a better understanding of

a business service firm's innovation. Once more the breakdown of the hypothesis is as follows:

❖ Hypothesis 1a:

> Service firms that are customer-driven in innovation will be more innovative than other service firms.

❖ Hypothesis 1b:

> Service firms that harness customer-driven innovation will be more innovative than service firms who innovate without the aid of customer input.

Essentially hypothesis 1a is addressing all innovating service firms; however the distinction falls between those innovating firms which utilise their customer's input and those that do not. It is important to mention hypothesis 1a may not be a fair test because it is including all non-innovators. On the other hand, hypothesis 1b is specifically comparing, among all innovators, those that are customer-driven to those which do not utilise their customer. Fundamentally, hypothesis 1b is attempting to decipher between firms that nevertheless do partake in innovation. Measures for determining these levels of being more innovative include the percentage of current sales (by value) that consist of: new services and products introduced to the market for the first time, new services and products introduced by this business but previously provided by other firms, improved services and products, and lastly the sum of all three. Also, important to note is that this particular question is relevant only for service and product innovations. The specific uni-variate findings for hypothesis 1a and 1b will follow.

4.3.1 Service & Product Innovation

The findings for hypothesis 1a show an overwhelming positive effect for all customer-driven innovative service firms (refer to Table 4.2). You will note regardless of the categorisation of innovation there is significance. Specifically there is high significance for customer-driven SMEs which introduce new to the business innovations that are previously provided by other firms. On the other hand, there is great significance for customer-driven large firms which introduce improved services and products to the market. Therefore based upon the uni-variate findings for hypothesis 1a, there is a great deal of support for customer-driven service firms being

more innovative than those service firms. Next, the findings for hypothesis 1b will be presented.

Table 4.2 Hypothesis 1a

Total Number of Observations	All Firms 206		SMEs 95		Large Firms 111	
	t-test	Mean (%)	t-test	Mean (%)	t-test	Mean (%)
Service & Product Innovation						
Intro. to Market for First Time	3.18***		2.12***		2.35***	
Customer-driven Innovators		15.9		16.3		15.6
Other (not c.driven + non-innov.)		6.7		6.9		6.4
New to Bus., Previously Provided	4.08***		3.76***		2.01***	
Customer-driven Innovators		11.7		15.7		9.0
Other (not c.driven + non-innov.)		2.3		1.3		3.7
Improved Services/Products	4.54***		1.96*		4.41***	
Customer-driven Innovators		25.1		21.4		27.7
Other (not c.driven + non-innov.)		8.1		10.5		4.8
SUM of Above	7.17***		4.74***		5.33***	
Customer-driven Innovators		52.7		53.3		52.3
Other (not c.driven + non-innov.)		17.1		18.7		14.9

Notes: Significant at *** 1%, **5%, *10%

Next, it will be important to discuss the findings for hypothesis 1b (see Table 4.3). Again, in comparison to hypothesis 1a, this aspect of the hypothesis is isolating all innovators for analysis in order to identify any differences. Actually, it is only when differentiating between SMEs and large service firms that any significance is found. For instance, when addressing innovative large firms, it is apparent that being customer-driven is significant for introducing improved service and products. Additionally, there is a positive customer-driven effect for the sum of all large innovative service firms. To conclude, there is some support for hypothesis 1b as it is evident that among innovators, there is a positive effect for large customer-driven service firms. However, it is important to note that an overwhelming customer-driven effect is apparent when comparing innovators with non-innovators as is the case with hypothesis 1a. A discussion of the remainder hypotheses, which analyse the impact of innovation on performance, will follow.

Table 4.3 Hypothesis 1b

	All Firms		SMEs		Large Firms	
Total Number of Observations	163		68		95	
	t-test	Mean (%)	t-test	Mean (%)	t-test	Mean (%)
Service & Product Innovation						
Intro. to Market for First Time	-0.70		-0.95		0.10	
Customer-driven Innovators		15.9		16.3		15.6
Not Customer-driven		19.2		23.7		15.0
New to Bus., Previously Provided	1.31		1.57		0.11	
Customer-driven Innovators		11.7		15.7		9.0
Not Customer-driven		6.7		4.5		8.6
Improved Services/Products	0.31		-1.57		2.10***	
Customer-driven Innovators		25.1		21.4		27.7
Not Customer-driven		23.2		36.4		11.1
SUM of Above	0.48		-0.98		1.70*	
Customer-driven Innovators		52.7		53.3		52.3
Not Customer-driven		49.0		64.6		34.7

Notes: Significant at *** 1%, **5%, *10%

4.4 Hypothesis Two

Unlike hypothesis one, the following hypotheses are interested in service firm performance, specifically the impact of innovation on firm performance. Thus, another mention of hypothesis two:

❖ Hypothesis 2:

> Service firms that harness innovation will perform better than non-innovating service firms.

For comparison purposes, this hypothesis is strictly addressing those firms that innovate versus those that do not partake in innovation. Once more, the factors which determine performance at this level of analysis include: V.A.P.E., profit margin, sales growth, and employment growth (in latter analyses profit margin will not be utilised). The tables in this section will be divided into three sections according to the subsequent innovative efforts: service and product, organisational, and technological. First service and product initiatives will be of interest.

4.4.1 Service & Product Innovation

Of the total number of respondents, 163 innovate by way of service and product introductions. Referring to Table 4.4, the findings for V.A.P.E. of SMEs is

quite larger than that of larger service firms. There is a significant difference regarding an increase in sales growth favouring all service firms and SMEs that innovate with new or improved service and product versus non-innovating service firms. This increase in sales growth derives from the previous four years for the business. Due to the fact that large firms are not experiencing any magnitude of sales growth, the significance for all firms is evidently an effect of SMEs. There is also support concerning innovative SMEs regarding higher profit margin in addition to the report of higher sales growth. Thus, on the basis of these measurements, there is support that innovative SMEs will perform better than non-innovating service SMEs. The next analysis under hypothesis two involves organisational innovations.

Table 4.4 Hypothesis 2: Service & Product Innovation

	All Firms		SMEs		Large Firms	
Total Number of Observations	206		95		111	
	t-test	Mean (%)	t-test	Mean (%)	t-test	Mean (%)
Service & Product Innovation						
V.A.P.E.	0.49		0.72		0.43	
Did Innovate		1,157,971		2,448,484		197,590
Did not Innovate		612,470		891,227		147,875
Profit Margin	0.32		2.18***		-0.41	
Did Innovate		13.7		33.3		-0.9
Did not Innovate		4.1		-9.1		22.5
Sales Growth	1.87*		2.11***		0.41	
Did Innovate		40.3		59		27
Did not Innovate		14.3		10.6		20.6
Employment Growth	1.08		1.33		0.04	
Did Innovate		20.9		28.3		15.7
Did not Innovate		11.5		9.3		15.3

Notes: Significant at *** 1%, **5%, *10%

4.4.2 Organisational Innovation

SMEs that innovate by way of organisational developments experience higher sales growth in comparison to service firms which do not innovate (see Table 4.5). Similar to above, the SME effect is prevalent with respect to sales growth. Additionally, employment growth for these innovative SMEs is also significant, thus supporting hypothesis two. This is to say that SMEs which introduce organisational developments, in comparison to non-innovative SMEs, are experiencing a dual increase in growth. These findings may be due to smaller firms being more organic

while larger firms tend to be more mechanistic (Burns and Stalker, 1961). The univariate findings for technological innovations will now be of interest.

Table 4.5 Hypothesis 2: Organisational Innovation

Total Number of Observations	All Firms 206		SMEs 95		Large Firms 111	
	t-test	Mean (%)	t-test	Mean (%)	t-test	Mean (%)
Organisational Innovation						
V.A.P.E.	1.17		1.31		-0.67	
Did Innovate		1,634,722		3,452,846		161,317
Did not Innovate		564,220		918,758		216,371
Profit Margin	-0.81		-0.32		-0.72	
Did Innovate		1.40		19.6		-12.9
Did not Innovate		20.7		25.1		16.7
Sales Growth	2.14***		3.09***		-0.59	
Did Innovate		48.3		81.8		22.6
Did not Innovate		24		18.6		29
Employment Growth	1.35		2.76***		-1.49	
Did Innovate		24.3		43.2		9.9
Did not Innovate		14.6		8.2		20.7

Notes: Significant at *** 1%, **5%, *10%

4.4.3 Technology Driven Innovation

Out of the 206 total respondents, 127 do introduce significant new or improved technological driven developments. Again, this hypothesis is looking at those firms that innovate versus those that do not, regarding technological innovations. Interestingly enough, there is significant difference (refer to Table 4.6) in higher sales growth and employment growth among all firms and SMEs which introduce technological innovations, as compared to non-innovating SMEs. The apparent support for hypothesis two from all firms may well be due to SMEs. Large firms do not display any effect. This may be due to, "Small firms, whether young or old, benefit from both categories of alert behaviour (high activity levels) in the field of technology and organisation; small firms seem to be able to develop adaptive behaviour that is conducive to their innovative performance with their limited resource base" (Meeus and Oerlemans, 2000). With the final aspect of hypothesis two complete, overall conclusions will follow.

Table 4.6 Hypothesis 2: Technological Innovation

	All Firms		SMEs		Large Firms	
Total Number of Observations	206		95		111	
	t-test	Mean (%)	t-test	Mean (%)	t-test	Mean (%)
Technological Innovation						
V.A.P.E.	-0.96		-0.65		0.42	
Did Innovate		702,850		1,414,894		201,539
Did not Innovate		1,613,456		2,674,481		163,387
Profit Margin	-0.97		-0.87		-0.62	
Did Innovate		3.3		16.2		-5.76
Did not Innovate		27		31.3		21.9
Sales Growth	1.66*		2.18***		0.08	
Did Innovate		42.3		66.1		26.3
Did not Innovate		22.9		20.9		25.4
Employment Growth	1.76*		2.60***		-0.49	
Did Innovate		23.9		38.0		14.4
Did not Innovate		11.1		5.3		18.2

Notes: Significant at *** 1%, **5%, *10%

4.5 Hypothesis Three

Again, this hypothesis is interested in the impact of innovation on service firm performance. Another mention of it will aid in understanding the following univariate findings.

❖ Hypothesis 3:

> Service firms that harness customer-driven innovation will perform better than non-innovating service firms.

Hypothesis three essentially brings about a slight diversion from hypothesis two. The key addition is the customer aspect; therefore, this analysis is specifically addressing innovation which is customer-driven in comparison to non-innovating service firms. The same performance factors from hypothesis two apply here, also. Similar to above, the first section will address service and product developments, followed by organisational developments, and then technological initiatives.

4.5.1 Service & Product Innovation

To begin with, a total of 140 service firms innovate via customer ideas and or suggestions. There is an emergence of customer-driven SMEs experiencing a stronger sales growth effect versus non-innovating SMEs (refer to Table 4.7). This sales growth by SMEs again explains the significance for all firms. Additionally,

results from this analysis of customer-driven SMEs show significant difference regarding profit margin. This finding, in addition to sales growth, suggests an effect between customer-driven innovation and an increase in performance. The next type of innovation under hypothesis three is organisational innovations.

Table 4.7 Hypothesis 3: Service & Product Innovation

	All Firms		SMEs		Large Firms	
Total Number of Observations	183		84		99	
	t-test	Mean (%)	t-test	Mean (%)	t-test	Mean (%)
Service & Product Innovation						
V.A.P.E.	0.47		0.71		0.50	
Did Innovate with Customer		1,159,916		2,541,440		208,998
Did not Innovate		612,470		891,227		147,875
Profit Margin	0.25		2.16***		-0.45	
Did Innovate with Customer		12.2		35.9		-4.6
Did not Innovate		4.1		-9.1		22.5
Sales Growth	1.72*		2.01***		0.33	
Did Innovate with Customer		38.6		57.1		25.8
Did not Innovate		14.3		10.6		20.6
Employment Growth	0.74		1.22		-0.21	
Did Innovate with Customer		17		22.8		13
Did not Innovate		11.5		9.3		15.3

Notes: Significant at *** 1%, **5%, *10%

4.5.2 Organisational Innovation

There are a total of 70 firms which develop organisational innovations with the aid of their customer. Customer-driven SMEs which initiate organisational developments experience performance benefits by way of an increase in both sales and employment growth in comparison to non-innovating SMEs (refer to Table 4.8). With that said, overall service firms are more likely than manufacturers to claim an orientation to organisational changes (Tether, 2005). Once more, you will note that there is a SME effect spilling over to the results for all service firms. Benefits for customer-driven SMEs also include a hint of effect for V.A.P.E. regarding organisational innovations. Since organisational developments are ordinarily internal this V.A.P.E. effect is interesting. The next section, under hypothesis three, will look at technological innovation where there are similar findings.

Table 4.8 Hypothesis 3: Organisational Innovation

	All Firms		SMEs		Large Firms	
Total Number of Observations	184		86		98	
	t-test	Mean (%)	t-test	Mean (%)	t-test	Mean (%)
Organisational Innovation						
V.A.P.E.	1.49		1.61*		-0.35	
Did Innovate with Customer		2,151,935		4,454,816		182,349
Did not Innovate		564,220		918,758		216,371
Profit Margin	-1.01		-0.60		-0.84	
Did Innovate with Customer		-6.7		13.6		-23.5
Did not Innovate		20.7		25		16.7
Sales Growth	2.34***		3.18***		-0.34	
Did Innovate with Customer		53.6		89.8		24.8
Did not Innovate		24		18.6		29
Employment Growth	1.84*		3.15***		-1.12	
Did Innovate with Customer		29.5		52.5		11.3
Did not Innovate		14.6		8.2		20.7

Notes: Significant at *** 1%, **5%, *10%

4.5.3 Technology Driven Innovation

This section will address service firms which allow for customer-driven technological innovation and those that are non-innovators. Firstly, there is significant difference for non-innovative service firms regarding higher value-added per employee as compared to service firms which are innovate with the aid of their customer (see Table 4.9). Again, reasons behind this finding may well be due to efficient use of employees by non-innovating firms. There is significant difference in technologically innovative customer-driven SMEs in comparison to non-innovating SMEs regarding an increase in both employment and sales growth. As seen above, this SME effect is again impacting the results for all firms. Overall conclusions for hypothesis three will now follow.

Table 4.9 Hypothesis 3: Technological Innovation

	All Firms		SMEs		Large Firms	
Total Number of Observations	169		77		92	
	t-test	Mean (%)	t-test	Mean (%)	t-test	Mean (%)
Technological Innovation						
V.A.P.E.	-1.83*		-1.47		0.24	
Did Innovate with Customer		176,481		169,410		180,467
Did not Innovate		1,613,456		2,674,481		163,387
Profit Margin	-0.91		-0.48		-0.67	
Did Innovate with Customer		2.1		26.8		-11.8
Did not Innovate		27		31.3		21.9
Sales Growth	1.88*		2.64***		0.10	
Did Innovate with Customer		47.1		82.5		26.7
Did not Innovate		22.9		21		25.4
Employment Growth	1.92*		2.92***		-0.44	
Did Innovate with Customer		27.2		49.5		14.4
Did not Innovate		11.1		5.3		18.2

Notes: Significant at *** 1%, **5%, *10%

4.6 Hypothesis Four

The final hypothesis for this research is perhaps the most complex as it is attempting to differentiate between innovators.

❖ Hypothesis 4:

> Service firms that are customer-driven in regards to innovation will perform better than other service firms that innovate.

In short, it addresses performance levels among those innovating firms which utilise their customer's input and those that do not. Same as above, the next section will address service and product innovations, followed by organisational, then technological innovations.

4.6.1 Service & Product Innovation

Beginning with service and product innovation, there are a total of 163 service firms which innovate, of them 140 innovate with their customer. Interestingly, after an analysis of SMEs which innovate with the customer and those that do not for all three types of innovation no significant differences can be found for performance. However, large innovative service firms, which innovate without the aid of their customer, experience higher employment growth (refer to Table 4.10). This

employment growth effect is similar to that of all service firms. Hence, these findings of innovative large firms which innovate without their customer are contrary to hypothesis four. Continuing this discussion of hypothesis four will now address organisational developments.

Table 4.10 Hypothesis 4: Service & Product Innovation

	All Firms		SMEs		Large Firms	
Total Number of Observations	163		68		95	
	t-test	Mean (%)	t-test	Mean (%)	t-test	Mean (%)
Service & Product Innovation						
V.A.P.E.	0.003		0.15		0.71	
Innovate with Customer		1,151,062		2,494,376		208,997
Innovate without Customer		1,145,329		2,000,599		99,999
Profit Margin	-0.29		1.22		-0.44	
Innovate with Customer		12.2		35.9		-4.6
Innovate without Customer		24.3		19.2		29.9
Sales Growth	-0.60		-1.41		-0.46	
Innovate with Customer		38.6		57.1		25.8
Innovate without Customer		50.7		68.4		34.5
Employment Growth	-2.21***		-0.29		-1.71*	
Innovate with Customer		17.1		22.8		13
Innovate without Customer		44.9		56.7		34

Notes: Significant at *** 1%, **5%, *10%

4.6.2 Organisational Innovation

In total there are 70 firms which innovate with the aid of their customer's input. No significant differences are found, among innovative service firms which allow for customer input and those that are not customer oriented, to support hypothesis four (see Table 4.11). Next, similar results for technological innovations will conclude the uni-variate analysis of hypothesis four.

Table 4.11 Hypothesis 4: Organisational Innovation

	All Firms		SMEs		Large Firms	
Total Number of Observations	92		40		52	
	t-test	Mean (%)	t-test	Mean (%)	t-test	Mean (%)
Organisational Innovation						
V.A.P.E.	0.89		0.85		0.66	
Innovate with Customer		2,118,311		4,613,917		182,348
Innovate without Customer		153,615		224,275		104,695
Profit Margin	-0.58		-0.62		-0.43	
Innovate with Customer		-6.7		13.6		-23.5
Innovate without Customer		27.4		41.5		17.9
Sales Growth	0.85		0.63		0.66	
Innovate with Customer		53.6		89.8		24.8
Innovate without Customer		31.5		54.1		15.8
Employment Growth	1.35		1.19		0.64	
Innovate with Customer		29.5		52.5		11.3
Innovate without Customer		7.8		11.1		5.6

Notes: Significant at *** 1%, **5%, *10%

4.6.3 Technology Driven Developments

Analysis of the 90 firms that do partake in customer-driven innovation and those firms that innovate but without their customer show no significant differences in the performance variables (refer to Table 4.12). Except for the findings for all firms' experiencing a hint of higher V.A.P.E., there is no other supporting evidence for differences in performance between customer-driven innovators and non-innovators. Conclusions for hypothesis four will now be presented.

Table 4.12 Hypothesis 4: Technological Innovation

	All Firms		SMEs		Large Firms	
Total Number of Observations	127		51		76	
	t-test	Mean (%)	t-test	Mean (%)	t-test	Mean (%)
Technological Innovation						
V.A.P.E.	-1.65*		-1.35		-0.70	
Innovate with Customer		176,481		169,410		180,467
Innovate without Customer		2,074,597		3,769,300		273,976
Profit Margin	-0.10		1.00		-0.41	
Innovate with Customer		2.1		26.8		-11.8
Innovate without Customer		6.4		-3.1		18
Sales Growth	0.85		1.19		0.08	
Innovate with Customer		47.1		82.5		26.7
Innovate without Customer		30.6		36.2		25.3
Employment Growth	0.96		1.36		-0.01	
Innovate with Customer		27.3		49.5		14.4
Innovate without Customer		15.7		16.9		14.4

Notes: Significant at *** 1%, **5%, *10%

4.7 Innovative Findings

It will be imperative to discuss the overall implications of the uni-variate results for all of the hypotheses. Firstly, results for innovative service firms do not differ much, regardless of the three types of innovation under analysis: service and product, organisational, and technological. There seem to be underlying benefits for innovative SMEs regarding sales and employment growth. The same holds true for customer-driven innovative SMEs in comparison with non-innovating SMEs and non-innovating large firms. Some support for the role of the customer in innovation is significant when looking at those firms which utilise their customer's input versus those that do not. In general, findings for all firms seem to follow suit from the SME effect.

Lastly, large service firms, in very few circumstances exhibit any significant differences in these analyses for innovativeness or performance. With that said, large service firms which are not innovative display much higher V.A.P.E. than large customer-driven service firms. Also, innovative large firms, which do not involve their customer in service and product innovations, show there is significance regarding an increase in employment growth. Noteworthy findings include large service firms, which do not involve their customer in their innovations, experience a higher percentage of unchanged service or products. Overall, large service firms may not display the positive effects of innovation as SMEs. This finding in addition to the previous results may bring to light some supportive evidence as to the beneficial relationship between service firm and customer regarding innovation.

Again, it is important to note that uni-variate analysis is partial as it fails to take into account other factors. Additionally, uni-variate analysis only enquires about the correlation between variables, thus this analysis is unable to say anything about the direction of causality. Therefore, we move on to multi-variate analysis.

5.1 Introduction

The purpose of this chapter will attempt to shed some light on the factors which determine innovation among service firms, using the dataset outlined in the earlier chapters. Hagedoorn and Cloodt (2003) state that there appears to be a lack of clear understanding of the concept and measurement of innovative performance. There are two key elements to the analysis: determining the *likelihood* of innovation (probit analysis) and determining the *extent* of innovation (tobit and truncated regression analysis). In both cases the emphasis will be on the role of customers in the innovation process while allowing for other influences, with the aim of addressing hypothesis 1a and 1b. Again, the hypotheses state:

❖ Hypothesis 1a:

> Service firms that are customer-driven in innovation will be more innovative than other service firms.

❖ Hypothesis 1b:

> Service firms that harness customer-driven innovation will be more innovative than service firms who innovate without the aid of customer input.

Firstly, though, it is important to note some of the limitations of this analysis. The questionnaire asks for the percentages of the business's new or improved services or products, organisational practices, and/or technological driven developments that derive from suggestions and/or ideas from six linkages. Again, for each of the three types of innovation, percentages, ranging between zero to 100 per cent, were allocated for each external linkage to designate the level of ideas/suggestions. Innovation cannot be regarded purely as an internal matter as firms' external linkages or networks may also play a potentially important role (Oerlemans et al., 1998). Financially the role of external linkages may increase a firms' ability to appropriate returns from innovation (Gemser and Wijnberg, 1995). Also, Powell (1998) states external linkages may help by stimulating creativity, reducing risk, accelerating or upgrading

the quality of the innovations made, signalling the quality of firms' innovation activities.

Although this research focuses on customer-driven innovation, five additional linkages were included in the analysis: strategic alliances or joint ventures, suppliers, subsidiaries, consultancy firms, and competitors. One limitation for this research's probit analyses is the lack of inclusion for all six independent variables in the analysis; however, all six linkages are included in the tobit analyses (see section 5.4). Creating probit models with all six sources was not feasible due largely to the limited number of observations. Therefore, after many models were created, it was found that the three links: strategic alliance or joint venture, suppliers, and customers proved to be most significant. In each of the three different probit models you will find these three sources of ideas and suggestions.

However, there were not any supplementary questions regarding the nature of the involvement for organisational practices or technological innovations. Only service and product innovations further probed into the role of the customer by asking: with regard to involvement, if the customer was involved in the development of the new services and products were the modes of interaction formal or informal, or both? Additionally, the nature of the involvement, for new services and products, was addressed by means of several options: ad hoc, focus groups, marketing or customer information, working with lead customers, and other. Due to the intention to administer a fairly concise questionnaire, with hope of increasing the response rate, further questions were not devised for the other types of innovation.

Additionally, the breakdown of data by Standardized Industrial Classifications (SIC) was not possible for the probit models for service and products. Probits, which did allow for the inclusion of SIC variations, were feasible for organisational and technological innovations; however, no sectoral effects were noted. Probits which factor in all SIC codes would be ideal; however, it proved impossible to compute due to the large number of other variables. It was decided that the factors mentioned previously proved more relevant to this analysis. The same holds true for the tobit and truncation analyses; thus, in this chapter none of the analyses include SIC information.

5.2 The Probability of Innovation

With the limitations discussed, this next section will further elaborate on the analysis of the first hypothesis. The extensiveness of services, in conjunction with the

diversity of their innovation activities, means it is difficult to generalise about what findings to expect from empirical research (Tether, 2003). However, for the purpose of further analysis, probit models were constructed with the dependent variable in this analysis as a dummy variable taking the value of one if the firm innovates and zero otherwise (refer to Appendix V for all variable definitions). Three different probit models will be presented for each of the three types of innovation: service and product, organisational, and technological. Within each of these charts, three analogous models are devised representing the various ways of measuring R&D. Also, the actual versus predicted cases for each of the three types of innovation will be presented.

When utilising a qualitative dependent variable such as the probability of a firm being an innovator, probit analysis is a useful model estimator (Greene, 1998). Probit analysis is the most popular regression model as it allows for a standard normal cumulative distribution function for a standard logistic random variable (Wooldridge, 2000). In the dataset many observations are zero, thus taking the natural log is not possible. Other reasons for using probit analysis include this techniques' ability to assume normality for the independent variables. Thus, probit models were formulated in this analysis.

The independent variables in determining the probability that a service firm will innovate include derive from the descriptive chapter. Three main groups reflecting the determinants of innovation include:

- Internal Resource Indicators
- Other Service Firm Characteristics
- External Linkages

A clarification of the independent variables which fall under these three groups will follow. Firstly, addressing the internal resource indicators, the independent variables are: firm size, level of qualification for employees, research and development (in addition to formal R&D and R&D intensity). Next, other service firm characteristics include: age of the firm, type of business (a stand-alone, parent of group headquarter, subsidiary in a group, or other), main type of service and products supplied (services and products customised to individual customers, tailored to specific customer groups, suitable for large customer groups, or standardised services and products). Lastly, the

involvement of various external links such as: strategic alliances or joint ventures, suppliers, and customers. Reasons as to why these variables were selected for determining the probability of innovation will follow.

Previous empirical research on the study of innovation also incorporated such variables. Size, for example, is a standard question for almost all business studies, whether for manufacturing or service innovation studies (Shan et al., 1994; Tether, 1998; Love and Ashcroft, 1999; Antonelli, 2000; Antonelli, et al., 2000; Grupp and Maital, 2000; Meeus and Oerlemans, 2000; Hagedoorn and Cloodt, 2003; Galende and de la Fuente, 2003; Swamidass, 2003; Tether, 2005). Allocating a question relating to firm size is important for later isolating SMEs from large firms while looking for patterns of differences. Bougrain and Haudeville (2002) conducted research specifically addressing collaborative efforts for innovation in SMEs. Meanwhile, Acs and Audretsch (1988) findings suggest small firms, with five hundred or less employees, tend to be more innovative intensive than large firms. Therefore, innovation is suggested to differ between SMEs and large firms thus for the purpose of this research this is also examined.

Educational level of employees is important to note. Numerous empirical researches have enquired into a firm's workforce (Love and Roper, 1999; Garrone and Colombo, 1999; Hipp, 2000; Preissl, 2000; Bougrain and Haudeville, 2002; Ong, et al., 2003; Galende and de la Fuente, 2003; Swamidass, 2003; Tether, 2005). Having a qualified workforce is suggested to aid in a firm's innovative efforts. Although, Preissl (2000) reports that among German service firms, qualifications of employees vary with knowledge intensity, for example in financial services 18 per cent hold university degrees. On the other hand, Freel's (1999) research on SMEs reports innovative firms are significantly more likely to employ graduates, 47.9 per cent of these innovative firms have one or more graduates, in comparison to their less innovative counterparts representing 30.8 per cent. By asking what percentage of the workforce has as their highest level of qualification a bachelor's degree for example allows for a distinction among employees' qualifications. Leiponen's (2005) research finds that education levels are particularly high in industrial design and management consulting and employees with postgraduate degrees are concentrated in R&D services. Nevertheless, the key is to be aware of not only the number of employees in a firm's workforce, but also the level of education and qualifications. Additionally, the skill set of ones' employees is also important to enquire into; Freel (1999), for

example, reports SMEs perceive technical skills to be of most importance for increasing their innovative efforts, followed by marketing, managerial, financial and exporting skill in that order.

Of course one of the most important determinants of innovation is research and development. Innovation stems from R&D activities, which aim at the generation of production techniques or new marketable goods. Countless research regarding R&D and its role on innovation has been conducted (Love and Roper, 1999; Veugelers and Cassiman, 1999; Antonelli, 2000; Hipp, 2000; Preissl, 2000; Bougrain and Haudeville, 2002; Furman, et al., 2002; Roper and Love, 2002; Silverberg, 2002; Hagedoorn and Cloodt, 2003; Leiponen, 2005). Love and Ashcroft (1999) report R&D is positively associated with innovation. Other research has shown that firms which conduct internal R&D are better able to use externally gathered information (Freel, 2000b). This will be important later when the addition of external linkages for innovation will be discussed. Not only knowing whether a firm participates in R&D, it is also important whether this R&D is formal or informal.

For even further analysis, calculating R&D intensity is a measure of the percentage of sales revenue spent on R&D. Another way to measure internal efficiency, general competitiveness, or perhaps a measure of value-added may be sales turnover per full-time-employee (Freel, 2000a). Cohen and Levinthal (1989) utilise R&D intensity as a measure of innovativeness and a substitute for the development of absorptive capacity comparing innovators and non-innovators qualitatively. The OECD (1998) addresses the link between innovativeness and productivity. Wakelin (1997) reports a positive role for R&D expenditure in productivity growth. Additionally, Cesaratto and Stirati's (1996) research into manufacturing firms find a positive relationship between innovation and productivity. It is essential to note whether R&D has an effect on a firm's innovative efforts.

Other service firm characteristics will now be further discussed with support from existing empirical research. Questions regarding firm vintage is a fairly common measurement in order to determine at which stage of the business life cycle the firm is. Research generally does enquire into the age of a firm as it could be an important factor for innovation (Love and Roper, 1999; Garrone and Colombo, 1999; Avermaete, et al., 2003; Tether, 2005).

Next, a question regarding the type of business whether a stand-alone, parent of group headquarter, subsidiary in a group, or other is useful in order to later create a

dummy variable to isolate stand alone firms (Love and Roper 1999, 2001; Hipp, 2000). Additionally, the main type of service and products supplied is important to know as it aids in determining the nature of the firm's offering. Previous research has taken into account the differences in the type of services and products supplied (Nijhof, et al., 2002; Love and Roper, 2005). In this research it is important to know, if for example, a service firm is offering customised or standardised offerings as it may well relate to innovative efforts or lack there of.

And lastly the involvement of various links could be vital to understanding the innovation process. Nooteboom (1992; 1999) developed a theory of transactions which yields the notion of external economy of cognitive scope: people and firms need outside sources of cognition and competence to complement their own. For this analysis, three outside sources will be important: strategic alliances or joint ventures, suppliers, and customers.

A firm's linkage with strategic alliances or joint ventures has been widely researched topic. Strategic alliances and joint ventures include activities such as R&D partnerships, collaborative manufacturing, distribution, or complex co-marketing arrangements. The most common rationales offered for corporate partnering and external collaboration involve some combination of risk sharing, obtaining access to new markets and technologies, speeding products to market, and pooling complementary skills (Kogut, 1989; Kleinknecht and Reijnen, 1992; Hagedoorn, 1993; Eisenhardt and Schoonhoven, 1996). Additionally, firms use external relations, such as collaborations, as a temporary mechanism to compensate for capabilities a firm has not yet mastered and to expand all their competencies often by means of vertical integration (Powell, et al., 1996). Meyer-Krahmer and Reger (1999) stress the importance of not only large multinational firms joining together for R&D and technology but also countries in order to coordinate innovation strategies. Additionally, Linnarsson and Werr (2004) report some of the challenges of radical innovation could be reduced by engaging in alliances for innovation.

Next, the role of suppliers in the innovation process has been greatly researched (Hipp, 2000; Hughes and Wood, 2000; Freel, 2000b; Bougrain and Haudeville, 2002; Sobrero and Roberts, 2002; Chung and Kim, 2003; Tether, 2005). Suppliers and their role in the value-added chain regarding innovation is also an important topic. This is particularly so due to the closer relationship existing between

firm and supplier. This relationship allows for formal interaction- possibly a hotbed for originating innovative ideas and/or suggestions.

Lastly, customers' involvement in a firm's innovation process, either formal or informal, has also been researched (Shostack, 1984; Gadrey, et al., 1994; Miles et al., 1994; Strambach, 1994; Hughes and Wood, 2000; Preissl, 2000; Bougrain and Haudeville, 2002; Caloghirou et al., 2002; Leiponen, 2005; Tether, 2005). The primary focus of this research is on the role of the customer in a service firm's innovative efforts. Freel's (2000b) research on manufacturing SMEs enquired into collaboration with external linkages for innovation such as customers, competitors, and suppliers.

Since the early 1990s, CSI Community Innovation Survey has attempted to collect micro-data on innovation. Later, CSI2 (1997/1998) was launched in Europe for the purpose of collecting more data. In addition, other country wide surveys, for comparison purposes, utilise standard questions regarding similar variables as used in this research (OECD: European Commission Eurostat, 1997; ZEW: Centre for European Economic Research). Therefore, based on previous empirical research these variables are good indicators for innovation and will be included in the probit analysis.

Again, the structure will follow a similar format as the uni-variate analysis chapter. In brief, three types of innovation are of interest: service and product, organisational, and technology driven, of which each will be individually analysed. Rogers (1998) states the importance in considering a broad range of innovation indicators in order to more accurately capture the level of innovativeness in a firm. We will begin with service and product innovations; an explanation of the findings and tables will follow. Again, the actual versus predicted cases for each of the three types of innovation will also be presented. It will be important to mention the correlation matrices for each type of innovation presented at the end of this chapter in Tables 5.8, 5.9, and 5.10.

5.2.1 Service & Product Innovation

We will begin with factors which increase the probability of a firm to initiate service and product innovation. Again, the dependent variable is a dummy variable taking the value of one if the firm innovates and zero otherwise. Based on the independent variables mentioned above, interesting findings include criteria which are

consistent across the different types of R&D measurements (refer to Table 5.1). The above discussion suggests a basic model of the form:

$$I_i = \alpha + \beta_0 R_i + \beta_1 C_i + \beta_2 E_i + \varepsilon_i$$

Where I_i is the dummy innovation variable, R_i is the set of internal resource indicators, C_i is the set of other service firm characteristics, and E_i represents indications of external linkages.

Firstly, findings in literature regarding the size of a firm are greatly contrasted. Galende and de la Fuente state, "With regard to its incidence on the innovative result, arguments exist both supporting a large size (greater economies, smaller risk, greater market, better appropriation possibilities) and supporting a small size (greater flexibility, better communication, greater specialisation possibilities, informal and strategic controls)." From studies in manufacturing, the tendency to increase innovative efforts with the size of a firm has been explained by large firms having a greater scope for innovation (Sirilli and Evangelista, 1998). Similarly, Love and Ashcroft (1999) report the importance in plant size lies principally in encouraging further innovations in plants that are already innovative. Nevertheless, in this analysis, this pattern is also the case for large service firms being more innovative (refer to Table 5.1). These findings coincide with the survey of literature by Kamien and Schwartz (1982) which suggests that large firms have an advantage in terms of R&D and innovative activity.

Research in services appears to show a weaker relationship between firm size and number of innovations, as compared to manufacturing (Tether, 2003). Similarly, results from empirical research shows that the estimations of size show that there is no significant effect to the level of innovativeness (Caloghirou et al., 2002; Wan et al., 2005). Table 5.1 clearly displays an inverse u-shaped relationship between employment and employment squared, thus the probability of innovation does increase as the firm size increases, but diminishing returns to size is apparent. In other words, having large numbers of employees is important but at a certain point the returns begin to decrease. Love and Roper (1999) report similar findings for this plant size effect showing a quadratic relationship with innovation. In other words, Love and Roper (1999) found innovation intensity decreases with plant size, while the extent of innovation or number of new or improved products introduced increases. Their findings parallel that of Acs and Audretsch (1988) with respect to firm size.

Not only is size a determining factor in innovativeness, employing qualified human capital is also integral. The questionnaire enquires as to what percentage of the workforce has a bachelor's degree qualification or higher. Due to the fact that having a formal R&D department proves significant, it may be safe to conclude that large firms will most probably have this type of department. These large firms with qualified workers in their formal R&D departments might be more likely to innovate.

As R&D is fundamental to innovation studies, the questionnaire enquires about R&D in different ways. Firstly, a dummy variable of one represents service firms that did partake in R&D and zero for no R&D activity. Next, the simple dummy variable was separated into formal R&D and informal R&D. Then, replacing those two measures, R&D intensity was calculated as an additional measure (the percentage of sales revenue spent on R&D).

Thus, the findings show whether a firm partakes in R&D is an important factor determining its capability to innovate (refer to Table 5.1). When firms spend more on innovative activities they have a higher probability of introducing a service innovation (Lopes and Godinho, 2005). Veugelers and Cassiman (1999) suggest R&D capability may act as more general indicator of the overall level of sophistication of the firm enabling it to absorb more readily external information. Also, the complexity of a firm's R&D capability in effectively managing and organising external information is important (Hertog and Thurik, 1993; Audretsch et al., 1996; Love and Roper 2002).

Subsequently, these findings suggest that having a formal R&D department does matter significantly to innovation (refer to Table 5.1). According to Cohen and Levinthal (1989) innovative capabilities depend on a firm's ability to exploit external knowledge and on in-house R&D efforts. Possibly having a recognised department, which has R&D as its sole purpose, allows for the adequate resources and focus on introducing new or improved service and products. R&D is often perceived by respondents to entail formal distinct activities (Howells et al., 2001). Thus, whether or not a firm performs R&D and if a formal R&D department exists are factors which increase the likelihood of innovation. Additionally, when R&D intensity, calculated as sales revenue divided by R&D expenditure, is isolated results show that the more R&D a firm partakes in does not make it more likely to innovate. Similarly, Freel's (2000a) research on innovative and non-innovative SMEs calculates profit divided by sales turnover per full-time-employee and finds no evidence for innovative firms' experiencing inferior profit performance or inferior profit growth performance.

Firm age does not have any affect on the likelihood of introducing service and product innovations. There is a hint of effect concerning the type of business whether the service firm is a stand-alone or within some group. A stand-alone business may be more flexible with regard to the development of ideas and then the implementation of innovations.

Lastly, regarding the likelihood of a service firm to innovate by way of new or improved service and products involves the three links: strategic alliance or joint venture, suppliers, or customers. Many studies have derived from the results from the CIS II study, for example Tether (2002) found that service firms were more likely to have co-operation arrangements with suppliers, customers, consultancy firms, and competitors for innovation. Karlsson and Olsson (1998) state in supplier dominant industries it is plausible that suppliers will replace the customer as the key source of new product ideas. Of the sample, for this research, of innovative service firms, 86 per cent did so with the aid of their customer. As Table 5.1 shows, service firms that engage in either direct or indirect involvement of their customer do significantly increase the probability of innovation. Freel (2000b) reports 26.3 per cent of innovative SMEs collaborate with their customers meanwhile 27.3 per cent of innovative SMEs utilised their suppliers for innovations. Additionally, there is effect of coordinating innovative efforts with strategic alliances or joint ventures. This finding seems plausible as a purpose of such endeavour allows for the exchange of information and ideas between firms.

5.2.2 Brief Conclusions: Service & Product Innovation

In summary, the size of a firm and having an educated workforce are both significant. Also, some determining factors which play a role in the likelihood that a service firm will innovate include not only partaking in R&D, but also the presence of a formal R&D department. There is no effect regarding the age of the service firm. However, there is some effect whether the business structure of a service firm is a stand-alone or member of a group. And importantly is the role of the customer as a link in service and product innovation. This suggests that firms which allow for the involvement of their customer are more likely to innovate. Lastly, service firms which involve their business activities with strategic alliances or joint ventures prove significant for innovation. Thus, amalgamations of these coefficients mentioned suggest the probability of a service firm to be innovative.

Table 5.1
Probit Models: Service & Product Innovation

Model	(a)	(b)	(c)
Constant	-3.67***	-3.73***	-8.29*
	(1.40)	(1.42)	(4.54)
Internal Resource Indicators			
Employment	0.001**	0.001***	0.001*
	(0.000)	(0.000)	(0.001)
Employment Squared	-0.0004***	-0.001***	-0.001
	(0.000)	(0.000)	(0.001)
Workforce with Degree	0.019*	0.020*	0.049**
	(0.011)	(0.011)	(0.024)
Workforce with no Qualifications	-0.061	-0.069	-0.038
	(0.099)	(0.097)	(0.071)
R&D	1.39**	-	-
	(0.673)		
Formal R&D	-	1.88**	-
		(0.871)	
Informal R&D (only)	-	1.03	-
		(0.827)	
R&D Intensity	-	-	0.065
			(.078)
Other Service Firm Characteristics			
Firm Vintage	0.004	-0.0004	0.002
	(0.017)	(0.018)	(0.024)
Business Type	1.45	1.49	1.43
	(0.938)	(0.939)	(1.42)
Customised Offerings for Individuals	-0.298	-0.243	-117.58
	(0.916)	(0.890)	(4774.5)
Tailored Offerings for Groups	-0.897	-0.912	0.580
	(0.966)	(0.929)	(2.90)
Suitable for Large Customer Groups	0.759	0.916	4.26
	(0.859)	(0.879)	(3.45)
Standardised	-0.461	-0.686	2.21
	(1.05)	(1.09)	(3.23)
External Linkages			
Strategic Alliance or Joint Venture	0.687	0.647	4357.4***
	(81.8)	(47.3)	(51.2)
Suppliers	0.142	0.129	94.27
	(65.5)	(35.9)	(182)
Customers	452.03***	564.71***	668.02***
	(105.3)	(96.4)	(79.5)
Log Likelihood Function	-12.11	-11.77	-6.73
Restricted Log Likelihood	-102.79	-102.55	-103.03
Chi squared	181.36	181.57	192.59
R-squared ML	0.596	0.598	0.616
Number of Observations	200	199	201

Notes: Standard Errors are in parentheses. *Significant at* *** 1%, **5%, *10%

Model (a)

```
                Predicted
-------------------------  +   -------
Actual          0       1  |     Total
-------------------------  +   -------
    0          42       0  |        42
    1           4     154  |       158
-------------------------  +   -------
Total          46     154  |       200
```

Probit models provide an actual versus predicted dispersion of innovators and non-innovators. In this case only model (a) will be presented as the remaining models are quite similar. As model (a) above shows zero representing non-innovators and one for innovators, forty-two non-innovators out of the total non-innovators are correctly predicted. Meanwhile, only four innovators were wrongly predicted by the probit model. In other words, this model is an excellent fit predicting 154 of the innovators. Thus, model (a) strongly allocates the numbers for both innovators and non-innovators very well. Next will be the results from the probits for organisational innovation.

5.2.3 Organisational Innovation

Regarding organisational innovation the factors which aid in determining innovativeness are somewhat different from the findings for service and product innovations. Organisational innovation involves significant new or improved practices which do not include technology. Usually, organisational innovation tends to be associated with relationships and intangibles, which are by their nature difficult to trade or export (Tether, 2005). The questionnaire asks has the firm introduced any significant new or improved organisational practices (changes in work practices), that did not including technology. Gjerding's (1996) definition is similar regarding it an 'important organisational change'. As previously mentioned organisational innovations have been referred to as non-technological as firms are often reporting these forms of innovation (Drejer, 2004). Moreover, this organisational change encompasses both product and process innovations as Preissl (2000) states that innovation surveys do not provide significant results for the distinction between process and organisational innovation in services. For this analysis, significant factors for introducing new or improved organisational innovations will follow.

Interestingly, the independent variable firm size shows no effect on the likelihood to introduce organisational innovation. In other words, whether the firm is large or an SME is not significant for organisational innovation.

Similar to service and product innovations, having qualified human capital may increase the likelihood of being innovative. With that said, Table 5.2 shows, having either qualified employees or employees with no post education both prove significant. These results are interesting; although having educated workers seems more significant in the introduction of organisational innovations. Such findings may suggest that employing a workforce with various skill sets and backgrounds is important for internally originating innovations. Or, once an employee joins a firm they then understand the corporate culture and are capable of aiding in the introduction of organisational developments. The importance of informal instruments and the formation of a corporate culture are often underestimated in innovation (Meyer-Krahmer and Reger, 1999).

Unlike service and products, not surprisingly the type of R&D does not matter regarding organisational innovations. The case may well be that organisational innovations are not R&D intense and thus not necessary. Moreover, the involvement of outside sources proves not to affect the introduction of organisational innovations. This may be due largely to the internal nature of such innovations.

Age of the firm largely affects the probability of a service firm to initiate organisational innovations. This may suggest that older more established firms are better suited to innovate internally. On the other hand, this finding might relate to the business life cycle. Innovation is a compromise between competing risks; the risk of changing products, processes and routines and the risk of organisational decline or even death due to a lack of change (Meeus and Oerlemans, 2000). Generally, older firms are more hierarchical with more layers and may need to introduce organisational changes. Oftentimes older firms' experience the need to change in order to compete or even to survive in a dynamic business environment. Kanter (1983) describes an innovative organisation as one with reduced layers of hierarchy, greater lateral communication and greater empowerment to lower-level employees. This description may describe a firm in the beginning stages of the business life cycle. Although, that is not to say that older firms cannot operate with less hierarchy, open communications, or stress the importance of employee input. Newer firms that are not fully established might be in less need of introducing new or improved organisational

developments. Additionally, newer firms are less likely to have developed long-term trust-based relationships with suppliers and/or customers (Tether, 2005). Business relationships oftentimes take time to form and grow between firms, hence older firms may be more prone to either formally or informally utilise outside sources as partners.

Next, there is some suggestion as to the main type of service and products supplied as both services and products suitable for large customer groups and standardised services and products show a hint of significance. This is perhaps possible as these firms, which offer standardised services and products suitable for large customer groups, have more resources available for organisational innovation. In other words, firms which have customised or tailored services and products may need to focus their innovative efforts on R&D and not so much on organisational innovations.

And lastly, regarding the use of external linkages shows no significance for organisational innovation. Organisational innovation is internal and directly affects the operations of a service firm, thus it is possible that these various external sources for ideas and suggests are not knowledgeable regarding the internal business structure. Therefore, it is suggested that due to the internal nature of organisational innovations, these innovations usually derive from top management and not so much external links.

5.2.4 Brief Conclusions: Organisational Innovation

A recap of the factors which play a role in the innovativeness of organisational developments include the age of the firm, suggesting that older firms are more prone to partake in this type of innovation. There is also importance in a firm employing a qualified workforce along with employees with no post education. Also, the main type of service and product on offer shows a hint of significance for both services and products suitable for large customer groups and standardised services and products. Lastly, there is no significance for a firm's R&D or utilising links for organisational innovations.

Table 5.2
Probit Models: Organisational Innovation

Model	(a)	(b)	(c)
Constant	-4.66***	-4.71***	-4.64***
	(1.23)	(1.24)	(1.22)
Internal Resource Indicators			
Employment	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)
Employment Squared	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)
Workforce with Degree	0.026***	0.027***	0.027***
	(0.010)	(0.010)	(0.010)
Workforce with no Qualifications	0.027*	0.030*	0.027*
	(0.016)	(0.017)	(0.016)
R&D	0.179	-	-
	(0.465)		
Formal R&D	-	0.112	-
		(0.559)	
Informal R&D (only)	-	0.235	-
		(0.583)	
R&D Intensity	-	-	0.001
			(0.004)
Other Service Firm Characteristics			
Firm Vintage	0.016**	0.016**	0.016**
	(0.008)	(0.008)	(0.008)
Business Type	0.336	0.292	0.369
	(0.556)	(0.571)	(0.557)
Customised Offerings for Individuals	-0.836	-0.707	-0.881
	(0.839)	(0.843)	(0.816)
Tailored Offerings for Groups	0.411	0.440	0.442
	(0.554)	(0.562)	(0.546)
Suitable for Large Customer Groups	0.913*	0.972*	0.922*
	(0.571)	(0.573)	(0.563)
Standardised	1.09*	1.12*	1.08*
	(0.673)	(0.662)	(0.663)
External Linkages			
Strategic Alliance or Joint Venture	1.87	1.86	1.89
	(2928.7)	(2928.2)	(2909.8)
Suppliers	8.33	8.45	8.44
	(4359.6)	(4340.4)	(4331.5)
Customers	1.84	1.83	1.87
	(2530.9)	(2531.3)	(2512.2)
Log Likelihood Function	-20.11	-19.95	-20.18
Restricted Log Likelihood	-137.19	-136.60	-137.76
Chi squared	234.15	233.31	235.16
R-squared ML	0.690	0.690	0.690
Number of Observations	200	199	201

Notes: Standard Errors are in parentheses. Significant at *** 1%, **5%, *10%

Model (a)

```
Predicted
--------------------    +    -------
Actual         0      1 |       Total
--------------------    +    -------
   0         112      0 |         112
   1           7     81 |          88
--------------------    +    -------
Total        119     81 |         200
```

Again, model (a) will show the actual versus predicted cases for innovators and non-innovators. In this case of organisational innovators, model (a) above shows zero representing non-innovators and one for innovators. One hundred and twelve non-innovators are correctly predicted. Meanwhile, none of the non-innovators were wrongly predicted by the probit model. In other words, this model is an excellent fit predicting nearly all eighty-eight of the innovators, only wrongly predicting seven. Consequently, model (a) provides a great fit by predicting almost all of the innovators by allocating the numbers for both innovators and non-innovators very well. The next section will discuss the regression analysis for technological innovations.

5.2.5 Technology Driven Innovation

The factors which increase the probability of a firm introducing technology driven developments are seemingly less significant than the factors present for service and product or organisational innovations. In this rapidly changing technological environment, firms are more likely to innovative to survive. The questionnaire asks has the firm introduced any significant new or improved technological driven developments. This is quite similar to the Oslo Manual (OECD-EUROSTAT, 1997) which states 'non-technological innovation covers all innovation activities of firms which do not relate to the introduction of a technologically new or substantially changed good or service or to the use of a technologically new or substantially changed process'.

Firstly, in reference to Table 5.3, similar to service and products, the size of the firm is significant. This suggests that the probability of larger service firms to be more likely to partake in technological innovations increases with firm size. Applying Schumpeter's theory to the entrepreneurial firm, larger firms should have more resources devoted to R&D and thus more innovative output (Powell and Brantley, 1991). Although this seems quite logical, this is not the case as the findings for this

research suggest that there is a size effect; however there is no effect on these large firms' R&D activity. In other words, being a large service firm has an effect towards technological innovation but this innovation is not deriving specifically from R&D efforts. However, referring back to the findings of this research for service and product innovations (see Table 5.1) those results do coincide with those of Powell and Brantley (1991).

Interestingly the qualifications of the workforce did not play an important factor in estimating the probability of a service firm introducing technology driven developments.

One may assume that technology driven developments will derive from formal R&D and not much via informal R&D. Although, Table 5.3 shows there is no significance in any of the R&D aspects. These findings are quite different from Tether's (2003) findings from CIS II which suggests that service firms that actively engage in technologically creative actives are found in the extent to which they undertake R&D. This may also relate to the under-reporting of technological R&D. As Roper (1998) found it is difficult to identify R&D investments of small firms. Service firms may undertake R&D related activities meanwhile not recognising some of their activities as R&D. An under-reporting of R&D and total innovation costs may infer that services are less innovative or less committed to innovation (Tether, 2003).

Additionally, in relation to a service firm being large, the main type of offering is important. Thus, firms which offer services and products tailored to specific customer groups will be more likely to introduce technological innovations. This finding seems logical as the R&D along with the offering of services and products customised to individual customers may be too costly. The costs involved may greatly outweigh the benefit of introducing such technological driven developments. Moreover, offering standardised technological service and products may not be feasible due to the nature of the offering. Technology can be quite intricate, thus a firm may choose to only offer these technological service and products to specific customer groups.

Again, as mentioned above, the results from the different analysis of R&D, having a formal R&D department, and R&D intensity make no major changes in the coefficients. Thus, Table 5.3 presents the figures for R&D, which for technological

innovations proves insignificant. In other words, the type of R&D (whether formal or informal) a service firm initiates does not matter or the R&D expenditure.

Lastly, a brief mention of the links for innovation proves to be insignificant for technology driven developments. Connell (2002) states, "It is often the organisation's realisation of the magnitude and diversity of the data required that creates the initial obstacle to the development of a process to determine customer contribution." Also, these findings do not seem out of the ordinary as technological innovations are usually heavily protected regarding internal information and later patents. A study of SMEs regarding the technological co-operative R&D arrangement with various technical partners or network members shows a lack of importance for successful innovative projects (Bougrain and Haudeville, 2002). Additionally, Bourgrain and Haudeville's (2002) research does not suggest that the innovative projects by SMEs would have been successful without co-operative efforts. Regarding this research strategic alliance, suppliers, or customers play no role in the introduction of technological innovations. However, this was not the case in Tether's (2005) findings of service firms who cooperate with customers and/or suppliers as they are the most widely used means of accessing advanced technologies. Finally, according to Preissl's (2000) research, lack of capital was a larger problem for smaller firms (almost half of the firms) wishing to innovate as compared to larger firms (16 per cent). This may well present a palpable reason for SMEs to engage in linkages.

5.2.6 Brief Conclusions: Technology Driven Innovation

In short, these results show that simply the size of the firm has an effect suggesting larger service firms are more likely to partake in technology driven developments. Interestingly the qualifications of the workforce did not play an important factor in estimating the probability of a service firm introducing technology driven developments. There is no significance in any of the R&D aspects or a service firms' age. Also, the type of service and product offering affects the likelihood of a service firm being technologically innovative. Lastly, there is no effect concerning any of the links for organisational innovation. The model showing the actual versus predicted model for technological innovators and non-innovators will follow.

Table 5.3
Probit Models: Technological Innovation

Model	(a)	(b)	(c)
Constant	-1.76***	-1.82***	-2.32***
	(0.569)	(0.576)	(0.629)
Internal Resource Indicators			
Employment	0.000**	0.000**	0.000**
	(0.000)	(0.000)	(0.000)
Employment Squared	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)
Workforce with Degree	-0.002	-0.001	0.002
	(0.005)	(0.006)	(0.006)
Workforce with no Qualifications	0.005	0.006	0.011
	(0.009)	(0.009)	(0.010)
R&D	-0.152	-	-
	(0.376)		
Formal R&D	-	-0.430	-
		(0.472)	
Informal R&D (only)	-	0.001	-
		(0.492)	
R&D Intensity	-	-	0.028
			(0.031)
Other Service Firm Characteristics			
Firm Vintage	0.000	0.000	0.001
	(0.008)	(0.008)	(0.009)
Business Type	0.430	0.422	0.337
	(0.393)	(0.409)	(0.407)
Customised Offerings for Individuals	-0.142	-0.063	-0.422
	(0.392)	(0.399)	(0.473)
Tailored Offerings for Groups	0.771**	0.830**	1.00**
	(0.378)	(0.380)	(0.415)
Suitable for Large Customer Groups	0.107	0.160	0.392
	(0.394)	(0.397)	(0.421)
Standardised	0.393	0.366	0.403
	(0.400)	(0.404)	(0.434)
External Linkages			
Strategic Alliance or Joint Venture	0.851	0.844	0.911
	(3044.2)	(3059.5)	(3033.4)
Suppliers	1.78	1.75	1.81
	(3575.9)	(3606.3)	(3667.4)
Customers	3.92	3.87	3.18
	(1480.5)	(1490.4)	(1625.3)
Log Likelihood Function	-38.83	-38.11	-33.12
Restricted Log Likelihood	-133.74	-132.80	-134.24
Chi squared	189.83	189.40	202.25
R-squared ML	0.613	0.614	0.634
Number of Observations	200	199	201

Notes: Standard Errors are in parentheses. Significant at *** 1%, **5%, *10%

Model (a)

```
Predicted
----------------------  +   -------
Actual         0      1  |      Total
----------------------  +   -------
    0         77      1  |         78
    1         14    108  |        122
----------------------  +   -------
Total         91    109  |        200
```

Again, model (a) will show the actual versus predicted cases for innovators and non-innovators. Here technological innovators are of importance; again, model (a) below shows zero representing non-innovators and one for innovators. Seventy-seven non-innovators are correctly predicted out of a total of seventy-eight. Meanwhile, nearly all of the innovators are correctly predicted. In other words, this model is a good fit predicting nearly all of the innovators, only wrongly predicting fourteen. Consequently, model (a) provides a great fit by predicting almost all of the innovators by allocating the numbers for both innovators and non-innovators very well. The last section will attempt to make overall conclusions of these analyses.

5.3 Overall Conclusions: Probability of Innovation

Conclusions for the overall likelihood towards innovativeness of service firms centre on a few factors. Similarities for service and product introductions along with technology driven developments include the size of a service firm. This finding may once more be due to larger firms comprising a formal R&D department. Educational qualifications of employees are important for the introduction of service and product in addition to organisational innovations. The probabilities of introducing service and product or organisational innovations are higher when ones human capital is educated. Not to mention, the appearance of no post-school vocational qualification affecting the introduction of organisational innovations. Whether a service firms' workforce is educated or not may not prove important because a diverse skill and knowledge set is important.

Service firms which innovate via service and product is the only type of innovation which shows any links with outside sources- namely the customer and strategic alliances or joint ventures. This suggests that service firms which allow for the involvement of their customer are more likely to innovate. Also, there is importance in the effect of opening communications for ideas or suggestions from

strategic alliances or joint ventures. In no other circumstance are links proving to increase the likelihood of innovativeness.

For a service firm, it is not only valuable to partake in R&D, but also have the presence of a formal R&D department. There is also some effect whether the service firm is a stand-alone or member of a group.

Organisational innovativeness is unique as this is the only circumstance in which the age of the firm is significant. This suggests that older firms are more prone to partake in this type of innovation partly due to need. A service firm's main type of offering shows an indication of significance for both services and products suitable for large customer groups and standardised services and products.

Finally, the only remaining aspect for technological innovations includes the offering being tailored to specific customer groups; this may be due to the technical nature of the offerings.

Service firms which offer similar conglomerations of these coefficients may well increase the likelihood of being innovative in all or in part of service and product, organisational, or technological innovations. Therefore, there is clear evidence that having customer involvement increases the probability of innovation, thus there is definitely support for hypothesis one. In other words, service firms that harness customer-driven innovation are more innovative than service firms that innovate without the aid of their customers. These findings, regarding customer involvement, from the probit models show an effect towards the likelihood of innovation. Finally, the results of all three actual versus predicted models provide a great fit by predicting almost all of the innovators by allocating the numbers for both innovators and non-innovators very well. At this time, the next section we have to examine how various independent variables affect the extent of innovation.

5.4 The Extent of Innovation

This section will further expand on the first hypothesis via regression analysis. Again, this hypothesis is inquiring about the innovativeness of service firms who utilise the customer versus those service firms that do not. For further analysis, tobit models and truncation were constructed by way of several constraints to determine the *extent* of innovation.

The dependent variable for this analysis is the proportion of new products and services in total sales. This particular analysis only involves a service firms' totally

new to the market products and services. This variable is currently the standard measure of innovative performance in empirical studies.

Both censored regression models and truncated regression analysis are of importance for this analysis. Censoring is done in the upper or lower (or both) tails of the distribution of which the most familiar case of this model in literature is the 'tobit' model (Greene, 1998). A tobit model is a latent variable model, which has a limited dependent variable that is roughly continuous over strictly positive values. But, it is zero for a nontrivial fraction of the population (see Wooldridge, 1999). The latent variable y* satisfies the classical linear model assumptions, in particular it has a normal homoskedastic distribution with a linear conditional mean (Wooldridge, 2000). Thus, tobit models allow for the fact that there is a genuine zero response; the effect of the zero response as a result explains something about the dataset. It is useful to have an estimate of the entire distribution of the dependent variable given the explanatory variables.

Tobit models with truncated regression were also devised in order to better grasp hypothesis one, thus this analysis is addressing the effect of customer involvement for innovators only. The benefit of using a tobit truncated regression model is that it applies to the non-limit observations in the tobit formulation. When performing the analysis for innovators, ordinary least squared regression is inconsistent, thus the estimator used here is maximum likelihood (Greene, 1998). Due to the sample size, since non-innovators are not in this analysis, there are limited numbers of innovators under analysis.

The independent variables in determining what factors affect the likelihood of innovation are divided into three groups:

- Internal Resource Indicators
- Other Service Firm Characteristics
- External Linkages

Again, the independent variables which fall under these three groups are similar to that of the probit analyses. Firstly, addressing the internal resource indicators, the independent variables are: firm size, level of qualification for employees, research and development (in addition to formal R&D and R&D intensity). Next, other service firm characteristics include: age of the firm, type of business (a stand-alone, parent of

group headquarter, subsidiary in a group, or other- represented as a dummy variable), main type of service and products supplied (services and products customised to individual customers, tailored to specific customer groups, suitable for large customer groups, or standardised services and products). Lastly, the involvement of various external links such as: strategic alliances or joint ventures, suppliers, subsidiaries, customers, consultancy firms, and competitors.

Unlike with the probit models, in these models all of the questionnaires' six links were able to be incorporated in these analyses. The purpose for enquiring into these specific variables derives from previous empirical research as discussed above with the addition of three new variables. Reasons for incorporating these additional variables: subsidiaries, consultancy firms, and competitors will follow.

Firstly, Leiponen (2005) researched the role of subsidiaries in service innovation. Due to the fact that subsidiaries may share the same corporate culture, communication for new and improved developments may easily flow. Also, the use of consultancy firms is another source for innovation (Hughes and Wood, 2000; Hipp, 2000). Lastly, the cooperation of utilising competitors has also been a link for innovation. Leiponen (2005) found that completely new services are most often introduced by firms that engage in external knowledge sourcing particularly from customers and competitors. Regarding competitors, it is important that both firms benefit from the sharing of information or technologies. Whether utilising competitors in the innovation proves fruitful has been researched (Von Hippel, 1987; Shan et al., 1994; Hughes and Wood, 2000; Hipp, 2000). Therefore based on this and the previous empirical research mentioned above, six linkages were incorporated into the questionnaire. And, in conjunction with these six links, based on previous research conducted in the field of service innovation various independent variables were selected for the probit analyses.

Once more, the breakdown of data by SIC code was not possible for this analysis of service and products innovations. Tobits, which did allow for the inclusion of SIC variations, show no sectoral effects. Consequently, only the independent variables mentioned above are going to be included in each of the tobit and truncation models. Again, ideally all of these independent variables would be incorporated into the models; however, it was impossible due to the number of variables allowed and/or the limited number of observations.

The structure of this section will follow the same format as in the previous analysis section, however only service and product innovations will be of interest in this section. There are two distinct ways to define innovation: narrowly (new-to-market) and broadly (imitations and improvements). Under a synthesis approach, both of these definitions of innovation have been incorporated in the questionnaire. Therefore, tobit models are constructed for new services and products introduced to the market for the first time followed by a broader definition of innovation.

Gadrey et al. (1994) classify service products which are to varying degrees new-to-market or new to the firm (ranging from mere improvements to radical new forms). As mentioned earlier, Schumpeter's definition of product innovation is based on a new theme or area of expertise or development of a new service by discovering and defining new functions. Some believe 'new to the firm' innovations, in a pure Schumpeterian sense, could be labelled as 'imitation' (Flikkema, 2005). Nevertheless, for the purpose of the tobit analyses, service and product innovations that are regarded by the firm as 'new' will be the first dependent variable.

There is existing research on the definition of innovation involving new-to-market introductions. For example, the CIS II questionnaire also provides a distinction about the novelty of the innovation, namely a product new to the firm versus one new to the market (Therrien and Mohnen, 2003).

On the other hand, an extensive view of innovation has also been researched via empirical studies. With regard to incremental innovation, the exact definition of it is not actually self-evident; an improvement to a product or procedure may also be innovation (Gallouj and Weinstein, 1997). Some believe a large majority of successful innovations are based on the cumulative effect of incremental change in methods or ideas (Tushman and Nadler, 1986). Tobit analyses of only new to the market innovations will be discussed first.

5.4.1 Service & Product Innovation: New-to-Market

This section will begin with factors which are important for new service and product innovation of service firms. Specifically, this analysis is just addressing new services and products introduced to market for the first time. Based on the constraints mentioned above, interesting findings include the importance of the main type of service and product offered. As Table 5.4 shows, service firms that offer standardised services and products show a stronger tendency towards innovation. Possible reasons involve the offering being suitable for a large customer niche, not to mention the

probable capturing of economies of scale. There is empirical evidence of a greater standardisation of service outputs, for example, the stipulation of services remaining unchanged between customers (Tether, 2003). A broad offering may ease the launch of services and products introduced to the market for the first time.

Additionally, the success rate of a standardised product and service launch could be higher than one tailored to specific customer groups. However, with that said, there is a hint of negative significance for those firms which offer product and services customised to individual customers. This particular type of innovation rightly assumes a coordination of communications in order to meet the specific demands of their customer. Services are often being created while they are provided, thus facilitating the involvement of customers along the process (Preissl, 2000).

Also, whether a firm partakes in R&D is an important factor in determining the extent of innovation (refer to Table 5.4). Again, the questionnaire inquires: was any R&D undertaken in your business in 2003 and then is there a formal R&D department in you business? Firms were then isolated based on their response, thus those firms with a formal R&D department are not included in the analysis of the first question. These findings suggest that having a formal R&D department does matter significantly to innovation. Firms which have a standard R&D department allows for concentration of resources for initiating new or improved service and products. At the same time, informal R&D provides evidence of significance. Obviously controlling costs is vital; therefore many firms do not invest in the required skills or equipment for the utilisation of in-house activities. Lack of investment may also arise due to viewing these activities as experimental, being only required occasionally, too different from a firm's core capabilities, or difficult with regard to achieving a minimum efficient scale (Metcalfe and Miles, 2000). Based on these costs and concerns, the need for co-operation clearly arises, thus firms oftentimes demand service inputs from member network. Also, the issue of buy-in R&D services is worth mentioning here. Perhaps the restructuring in industry (such as downsizing, concentrating on core activities) have led to the externalisation of activities that were previously provided in-house. R&D as it usually regarded as an in-house activity and part of the core business. Analysts normally assumed R&D activities could not be delegated to outsiders, however the makeup of many firms are changing. Additionally, new highly technical or complex services may be too expensive to maintain in-house, and the knowledge needed to establish in-house may not be

available. In short, both formal and informal R&D contribute to the extent of innovation, this finding differs from the earlier probit results which shows an effect only for formal R&D. Meanwhile, R&D intensity, sales revenue divided by R&D expenditure, shows that the more R&D a firm partakes in does not make it innovate more. These findings are similar to Leiponen's (2005) research of service firms which found that the role of R&D investment is not significant.

Other significant constraints include the various links mentioned above (refer to Table 5.4). Here, strategic alliances, either direct or indirect contact with suppliers and/or customers all prove to be very valuable in the innovation process. These findings are interesting as this interaction may fall under informal R&D for a service firm. This coincides with the R&D results mentioned above, as both formal and informal R&D are relevant. By utilising these external sources, service firms can extract ideas which may yield beneficial internal results (refer to the next chapters). Additionally, the role of consultancy firms shows significance, although not as high as for strategic alliances, suppliers, or customers. This finding, concerning a service firms' 'interactions' and 'relationships' with customers, are quite similar to that of previous empirical researches (Gallouj and Weinstein, 1997; Gadrey and Gallouj, 1998; Djellal and Gallouj, 2000; Sundbo and Gallouj, 2000; Tether, 2003).

Specifically, it is in Tether's (2003) empirical research that 80 per cent of the respondents recognised customers as a relevant source of information for innovation, secondly of importance were suppliers, followed by competitors. Although, in this research suppliers show a very high level of significance, it is closely matched with input from customers, thus the view of services being 'supplier dominated' may not completely be true from the perspective of the respondents.

Additionally, regarding the role of consultancy firms it is suggested that the development of client–consultancy relations requires to be viewed as an interactive process, and are mutually constituted, with both partners playing an equally important role (Hislop, 2002). Hence, relationships that allow for suggestions from links outside of service firms may aid in the innovativeness of services and products. With the tobit analysis for new-to-market complete, it will be of importance to address the proper sample distribution of innovators via truncation.

Table 5.4 Tobit Models: New-to-Market Services & Products

Model	(d)	(e)	(f)
Constant	-32.72***	-30.36***	-26.18**
	(8.28)	(8.03)	(8.13)
Internal Resource Indicators			
Employment	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)
Employment Squared	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)
Workforce with Degree	0.027	0.005	0.068
	(0.077)	(0.076)	(0.078)
Workforce with no Qualifications	0.046	0.024	0.018
	(0.151)	(0.156)	(0.155)
R&D	19.03***	-	-
	(5.36)		
Formal R&D	-	23.75***	-
		(6.24)	
Informal R&D (only)	-	19.63***	-
		(6.34)	
R&D Intensity	-	-	0.016
			(0.014)
Other Service Firm Characteristics			
Firm Vintage	-0.057	-0.069	-0.043
	(0.066)	(0.065)	(0.068)
Business Type	4.65	3.87	2.08
	(5.06)	(5.05)	(5.18)
Customised Offerings for Individuals	-6.40	-6.80	-8.14*
	(4.83)	(4.74)	(5.00)
Tailored Offerings for Groups	3.99	3.16	3.63
	(5.00)	(4.92)	(5.10)
Suitable for Large Customer Groups	6.77	5.83	6.24
	(5.00)	(4.93)	(5.13)
Standardised	9.72*	8.73*	9.72*
	(5.29)	(5.17)	(5.44)
External Linkages			
Strategic Alliance or Joint Venture	0.333***	0.294***	0.397***
	(0.104)	(0.103)	(0.104)
Suppliers	0.504***	0.504***	0.416***
	(0.138)	(0.135)	(0.138)
Subsidiaries	0.004	-0.019	0.041
	(0.222)	(0.217)	(0.229)
Customers	0.260***	0.245**	0.351***
	(0.087)	(0.086)	(0.088)
Consultancy Firms	0.445**	0.442**	0.457**
	(0.214)	(0.209)	(0.220)
Competitors	0.055	0.054	0.141
	(0.129)	(0.125)	(0.132)
Sigma	27.026	26.358	27.978
Log Likelihood Function	-565.55	-563.96	-572.72
Number of Observations	200	199	201
Pseudo R^2 (Anova)	0.246	0.109	0.200
Pseudo R^2 (Decomp)	0.129	0.264	0.115

Notes: Standard Errors are in parentheses. Significant at *** 1%, **5%, *10%

In this section truncation analysis will be discussed. Again, truncated regression allows for a better grasp of hypothesis one, thus this analysis is addressing the effect of customer involvement for innovators only. The benefit of using a tobit truncated regression model applies to the non-limit observations in the tobit formulation.

As you will note, in referring to Table 5.5, the truncation of the independent variables mentioned above prove no significance for innovations. With truncation, only a hint of effect is apparent from those service firms who provide service and products suitable for large customer groups. The basis for this finding may be well similar to that suggested above. Thus, the main type of product or service provided by a service firm may yield new-to-market innovations. Table 5.5 also shows no effect on innovation of any external linkages, meanwhile the previous tobit models did show importance of customer links. Conclusions for services and products offered to the market for the first time will follow.

5.4.2 Brief Conclusions: New-to-Market

In summary, there are numerous factors which aid in new to the market innovations. Firstly, there is strong support for service firms which offer standardised products and services. Meanwhile, there is a hint of significance for those service firms which provide services and products customised to individual customers. Both formal and informal R&D proves important for service firm innovation. Additionally, linkages with strategic alliances, suppliers, customers, and consultancy firms offer support for innovation.

The truncation models show only an effect regarding a hint of effect from those service firms who provide service and products suitable for large customer groups. Also, important are the tobit results showing importance of customer links, but looking only at innovators this is not important. The next section will discuss those service and product innovations which are not brand new-to-market.

Table 5.5 Truncation Models: New-to-Market Services & Products

Model	(d)	(e)	(f)
Constant	-41.69	-40.30	-30.60
	(48.21)	(45.97)	(36.71)
Internal Resource Indicators			
Employment	-0.000	-0.001	0.000
	(0.001)	(0.000)	(0.000)
Employment Squared	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)
Workforce with Degree	0.256	0.185	0.288
	(0.278)	(0.263)	(0.251)
Workforce with no Qualifications	-0.225	-0.123	-0.365
	(0.553)	(0.557)	(0.604)
R&D	5.41	-	-
	(18.09)		
Formal R&D	-	21.88	-
		(22.71)	
Informal R&D (only)	-	6.73	-
		(21.86)	
R&D Intensity	-	-	-0.013
			(0.056)
Other Service Firm Characteristics			
Firm Vintage	-0.185	-0.208	-0.321
	(0.234)	(0.230)	(0.243)
Business Type	8.69	3.91	0.283
	(16.84)	(16.47)	(16.21)
Customised Offerings for Individuals	-12.56	-10.50	-14.59
	(15.90)	(15.25)	(15.75)
Tailored Offerings for Groups	13.86	14.84	7.56
	(16.45)	(16.11)	(15.62)
Suitable for Large Customer Groups	21.88	22.61	27.90*
	(17.76)	(17.36)	(16.91)
Standardised	14.52	13.38	22.70
	(16.65)	(15.87)	(15.95)
External Linkages			
Strategic Alliance or Joint Venture	0.246	0.179	0.263
	(0.323)	(0.309)	(0.318)
Suppliers	-0.026	0.053	0.332
	(0.486)	(0.478)	(0.388)
Subsidiaries	-0.984	-1.00	-1.24
	(0.855)	(0.831)	(0.878)
Customers	-0.192	-0.184	-0.289
	(0.300)	(0.292)	(0.310)
Consultancy Firms	0.902	0.865	0.851
	(0.695)	(0.667)	(0.631)
Competitors	0.094	0.073	-0.066
	(0.452)	(0.438)	(0.477)
Sigma	34.816	34.122	35.929
Log Likelihood Function	-436.72	-432.69	-449.90
Number of Observations	109	108	111

Notes: Standard Errors are in parentheses. Significant at *** 1%, **5%, *10%

5.4.3 Service & Product Innovation: A Broader Scope

The following paragraphs will be addressing a broader definition of innovation which includes: services and products new-to-market, new services and products introduced by this business but previously provided by other firms, and improved services and products. The tobit results from a sum of these different types of innovations are visible in Table 5.6.

Firstly, unlike the findings from those service and products new-to-market, having a qualified workforce aids in innovations. Surprisingly, a service firm with employees having no post school qualification is also a variable showing significance. Clearly, those with a qualified workforce display more inclinations to innovative, but it is interesting to see no post school qualification as one of the variables. Although the allocation of employees, on the questionnaire, is not department specific, possible reasons for such findings may involve the strong importance of educated employees in areas such as R&D. Meanwhile, service firms may also employ individuals with no post education in various other departments throughout the firm. Therefore, it is not necessarily the case that those employees who lack a formal education are not involved in R&D, but generally speaking this may be appropriate to assume. Nevertheless, services may be more likely to place emphasis on the professionalism and skill set of their workforce (Tether, 2005). But, keep in mind this is a broader definition of innovation, thus these various types of innovations may originate in any department. Hence, service firms which employ a variation of employees could support their innovative efforts.

Next, regarding the type of service and product offering, Table 5.6 identifies the significance of two coefficients. There is an indication of effect of services and products for large customer groups in addition to services and products tailored to specific customer groups. This is unlike the findings for services and products introduced to market for the first time as above standardised offerings are the most significance. Standardised offerings may prove easier in marketing to new or potential customers. Services and products suitable for large customer groups are also important for the introduction of innovations in a broader view. More significant is the negative effect on the likelihood for innovation if a firm's offerings are tailored to specific customer groups. This may be due to the lack of ability for a firm to offer improved services and products which meet the specific needs of their existing

customers. Or, by narrowing the scope of the firm's offering, this decreases the potential for capturing new customers or new markets.

Whether or not a firm undergoes R&D is significant in introducing innovations, as Table 5.6 shows the importance. Similar findings were reported, in Tether's (2003) research on services, as approximately half of all firms did engage in innovative activities undertook R&D, while half of those doing so on a continuous basis. Additionally, R&D intensity is not a determining factor for service and product innovation. Regarding the prevalent findings from service firms that participate in formal R&D can be expected, however interestingly informal R&D is more significant. Pavitt et al. (1989) research, along with existing statistical data at the time, showed that services undertook very little R&D. More recently, R&D surveys have documentation for extensive service R&D (Young, 1996).

Also, regarding innovations, there are significant results concerning the linkage between strategic alliances, suppliers, customers, and competitors. In comparison with new-to-market innovations, here competitors are noteworthy. The participatory role of a service firm's competition, in a broad sense of innovation, is conceivable, since competitors are less likely to be involved in new-to-market innovations. Possible reasons for this include a firm's protection of internal information. Although competitors are significant in this broader definition of innovation, they were not significant in new-to-market innovations.

A service firm's participation in co-operations may be substantial in more complex or uncertain developments, particularly when changes to existing services are being made (Tether, 2002). Consistently utilising relationships with strategic alliances, suppliers, and customers show an effect of all four categories of innovation under this analysis. Again, Table 5.6 shows the strong significance for strategic alliances or joint ventures, customers, and competitors. These findings, regarding suppliers, differ from Pavitt's (1984) dominant 'supplier dominated' classification for services, as being dependent on their suppliers for innovative inputs. Similar results from previous empirical research regarding competitors exist. Hipp (2000) for example, found a positive effect in knowledge-intensive business services (KIBS) who utilise competitors as an external source of innovation. Additionally, Hughes and Wood (2000) report business services highly regarding the importance of competitors in the same line of business. Thus, service firms who extrapolate ideas and/or suggestions from these three sources, not only suppliers, benefit by way of

innovation. The next section will follow up this portion of the analysis with truncation models.

Table 5.6 Tobit Models: Service & Product Innovation

Model	(g)	(h)	(i)
Constant	-33.93***	-25.84***	-26.39***
	(11.33)	(9.57)	(11.05)
Internal Resource Indicators			
Employment	-0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)
Employment Squared	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)
Workforce with Degree	0.448***	0.381***	0.482***
	(0.107)	(0.092)	(0.107)
Workforce with no Qualifications	0.507**	0.496***	0.463**
	(0.214)	(0.187)	(0.215)
R&D	20.44***	-	-
	7.33		
Formal R&D	-	13.93*	-
		(7.42)	
Informal R&D (only)	-	20.81***	-
		(7.57)	
R&D Intensity	-	-	0.012
			(0.021)
Other Service Firm Characteristics			
Firm Vintage	0.129	0.125	0.141
	(0.092)	(0.079)	(0.093)
Business Type	5.71	2.79	2.94
	(7.06)	(6.19)	(7.10)
Customised Offerings for Individuals	-1.78	-1.16	-3.21
	(6.89)	(5.91)	(6.98)
Tailored Offerings for Groups	-20.19***	-16.57***	-20.36***
	(7.25)	(6.21)	(7.28)
Suitable for Large Customer Groups	12.61*	10.74*	11.72*
	(7.11)	(6.09)	(7.18)
Standardised	6.12	2.90	5.96
	(7.73)	(6.56)	(7.79)
External Linkages			
Strategic Alliance or Joint Venture	0.683***	0.588***	0.752***
	(0.149)	(0.128)	(0.145)
Suppliers	0.462**	0.431***	0.373**
	(0.194)	(0.167)	(0.194)
Subsidiaries	-0.149	-0.112	-0.109
	(0.317)	(0.275)	(0.321)
Customers	0.591***	0.497***	0.684***
	(0.124)	(0.105)	(0.123)
Consultancy Firms	0.385	0.387	0.388
	(0.301)	(0.262)	(0.306)
Competitors	0.492***	0.499***	0.599***
	(0.176)	(0.151)	(0.175)

Sigma	40.313	35.057	40.931
Log Likelihood Function	-738.31	-806.55	-746.95
Number of Observations	200	199	201
Pseudo R^2 (Anova)	0.330	0.237	0.276
Pseudo R^2 (Decomp)	0.299	0.248	0.288

Notes: Standard Errors are in parentheses. Significant at *** 1%, **5%, *10%

As you will note, in referring to Table 5.7, the truncation of the sample mentioned above for innovations show some significance. Firstly, same as above, a service firm's workforce either educated or not, is an important factor for service and product innovation. Additionally, service firms which offer services and products tailored to specific customer groups tend to show a negative effect towards innovation. This may be due to the lack of ability for a firm to offer improved services and products which meet the niche of their existing customers. Or, having a narrow offering may decrease the potential for capturing new customers or new markets. Quite different from the above analysis, Table 5.7 shows, a negative effect regarding connections with subsidiaries as a factor in determining service firm's innovations. Overall, one can conclude that allowing for indiscriminate suggestions from outside links proves valuable for a service firm.

5.4.4 Brief Conclusions: A Broader Scope

Hence, there are various factors which impact the ability of a service firm to innovate. Based on the tobit and truncation models, the educational level of both qualified and unqualified employees are important for service firms. Additionally, informal R&D is more significant than formal R&D; but both types are relevant for service and product innovation. Similar results from Caloghirou et al. (2002) show a strong positive relationship between the extent of innovation of the firms and their R&D intensity and personnel qualifications. There is an indication of effect of services and products for large customer groups. Additionally, there is a negative effect for service firms which offer services and products tailored to specific customer groups. Also, service firms which extrapolate ideas and/or suggestions from their strategic alliances, suppliers, subsidiaries, customers, and competitors benefit by way of service and product innovation. However, with the truncation model, there is a negative effect of utilising subsidiaries in innovative efforts. These numerous factors in conjunction enable a service firm to innovate.

Table 5.7 Truncation Model: Service & Product Innovation

Model	(g)	(h)	(i)
Constant	3.70	2.46	13.78
	(17.58)	(16.89)	(16.00)
Internal Resource Indicators			
Employment	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)
Employment Squared	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)
Workforce with Degree	0.496***	0.497***	0.471***
	(0.143)	(0.140)	(0.137)
Workforce with no Qualifications	0.592**	0.684***	0.530**
	(0.263)	(0.264)	(0.255)
R&D	8.39	-	-
	(9.52)		
Formal R&D	-	2.93	-
		(10.72)	
Informal R&D (only)	-	14.00	-
		(10.95)	
R&D Intensity	-	-	-0.010
			(0.031)
Other Service Firm Characteristics			
Firm Vintage	0.044	0.061	0.032
	(0.112)	(0.109)	(0.109)
Business Type	3.97	3.31	3.12
	(8.95)	(8.94)	(8.64)
Customised Offerings for Individuals	2.96	3.78	3.27
	(8.44)	(8.19)	(8.24)
Tailored Offerings for Groups	-19.39**	-17.42**	-18.61**
	(9.14)	(8.87)	(8.83)
Suitable for Large Customer Groups	4.29	6.40	3.18
	(8.65)	(8.46)	(8.42)
Standardised	10.45	10.42	11.31
	(9.35)	(9.08)	(9.11)
External Linkages			
Strategic Alliance or Joint Venture	0.268	0.252	0.233
	(0.185)	(0.181)	(0.176)
Suppliers	-0.305	-0.294	-0.400
	(0.275)	(0.268)	(0.261)
Subsidiaries	-0.687*	-0.647*	-0.676*
	(0.416)	(0.405)	(0.408)
Customers	0.077	0.086	0.076
	(0.156)	(0.153)	(0.151)
Consultancy Firms	0.138	0.123	0.086
	(0.359)	(0.351)	(0.351)
Competitors	0.175	0.167	0.178
	(0.203)	(0.197)	(0.197)
Sigma	38.343	37.530	37.754
Log Likelihood Function	-750.73	-744.80	-755.52
Number of Observations	158	157	159

Notes: Standard Errors are in parentheses. Significant at *** 1%, **5%, *10%

5.5 Overall Conclusions: Extent of Innovation

In review, there are numerous factors which aid in new-to-market service and product innovations in addition to those that are considered imitations or improvements. The purpose of this chapter was to shed light on the factors which determine innovation among service firms utilising two key elements: the *likelihood* of innovation (probit analysis) and the *extent* of innovation (tobit and truncated regression analysis).

Firstly, regarding size, larger service firms are more likely to innovate but do not innovate more. In other words, the extent of larger firms' innovation is not more than that of SMEs.

Next, there is an effect towards the educational level of employees for service and product and organisational innovations. Also, there is significance for organisationally innovative service firms who employ individuals without a degree. Surprisingly there was no education effect present for service firms which introduce technological innovations. When isolating new-to-market innovations, there was no education effect, the same holds true for the truncation model for extent of innovation. Finally, when addressing the broad definition of innovation, there was an educational effect present, even in the truncation model. Important to note for this broad definition, this education effect represents both an effect on service firms which have a qualified workforce and those which do not.

There is strong support for those service firms, who participate in R&D, not the intensity. Interestingly, both formal and informal R&D contributes to the extent of innovation for a service firm. However, only formal R&D displays a positive effect on the likelihood of a service firm partaking in innovation.

The age of the service firm proved to be of importance only for organisational innovation. The business life cycle may have a role in this finding. Additionally, regardless of the main type of offering a service firm provides, services and products customised to individual customers, tailored to specific customer groups, suitable for large customer groups, or standardised services and products, the differences are essentially not so significant.

Lastly, all linkages, which provide ideas and/or suggestions, whether it is with strategic alliances, suppliers, subsidiaries, customers, consultancy firms or competitors all aid in service and product innovation. Based on the probit and tobit analyses, there is sufficient evidence which supports all of the service and product

links. These findings differ from Tether's (2003) as he found only a third of the service firms admitted to having innovated 'jointly with others'. On the other hand, previous empirical research has found that, participation in collaborations is indicative of an ability for interactive knowledge sharing that may prove very beneficial for further exploitation of knowledge and thus inter-firm linkages seem to promote innovativeness (Caloghirou et al., 2002).

Addressing the results from the truncation models, it is apparent that when isolating innovative service firms the main difference is a service firm's involvement with subsidiaries. Nevertheless, having links with these external sources for ideas and/or suggestions do impact the ability of a service firm to innovate.

Generally speaking, involving any of the external links proves to benefit the service firm. The findings, from the probit and tobit models show a positive effect regarding customer involvement. Thus, there is strong support for those service firms who allow for the involvement of their customer for ideas or suggestions regarding innovation. In short, there is ample support for hypothesis 1a.

However, based on the truncation models, there is no support for hypothesis 1b which deals with customer-driven service firms being more innovative than service firms that innovate without the aid of their customer. Possibly these innovative service firms reach a threshold where they are already innovative. These service firms which are innovative may not need to utilise any external linkages or they may not acknowledge the benefits received from the linkages. For example, Hertog (2000) states due to the cooperation between business service firm and their client, increasingly there is no clear identifiable point to locate the innovation. Nevertheless, hypothesis 1a is supported, but not hypothesis 1b. In order to gather a clearer picture of this chapter's findings refer to the summary tables which show which variables are significant (Table 5.11, Table 5.12, and Table 5.13).

Table 5.8 Correlation Matrix: Service & Product Innovation (Probits & Tobits)

Variable	1	2	3	4	5	6	7	8	9	10	11	12
1. S&P Innovation												
2. New–to–Market	0.340											
3. New & Improved	0.584	0.559										
4. Employment	0.169	0.075	0.127									
5. Employment Squared	0.116	0.046	0.107	0.948								
6. Workforce with Degree	-0.057	0.088	0.020	0.083	0.043							
7. Workforce with no qualifications	-0.009	-0.040	0.086	-0.023	-0.004	-0.144						
8. R&D	0.407	0.242	0.331	0.249	0.189	0.056	-0.107					
9. Formal R&D	0.295	0.242	0.188	0.351	0.240	0.011	-0.124	0.599				
10. Informal R&D (only)	0.162	0.051	0.199	-0.096	-0.049	0.045	0.009	0.481	-0.389			
11. R&D Intensity	0.094	0.139	0.081	0.464	0.366	0.058	-0.020	0.162	0.249	-0.093		
12. Firm Vintage	0.210	-0.030	0.100	0.470	0.375	0.083	-0.083	0.213	0.297	-0.068	0.131	
13. Business Type	-0.178	-0.011	-0.084	-0.240	-0.216	-0.152	0.149	-0.285	-0.115	-0.188	-0.180	-0.305
14. Customised Offerings for Individuals	0.052	-0.102	0.047	0.026	0.008	0.027	0.121	0.013	0.001	0.020	0.049	0.000
15. Tailored Offerings for Groups	-0.037	0.077	-0.063	0.136	0.139	-0.112	-0.061	0.096	0.121	0.010	0.145	0.020
16. Suitable for Large Customer Groups	0.093	0.094	0.107	0.183	0.159	0.003	0.000	0.024	0.089	-0.062	0.108	0.082
17. Standardised Offerings	0.016	0.156	0.091	0.122	0.085	0.088	-0.046	0.026	0.071	-0.036	0.023	0.105
18. Strategic Alliance/Joint Venture	0.298	0.235	0.235	0.069	0.062	-0.039	-0.048	0.237	0.198	0.104	0.043	0.002
19. Suppliers	0.254	0.136	0.045	0.015	-0.005	0.033	-0.011	-0.169	-0.081	-0.113	0.013	-0.034
20. Subsidiaries	0.193	-0.013	0.013	0.343	0.269	0.065	-0.095	0.182	0.252	-0.056	0.191	0.277
21. Customers	0.439	0.113	0.299	-0.005	-0.007	-0.101	0.063	0.253	0.066	0.226	-0.051	0.065
22. Consultancy Firms	0.231	0.139	0.144	0.049	-0.008	0.031	0.082	0.103	0.145	-0.035	0.023	0.056
23. Competitors	0.291	0.047	0.247	0.027	0.004	0.089	-0.017	0.228	0.130	0.111	0.030	0.032

Table 5.8 Correlation Matrix: Service & Product Innovation (Probits & Tobits) continued

Variable	13	14	15	16	17	18	19	20	21	22
1. S&P Innovation										
2. New-to-Market										
3. New & Improved										
4. Employment										
5. Employment Squared										
6. Workforce with Degree										
7. Workforce with no qualifications										
8. R&D										
9. Formal R&D										
10. Informal R&D (only)										
11. R&D Intensity										
12. Firm Vintage										
13. Business Type										
14. Customised Offerings for Individuals	0.020									
15. Tailored Offerings for Groups	-0.063	-0.203								
16. Suitable for Large Customer Groups	0.000	-0.171	-0.034							
17. Standardised Offerings	-0.086	-0.169	-0.130	-0.072						
18. Strategic Alliance/Joint Venture	-0.267	0.005	0.179	-0.069	0.082					
19. Suppliers	0.136	0.055	-0.157	-0.062	0.084	-0.061				
20. Subsidiaries	-0.284	0.014	0.027	0.003	-0.023	0.092	-0.038			
21. Customers	-0.027	0.103	0.042	-0.012	-0.063	-0.095	0.027	-0.079		
22. Consultancy Firms	-0.105	0.138	-0.083	0.009	-0.015	0.130	-0.061	0.284	0.006	
23. Competitors	-0.062	0.050	-0.007	0.032	0.047	-0.073	-0.052	-0.016	0.111	0.125

Table 5.9 Correlation Matrix: Organisational Innovation (Probits & Tobits)

Variable	1	2	3	4	5	6	7	8	9	10
1. Organisational Innovation										
2. Employment	0.006									
3. Employment Squared	-0.065	0.948								
4. Workforce with Degree	0.023	0.083	0.043							
5. Workforce with no Qualifications	0.046	-0.023	-0.004	-0.144						
6. R&D	0.243	0.249	0.189	0.056	-0.107					
7. Formal R&D	0.191	0.351	0.240	0.011	-0.124	0.599				
8. Informal R&D (only)	0.099	-0.096	-0.049	0.045	0.009	0.481	-0.389			
9. R&D Intensity	0.054	0.464	0.366	0.058	-0.020	0.162	0.249	-0.093		
10. Firm Vintage	0.084	0.470	0.375	0.083	-0.083	0.213	0.297	-0.068	0.131	
11. Business Type	-0.148	-0.240	-0.216	-0.152	0.149	-0.285	-0.115	-0.188	-0.180	-0.305
12. Customised Offerings for Individuals	0.071	0.026	0.008	0.027	0.121	0.013	0.001	0.020	0.049	0.000
13. Tailored Offerings for Groups	0.010	0.139	0.139	-0.112	-0.061	0.096	0.121	0.010	0.145	0.020
14. Suitable for Large Customer Groups	-0.024	0.183	0.159	0.003	0.000	0.024	0.089	-0.062	0.108	0.082
15. Standardised Offerings	0.184	0.122	0.085	0.088	-0.046	0.026	0.071	-0.036	0.023	0.105
16. Strategic Alliance/Joint Venture	0.407	0.083	0.031	-0.016	-0.009	0.262	0.238	0.082	0.091	0.015
17. Suppliers	0.395	-0.071	-0.071	0.081	0.020	0.033	0.023	0.008	-0.024	-0.108
18. Subsidiaries	0.325	0.151	0.090	0.083	-0.047	0.099	0.087	0.020	0.168	0.197
19. Customers	0.578	-0.062	-0.088	-0.027	0.070	0.090	0.042	0.117	-0.029	-0.072
20. Consultancy Firms	0.460	0.056	-0.022	0.017	0.050	0.064	0.100	-0.016	-0.001	0.182
21. Competitors	0.427	-0.032	-0.055	-0.062	0.156	0.077	0.000	0.102	0.050	-0.016

Table 5.9 Correlation Matrix: Organisational Innovation (Probits & Tobits) continued

Variable	11	12	13	14	15	16	17	18	19	20
1. Organisational Innovation										
2. Employment										
3. Employment Squared										
4. Workforce with Degree										
5. Workforce with no Qualifications										
6. R&D										
7. Formal R&D										
8. Informal R&D (only)										
9. R&D Intensity										
10. Firm Vintage										
11. Business Type										
12. Customised Offerings for Individuals	0.020									
13. Tailored Offerings for Groups	-0.063	-0.203								
14. Suitable for Large Customer Groups	0.000	-0.171	-0.034							
15. Standardised Offerings	-0.086	-0.169	-0.130	-0.072						
16. Strategic Alliance/Joint Venture	-0.191	-0.050	0.147	-0.049	0.156					
17. Suppliers	0.012	0.010	-0.056	-0.059	0.140	0.161				
18. Subsidiaries	-0.287	0.025	-0.030	-0.054	0.014	0.208	0.120			
19. Customers	0.028	0.117	-0.031	0.033	-0.011	0.167	0.231	0.045		
20. Consultancy Firms	-0.097	0.122	-0.018	0.015	0.140	0.145	0.060	0.042	0.274	
21. Competitors	-0.056	0.087	-0.006	-0.051	0.157	0.047	0.229	0.050	0.302	0.119

Table 5.10 Correlation Matrix: Technological Innovation (Probits & Tobits)

Variable	1	2	3	4	5	6	7	8	9	10
1. Technological Innovation										
2. Employment	0.164									
3. Employment Squared	0.130	0.948								
4. Workforce with Degree	0.106	0.082	0.042							
5. Workforce with no Qualifications	-0.065	-0.024	-0.004	-0.145						
6. R&D	0.201	0.248	0.188	0.054	-0.109					
7. Formal R&D	0.112	0.350	0.239	0.010	-0.126	0.597				
8. Informal R&D (only)	0.106	-0.097	-0.049	0.044	0.008	0.480	-0.392			
9. R&D Intensity	0.005	0.464	0.365	0.058	-0.021	0.161	0.248	-0.094		
10. Firm Vintage	0.176	0.469	0.374	0.082	-0.084	0.211	0.295	-0.070	0.131	
11. Business Type	-0.044	-0.239	-0.216	-0.151	0.151	-0.281	-0.112	-0.186	-0.179	-0.303
12. Customised Offerings for Individuals	0.110	0.025	0.007	0.026	0.120	0.008	-0.002	0.018	0.049	-0.003
13. Tailored Offerings for Groups	0.054	0.135	0.138	-0.114	-0.063	0.092	0.118	0.008	0.145	0.018
14. Suitable for Large Customer Groups	0.060	0.182	0.159	0.002	-0.001	0.021	0.087	-0.063	0.107	0.080
15. Standardised Offerings	0.019	0.126	0.087	0.092	-0.043	0.036	0.078	-0.032	0.025	0.111
16. Strategic Alliance/Joint Venture	0.346	0.145	0.101	0.028	0.040	0.246	0.169	0.128	-0.002	0.072
17. Suppliers	0.351	0.056	0.041	0.058	-0.041	-0.081	-0.020	-0.083	-0.012	0.043
18. Subsidiaries	0.263	0.242	0.182	-0.034	-0.085	0.136	0.171	0.008	-0.026	0.345
19. Customers	0.472	0.125	0.116	0.094	-0.086	0.158	0.120	0.067	0.093	0.083
20. Consultancy Firms	0.323	0.036	0.007	-0.032	0.141	0.017	0.080	-0.057	-0.007	0.109
21. Competitors	0.411	0.087	0.096	0.130	0.054	0.138	-0.015	0.171	0.019	0.132

Table 5.10 Correlation Matrix: Technological Innovation (Probits & Tobits) continued

Variable	11	12	13	14	15	16	17	18	19	20
1. Technological Innovation										
2. Employment										
3. Employment Squared										
4. Workforce with Degree										
5. Workforce with no Qualifications										
6. R&D										
7. Formal R&D										
8. Informal R&D (only)										
9. R&D Intensity										
10. Firm Vintage										
11. Business Type										
12. Customised Offerings for Individuals	0.023									
13. Tailored Offerings for Groups	-0.060	-0.207								
14. Suitable for Large Customer Groups	0.003	-0.174	-0.036							
15. Standardised Offerings	-0.094	-0.164	-0.125	-0.067						
16. Strategic Alliance/Joint Venture	-0.138	0.181	0.055	0.011	-0.028					
17. Suppliers	0.087	0.095	-0.173	0.014	0.038	0.055				
18. Subsidiaries	-0.248	0.127	0.023	-0.049	0.002	0.169	0.040			
19. Customers	0.033	0.125	0.049	0.046	-0.097	0.060	0.063	0.062		
20. Consultancy Firms	0.028	0.035	0.043	0.014	0.047	0.035	-0.017	0.044	0.003	
21. Competitors	-0.059	-0.023	-0.048	0.086	0.182	0.016	0.051	0.064	0.186	0.047

Table 5.11 Summary of Key Results

Likelihood of Innovation

	S&P Innovation			Organisational Innovation			Technological Innovation		
	Model (a)	Model (b)	Model (c)	Model (a)	Model (b)	Model (c)	Model (a)	Model (b)	Model (c)
Internal Resource Indicators									
Employment	++	++	+				++	++	++
Employment Squared	- -	- -							
Workforce with Degree	+	+	++	++	++	++			
Workforce with no qualifications				+	+	+			
R&D	++								
Formal R&D		++							
Informal R&D (only)									
R&D Intensity									
Other Service Firm Characteristics									
Firm Vintage				++	++	++			
Business Type									
Customised Offerings for Individuals									
Tailored Offerings for Groups							++	++	++
Suitable for Large Customer Groups				+	+	+			
Standardised				+	+	+			
External Linkages									
Strategic Alliance or Joint Venture			++						
Suppliers									
Customers	++	++	++						

Notes: ++ positively significant at 0.05 or 0.01, + positively significant at 0.1, - - negatively significant at 0.05 or 0.01, - negatively significant at 0.1

Table 5.12 Summary of Key Results

Extent of S&P Innovation	New-to-Market			New-to-Market (truncated)		
	Model (d)	Model (e)	Model (f)	Model (d)	Model (e)	Model (f)
Internal Resource Indicators						
Employment						
Employment Squared						
Workforce with Degree						
Workforce with no qualifications						
R&D	++					
Formal R&D		++				
Informal R&D (only)		++				
R&D Intensity						
Other Service Firm Characteristics						
Firm Vintage						
Business Type						
Customised Offerings for Individuals			−			
Tailored Offerings for Groups						
Suitable for Large Customer Groups		+	+			+
Standardised	+					
External Linkages						
Strategic Alliance or Joint Venture	++	++	++			
Suppliers	++	++	++			
Subsidiaries						
Customers	++	++	++			
Consultancy Firms	++	++	++			
Competitors						

Notes: ++ positively significant at 0.05 or 0.01, + positively significant at 0.1, -- negatively significant at 0.05 or 0.01, - negatively significant at 0.1

Table 5.13 Summary of Key Results

Extent of S&P Innovation	Incremental Innovation			Incremental (truncated)		
	Model (g)	Model (h)	Model (i)	Model (g)	Model (h)	Model (i)
Internal Resource Indicators						
Employment						
Employment Squared						
Workforce with Degree	++	++	++	++	++	++
Workforce with no qualifications	++	++	++	++	++	++
R&D	++					
Formal R&D		+				
Informal R&D (only)		++				
R&D Intensity						
Other Service Firm Characteristics						
Firm Vintage						
Business Type						
Customised Offerings for Individuals						
Tailored Offerings for Groups	--	--	--	--	--	--
Suitable for Large Customer Groups	+	+	+			
Standardised						
External Linkages						
Strategic Alliance or Joint Venture	++	++	++			
Suppliers	++	++	++			
Subsidiaries				-	-	-
Customers	++	++	++			
Consultancy Firms						
Competitors	++	++	++			

Notes: ++ positively significant at 0.05 or 0.01, + positively significant at 0.1, -- negatively significant at 0.05 or 0.01, - negatively significant at 0.1

6.1 Introduction

The purpose of this chapter, and the following two chapters, will attempt to shed some light on the factors which determine the impact of innovation on performance among service firms, using the same dataset presented in the earlier chapter. The purpose is to look at effects of innovation on performance by means of productivity and growth measurements (sales and employment). With ordinary least squared (OLS) regression the remaining three hypotheses have been tested. Again, the emphasis will be on the role of customers in the innovation process while also permitting other independent influences, with the aim of first addressing hypothesis two which states:

❖ Hypothesis 2:

> Service firms that harness innovation will perform better than non-innovating service firms.

There are actually two additional hypotheses which enquire into the impact of innovation on business performance. The remaining two hypotheses relate directly to the role of the customer in innovations for service firms:

❖ Hypothesis 3:

> Service firms that harness customer-driven innovation will perform better than non-innovating service firms.

❖ Hypothesis 4:

> Service firms that are customer-driven in regards to innovation will perform better than other service firms that innovate.

Similar to the previous chapter on the determinants of innovation, six external linkages will be important to this analysis. Gemser and Wijnberg (1995) state, that financially the role of external linkages may increase a firms' ability to appropriate returns from innovation. Although this research focuses on customer-driven innovation, five additional linkages were included in the analysis: strategic alliances or joint ventures, suppliers, subsidiaries, consultancy firms, and competitors. Interaction variables have been created to signify the relationship between the three

types of innovation and their subsequent external links (refer to Appendix V for variable definitions). These interaction variables will be important for hypotheses three and four respectively.

Again, in this analysis, three main types of innovation are investigated. For service and product innovations the questionnaire further probed into the role of the customers' involvement. However, there were not any supplementary questions regarding the specific type of involvement for organisational practices or technological innovations. With regard to involvement, if the customer was involved in the development of the new services and products the modes of interaction include formal or informal, or both. Additionally, the nature of the involvement, for new services and products, was addressed by means of several options: ad hoc, focus groups, marketing or customer information, working with lead customers, and other. These particular aspects of the analysis will be pertinent for hypothesis four. Due to the aim of administering a succinct questionnaire further questions were not devised for the other two types of innovation. The next section will explain the rationale for utilising OLS regression models for the different performance variables.

6.2 Estimation Technique

As the hypotheses are essentially a production function, OLS regression will be presented for each of the three types of innovation: service and product, organisational, and technological. When utilising a continuous dependent variable such as the performance of service firms, OLS regression is relevant. This next area will address why OLS regression was used along with two important assumptions of this statistical technique.

6.2.1 The Importance of Autocorrelation & Heteroscedasticity

This section will address two key assumptions of ordinary least squared (OLS) regression: autocorrelation and heteroscedasticity. Firstly, OLS regression is appropriate as the dependent variables in this analysis are continuous and not truncated anywhere for the remaining hypotheses. Autocorrelation simply means that the disturbances of the observations are not independent and tend to lack randomness. Randomness is one of the key assumptions in determining if a univariate statistical process is in control (Natrella, 1963). Classical linear regression models assume that autocorrelation, or correlation between members of series of observations ordered in time (as in time series data) or space (as in cross-sectional data), is nonexistent in the disturbances (Kendall and Buckland, 1971). The problem of autocorrelation is more

common in time series data; although, it does appear in cross-sectional data (Gujarati, 1995).

With the basis of autocorrelation stated, determining how to measure the extent to which one property changes as the other changes for it is important. Durbin-Watson d test is used as a measure of autocorrelation between observations of a given characteristic in a data set. Durbin-Watson d statistic is the ratio of the sum of squared differences in successive residuals to the sum of squares residual (Durbin and Watson, 1951).

It is important to note one particular difficulty concerning the exact sampling or probability distribution of the d statistic as there is no unique critical value that will lead to the acceptance or rejection of the null hypothesis (Gujarati, 1995). In accordance, Durbin and Watson derived a lower bound d_L and an upper bound d_U to determine the presence of positive or negative autocorrelation. An appropriate finding for Durbin-Watson d statistic is two. In short, one assumption of the linear regression model is that the errors or disturbances are random or uncorrelated, thus it is imperative to ascertain if the problem of autocorrelation is present.

Additionally, heteroscedasticity is another important assumption which will now be addressed. Linear regression models assume that the variance or spread between groups in a data set is homogeneous. The classical linear regression model also assumes the variance of each disturbance term, conditional on the values of the explanatory variables, is equal (Gujarati, 1995). Regarding OLS estimators, heteroscedasticity does not destroy the unbiasedness and consistency properties, but these estimators are no longer efficient or a best linear unbiased estimator.

Unlike the case with autocorrelation, heteroscedasticity is likely to be more common in cross-sectional rather than in time series data. As is the case with the data under this analysis there are service firms of various sizes and profit margins, for example. The presence of outliers in the observations may bring about heteroscedasticity, especially if the sample size is small (Gujarati, 1995). One way to diminish the presence of negative outliers is to take the log of the dependent variable. This log technique was utilised in this data set in order to better explain the results of the model. For each of the three remaining hypotheses taking the log of the dependent variables was applicable.

Additionally, in order to detect heteroscedasticity a Breusch-Pagan test is used. The Breusch-Pagan chi-squared statistic of the model can be compared with the

critical value of the chi-squared distribution table. If the Breusch-Pagan chi-squared statistic is greater than the critical χ^2 value, given the appropriate degrees of freedom and chosen level of significance, there is a heteroscedastic error in the variances. Once heteroscedasticity is discovered, in order to correct the nature of the models, White-corrected covariance matrices are used. The general test proposed by White does not rely on the normality assumption (White, 1980). Most statistical packages, such as Limdep, automatically correct for heteroscedasticity using White's heteroscedasticity robust covariance matrix. In the cases where the variances are equal, the original OLS regression models are utilised.

In short, both autocorrelation and heteroscedasticity are important assumptions of ordinary least squared (OLS) regression model. This section attempted to explain the importance of understanding, identifying, and subsequently correcting the model for this analysis. Essentially, there are statistical tests which aid in this, for example the Durbin-Watson d statistic is important in identifying autocorrelation between observations. Also, the Breusch-Pagan chi-squared statistic is used to identify heteroscedasticity, meanwhile White's corrected errors terms when appropriate are used in this analysis. Each of the tables presented for the remaining hypotheses display if White's corrected errors terms were utilised or not.

6.3 Performance Factors for Innovation

This next section will further elaborate on the analyses regarding innovation and its impact on business performance. Again, the independent variables in determining the impact of innovation by a service firm on performance derive from the descriptive chapter (see Table 3.4). The three main groups reflecting the performance factors for innovation include:

- Internal Resource Indicators
- Other Service Firm Characteristics
- Type of Innovation

The explanations of the independent variables which fall under these three groups are similar to those mentioned in the previous chapter. However, for these hypotheses, relating to business performance, the addition of capital intensity and exports will be significant. Firstly, it is important to mention an ongoing debate in literature concerning firms which export, specifically *when* a firm decides to export.

It is generally agreed that only when firms are successful in their home country do they begin exporting. Evidence appears in literature which supports a positive effect of exporting for thriving firms. In other words, exporting is often used as a positive determinant of performance. Thus, exports are commonly used as a benchmark of economic performance (Rosenfeld, 1996). There is evidence that exporting is positively linked to other performance measures such as productivity and growth. Previous research on innovation includes performance measures such as capital intensity and exports. For example, Love and Roper's (2002) empirical research addresses innovation and export performance from German and U.K. firms, and report being innovative is positively linked to export probability. In short, Love and Roper (2002) enquired into the impact of exports on innovation; however, this research is interested in the existence of a link between exports and performance. Thus, in this case, innovation is one of the independent variables. Also, Cavusgil and Nevin (1981) look at an exporting firm's level of export intensity (percentage of sales exported) associated with its knowledge gained by systematic exploration of exporting possibilities. Özçelik and Taymaz's (2004) research on the determinants of export performance for Turkish firms utilised conduciveness of capital intensity. Regarding size, Wagner's (2001) research of German firms found a positive relationship between firm size and direct exports. Therefore, incorporating whether a service firm exports their product and service in addition to their capital intensity will be significant for this analysis. Essential to mention here is the lack of research enquiring into service firms which export their offering.

Important for measuring performance often times involve analysing productivity and growth. Freel's (2000a) research involves innovative SMEs using employment growth, growth in profits, absolute profit, profit margins, productivity levels, productivity growth, and export propensity (as both a binary variable and as a proportion of sales turnover). Consequently, the dependent variables for this analysis have been refined and now include: value-added per employee (V.A.P.E.), sales growth, and employment growth. Theoretically, there is a positive relationship between value-added, uniqueness of product, and export propensity (Freel, 2000a). Various individual aspects of this link will be addressed in these analyses, for example do service firms export and if any performance benefits exist? Or, what is the effect on V.A.P.E regarding a service firms' capital intensity? Again, this analysis will attempt to emphasise some important factors which impact the performance of

service firms. There are numerous performance measures regarding innovation existing in empirical research. With that said, it is common for empirical research to report productivity and growth as measures of performance. The next paragraphs will elaborate on these measures.

Baumol et al. (1989) believe services are characterised by their low productivity growth and increasing prices; but, paradoxically by output growth comparative to the rest of the economy, thus expanding employment bringing about a negative effect on aggregate productivity growth. This service paradox was recently considered by Pugno (2005) who found productivity is crucial for long-run economic performance, insofar as productivity can be captured by the labour productivity parameter in the service production function.

Other empirical research enquires into the labour productivity of employees in order to report the affect of such activity. For example, the Second Community Innovation Survey (CIS II) enquires into the labour productivity of firms. Recent empirical research based on CIS II, in Portugal, report a negative effect of innovation output on labour productivity (Lopes and Godinho, 2005). Unlike this analysis, Lopes and Godinho's (2005) measure of labour productivity was turnover per employee, not value-added. Evangelista and Savona's (2003) findings show most innovative service firms, who spend more on innovation per employee, and those introducing service innovation are more prone to report a positive impact of innovation on total employment. Negassi's (2004) research of R&D co-operation for innovation and measured human capital by the number of skilled employees divided by the total number of employees. Bouquet et al. (2004) investigate foreign expansion of service industries using value-added per employee, labour costs per employee, and sales per employee and found that service firms, irrespective of sector, are increasingly relying on assets that are dependent on human capital intensity. Thus, these researches express numerous different measures of productivity; nevertheless, this analysis will utilise value-added per employee as one of the performance measures.

In addition to productivity measures to encapsulate a firms' performance growth measurements are also used. Growth measures such as sales and employment are frequently utilised as measures of performance in empirical research. Löfsten and Lindelöf (2005) state, that growth must be seen as sales and employment growth. Löfsten and Lindelöf (2005) report, when looking at technology-based firms' R&D

networks with universities, for product innovation, that there were no differences in sales growth and profitability. Tether's (2003) research on services attempted to link the CIS II data with commercial performance, in other words the relationship between innovation and wealth and employment creation. Empirical analysis by Leiponen (2005) examines business service firms and addresses the share of sales revenue derived from new services. Also, Monck et al (1988) report negative employment growth for firms established by academics as compared to private firms. Evangelista and Savona's (2003) researched the impact of employment growth in services and brought about interesting findings which will be further presented along with the analysis for hypotheses two. Thus, sales and employment growth are viable measures of performance and will both be utilised in the analysis of this research.

Although initial OLS runs included profit margin, the findings were not conclusive as the adjusted R-squared was often times negative. Even after taking the log of profit margin similar adjusted R-squared results prevailed. It was after these techniques were utilised that it was decided that profit margin would not be included as a measure of performance. Various reasons for not including profit margin include the diversity of probable reasons underlying the findings. Additionally, the vast spread of the financial figures in this dataset further perpetuated this problem. Also, existing research has shown that measuring performance by means of profit margin is not always a true measure of performance. Therefore, the performance measures mentioned above will represent the dependent variables for the remaining hypotheses. The next section will specifically address hypothesis two, but first a glance at the correlation matrices for each type of innovation will be important, refer to the end of this chapter to Tables 6.4, 6.5, and 6.6. The first aspect will examine these three performance measures individually for the three types of innovation. The proceeding hypotheses will also follow the same format.

6.4 Hypothesis Two: Innovators versus Non-innovators

With the explanations of the OLS regression model and its variables considered, this section will discuss the findings of hypothesis two. Hypothesis two states: service firms that harness innovation will perform better than non-innovating service firms. Again, this hypothesis is concentrate on service firms who innovate versus those that do not. Once more, the three performance measures include the dependent variables: V.A.P.E., sales growth, and employment growth. It is also important to note that for the remaining hypotheses the log of each dependent variable

will be presented. The first area of interest will enquire into service and product innovation within service firms, followed by organisational and technological innovations.

6.4.1 Service & Product Innovation

The relevant findings under the group heading of internal resource indicators will be noted. As Table 6.1 shows, there is significance of capital intensity in relation to V.A.P.E. Again, these findings stem from the log of the dependent variable V.A.P.E. In other words, this finding suggests the more capital equipment provided for each employee the more productivity received per employee. This finding is not unfounded as it seems logical for a firm to invest in capital equipment in order to increase productivity. Also, for capital intensity there is a positive effect concerning those service firms which export their service and products outside of the United States.

Now, the growth aspects of service and product innovation will follow. Table 6.1 shows larger firms' experience less sales growth. When employment is squared the findings express a u-shaped relationship. This lack of sales growth may be due to the business life cycle, as it is harder proportionately for larger firms to grow. Meanwhile, smaller firms experience the impact of this growth in a more disproportionate nature. One might anticipate a successful innovation to have a greater impact on a small firm's growth rate than on a larger firm (Mansfield, 1962). For example, Freel (2000a) reports innovative SMEs experience greater growth in employment than non-innovators. Meanwhile, Geroski and Machin (1992) find little difference in firm growth for the observed large innovators and non-innovators. Very similar findings for size of the service firm are also reported for employment growth. Thus, there is a positive effect concerning sales growth and employment growth for innovative service firms.

Regarding exports, service firms that concentrate totally on the U.S. market are less productive, but grow faster then those which export. Possibly, concentrating efforts on local expansion is more important than exporting for service firms. The result of exporting service firms experiencing sales or employment growth slower is unexpected. Instead one would believe that exporting firms are tapping into foreign markets with a larger customer base, thus increasing their opportunities for growth. While the logic is definitely there, one must not overlook the receiving countries' risks. Quite possibly these service firms are experiencing hardship in understanding

the tastes, business style, or culture of the countries they are exporting to. This face-to-face requirement of services necessitates greater adaptation to local tastes and differences, leading firms to acquire locally specific resources and capabilities (Anand and Delios, 1997). Acquiring these resources and capabilities for exporting purposes can be expensive for a service firm. Barriers to the foreign market also effect the exporting of services and products, especially if the service firm as a new entrant did not experience a first mover advantage. Thus, these late comers to the market may be competing with existing home countries' service firms and this can prove troublesome. As a result, at home they are experiencing productivity while abroad there is presently no growth.

Under the next heading in Table 6.1, the only pertinent finding under 'other service firm characteristics' involves offerings tailored to specific customer groups. This finding is interesting as it suggests that service firms which offer tailored service and product have more sales growth. This is interesting as it is assumed that standardised products and services are easier to sell; however, this is not the case. Possible reasons for such sales growth may include niche marketing or an expansion of offering newly tailored services and products to existing customers.

Although having a skilled workforce did not positively affect any of the three performance measures, it is important to note the findings of previous research. For example, Evangelista and Savona (2003) report the probability of finding a positive impact of innovation on employment decreases with firm size and this relationship is statistically significant with respect to both high and low skilled workforces.

Lastly, it is important to note that service firms that are innovative experience higher sales growth (see Table 6.1). Freel (2000a) reports similar findings for SMEs as a positive relationship between product innovation and sales growth does exist. Thus, this finding provides support for hypotheses two as it illustrates that service firms that are innovative perform better than non-innovators. It will now be important to address these performance measures as they relate to organisational and then technological innovation.

Table 6.1
Service & Product Innovation

Log	Model (a) V.A.P.E.	(b) Sales Growth	(c) Employment Growth
Constant	10.330***	2.014***	1.833***
	(0.577)	(0.399)	(0.368)
Internal Resource Indicators			
Employment	-0.000	-0.000***	-0.000***
	(0.000)	(0.000)	(0.000)
Employment Squared	0.000	0.000*	0.000***
	(0.000)	(0.000)	(0.000)
Capital Intensity	0.000***	0.000	-0.000
	(0.000)	(0.000)	(0.000)
Exports	0.013*	-0.008*	-0.008**
	(0.007)	(0.005)	(0.004)
Workforce with Degree	-0.002	-0.000	-0.000
	(0.006)	(0.0004)	(0.004)
Workforce with no Qualifications	-0.009	-0.003	0.006
	(0.008)	(0.008)	(0.008)
Other Service Firm Characteristics			
Firm Vintage	0.003	-0.003	-0.004
	(0.005)	(0.004)	(0.003)
Business Type	0.249	0.267	0.016
	(0.363)	(0.244)	(0.245)
Customised Offerings for Individuals	-0.373	-0.086	-0.082
	(0.380)	(0.248)	(0.219)
Tailored Offerings for Groups	0.285	0.515**	0.348
	(0.336)	(0.253)	(0.264)
Suitable for Large Customer Groups	-0.240	0.032	0.073
	(0.344)	(0.255)	(0.241)
Standardised	0.051	-0.293	-0.264
	(0.400)	(0.269)	(0.250)
Innovation			
Service & Product Innovation Dummy	0.612	0.865***	0.416
	(0.513)	(0.312)	(0.302)
Adj. R squared	0.0713	0.1005	0.0699
Breusch-Pagan chi-squared (df)	38.38 (13)	-	24.06 (13)
Durbin-Watson	2.00	1.88	2.00
Rho	-0.0004	0.0594	-0.0012
Number of Observations	180	185	185

Notes: Standard Errors are in parentheses. Significant at *** 1%, **5%, *10%
Where Breusch-Pagan chi-squared is shown white-corrected covariance is used.

6.4.2 Organisational Innovation

This section will discuss organisational innovation of service firms. Beginning with the independent variables under the heading 'internal resource indicator', the size of a service firm will be discussed first. Not surprisingly, large service firms' experience less sales and employment growth. Again, this may be due to the life cycle of a business. Table 6.2 shows similar findings for V.A.P.E. as was also present for service and product innovation. Service firms which invest in capital investments experience higher productivity from their employees. Regarding exports, again there is a positive effect on productivity, while there is a negative effect on both types of growth. Similar explanations as seen for service and product innovations are suggested to hold true for organisational innovation.

Next, significant independent variables under the heading 'other service firm characteristics' will be discussed. Again, same as the findings for service and product innovation, offerings tailored to specific customer groups proves significant for sales growth. In addition, there is a slight negative effect for service firms which offer standardised service and products to the market. Possibly the broad scope of a service firm's offering may not adequately correspond to the specifications of the customer.

Lastly, there is evidence that service firms which innovate by way of organisational innovations experience both sales and employment growth. Possibly, service firms which introduce internal innovations are overall more prone to innovative activities. It may be the case that these innovative service firms support all types of innovation. Hammer (2004) states that fewer than 10 per cent of large companies endeavour to achieve operational innovations, due to the business culture undervaluing its importance, but it provides a lasting basis for superior performance. In turn, these organisational innovative firms' display the positive effects of growth; thus, there is support for hypothesis two. In other words, service firms which are internally innovative, as compared to non-innovating service firms, experience growth, thus do perform well. The final section under this analysis of hypothesis two involves technological innovations.

Table 6.2
Organisational Innovation

Log	Model (a) V.A.P.E.	(b) Sales Growth	(c) Employment Growth
Constant	10.829***	2.400***	1.943***
	(0.453)	(0.358)	(0.360)
Internal Resource Indicators			
Employment	-0.000	-0.000***	-0.000***
	(0.000)	(0.000)	(0.000)
Employment Squared	0.000	0.000**	0.000***
	(0.000)	(0.000)	(0.000)
Capital Intensity	0.000***	0.000	-0.000
	(0.000)	(0.000)	(0.000)
Exports	0.014*	-0.008*	-0.008*
	(0.008)	(0.005)	(0.005)
Workforce with Degree	0.002	0.002	0.001
	(0.006)	(0.004)	(0.004)
Workforce with no Qualifications	-0.005	-0.000	0.007
	(0.008)	(0.008)	(0.008)
Other Service Firm Characteristics			
Firm Vintage	0.004	-0.002	-0.003
	(0.005)	(0.004)	(0.004)
Business Type	0.117	0.239	0.037
	(0.367)	(0.246)	(0.247)
Customised Offerings for Individuals	-0.332	-0.097	-0.107
	(0.364)	(0.250)	(0.252)
Tailored Offerings for Groups	0.255	0.403*	0.278
	(0.320)	(0.254)	(0.255)
Suitable for Large Customer Groups	-0.251	0.085	0.114
	(0.343)	(0.258)	(0.259)
Standardised	0.096	-0.434*	-0.377
	(0.413)	(0.275)	(0.276)
Innovation			
Organisational Innovation Dummy	-0.365	0.506**	0.479**
	(0.374)	(0.240)	(0.242)
Adj. R squared	0.0673	0.0839	0.0818
Breusch-Pagan chi-squared (df)	32.72 (13)		
Durbin-Watson	1.95	1.84	1.96
Rho	0.0260	0.0800	0.0187
Number of Observations	180	185	185

Notes: Standard Errors are in parentheses. Significant at *** 1%, **5%, *10%
Where Breusch-Pagan chi-squared is shown white-corrected covariance is used.

6.4.3 Technology Driven Innovation

Now, addressing the three performance measures, this section will explain the findings for technological innovations. A discussion of the independent variables for

Table 6.3 under the heading 'internal resource indicators' will be presented first. Similar results are found in favour of the impact of growth for small service firms as seen for service and product and organisational innovation. Essentially, there is a size effect for these service firms as proportionately larger service firms are experiencing less sales and employment growth. As Table 6.3 displays, employment and employment squared together create a u-shaped relationship. Next, regarding capital intensity, there is significance for those service firms which invest in capital equipment for their employees as productivity is higher than those that do not. Again, there is a similar finding as seen above for service and product and organisational innovation; service firms that export are productive. One must not overlook the risks of exporting to another country. Possibly service firms are experiencing adversity in understanding customers' tastes of the countries they are exporting to. Also, acquiring resources and capabilities for exporting purposes can be costly for a service firm. Barriers to the foreign market also effect the exporting of services and products, especially if the service firm as a new entrant did not experience a first mover advantage. As a result, at home they are experiencing productivity while abroad there is presently no growth.

Also, for 'other service firm characteristics', service firms that offer service and product tailored to specific customer groups experience sales growth. This finding is similar to both types of innovation mentioned above.

Evangelista and Savona (2003) state the overall impact of technological change on employment in services is difficult to be empirically assessed due to the joint presence of positive and negative direct effects, in addition to the existence of a complex set of compensating mechanisms functioning within the service sector and between the services and manufacturing sectors. There is evidence of both sales and employment growth for service firms who innovate by way of technology driven developments. On the other hand, those service firms which introduce technological innovations experience less productivity per employee. In other words there is a negative effect on productivity when technology driven developments are introduced. This negative impact on the innovative service firm may be explained by a disruption effect. In essence this disruptive effect describes a lag in time both internally and externally. For example, a service firms' technological innovations may generally take more time to put into operation. With the introduction of new product and service, this might disturb productivity of employees. Also, efficiency levels of

production may take time to achieve. Love and Roper (2005) report an initial negative disruptive effect for product innovation success on productivity followed by a positive benefit. Externally, there could be a lag in customers' acceptance of the new technological innovation in the market. The complexity of many technological innovations may deter immediate purchase; although lower growth is unfounded (refer to Table 6.3). It is suggested that this disruption effect will most probably be experienced in the short term for innovative service firms. Supporting the existence of a technological disruptive effect, this negative effect is not apparent for service and product or organisational innovations. Nevertheless, there is ample support for hypothesis two in that technological innovative service firms' experience both sales and employment growth. The final section will attempt to devise general conclusions for innovators in comparison to non-innovators.

Table 6.3
Technological Innovation

Log	Model (a) V.A.P.E.	(b) Sales Growth	(c) Employment Growth
Constant	10.996***	3.331***	1.752***
	(0.470)	(0.374)	(0.371)
Internal Resource Indicators			
Employment	-0.000	-0.000***	-0.000***
	(0.000)	(0.000)	(0.000)
Employment Squared	0.000	0.000*	0.000***
	(0.000)	(0.000)	(0.000)
Capital Intensity	0.000***	0.000	-0.000
	(0.000)	(0.000)	(0.000)
Exports	0.012*	-0.007	-0.006
	(0.007)	(0.005)	(0.005)
Workforce with Degree	0.001	0.003	0.001
	(0.005)	(0.004)	(0.004)
Workforce with no Qualifications	-0.007	0.002	0.010
	(0.008)	(0.008)	(0.008)
Other Service Firm Characteristics			
Firm Vintage	0.005	-0.002	-0.004
	(0.005)	(0.004)	(0.004)
Business Type	0.186	0.153	-0.050
	(0.366)	(0.244)	(0.243)
Customised Offerings for Individuals	-0.302	-0.102	-0.137
	(0.359)	(0.252)	(0.250)
Tailored Offerings for Groups	0.258	0.418*	0.280
	(0.321)	(0.255)	(0.253)
Suitable for Large Customer Groups	-0.197	0.024	0.041
	(0.339)	(0.259)	(0.257)
Standardised	0.013	-0.327	-0.271
	(0.387)	(0.272)	(0.270)
Innovation			
Technological Innovation Dummy	-0.537*	0.436*	0.655***
	(0.313)	(0.245)	(0.244)
Adj. R squared	0.0739	0.0772	0.0988
Breusch-Pagan chi-squared (df)	28.35 (13)		
Durbin-Watson	1.98	1.84	1.95
Rho	0.0109	0.0824	0.0243
Number of Observations	180	185	185

Notes: Standard Errors are in parentheses. Significant at *** 1%, **5%, *10%
Where Breusch-Pagan chi-squared is shown white-corrected covariance is used.

6.5 Overall Conclusions for Hypothesis Two

The findings from the OLS regression models devised for hypothesis two are interesting and will now be discussed. There is clearly a consistent size effect

embodied by the evidence of growth for smaller firms. Next, regarding exports, consistent for all three types of innovation, service firms that export are more productive, but experience lower growth. Possible explanations could be service firms are experiencing difficulties in competing with existing home countries' service firms as one must not overlook the risks of exporting to another country. Possibly service firms are experiencing adversity in understanding customers' tastes of the exporting countries. Also, acquiring resources and capabilities for exporting purposes can be costly for a service firm. Barriers to the foreign market also effect the exporting of services and products, especially if the service firm did not experience a first mover advantage. As a result, at home they are experiencing productivity while abroad there is presently less growth.

Also, these findings would suggest that offering service and products which are tailored to specific customer groups proves beneficial for growth. Additionally, being innovative helps service firms grow, but not more productive. Again, hypothesis two is addressing innovative and non-innovative service firms and its impact on performance. Thus, there is some support for this hypothesis based on the growth performance measures for service and product, organisational, and technological innovation. The findings suggest non-innovators, in all three types, experience lower sales or employment growth. Based on Freel's (2000a) findings, he comments that 'innovators are likely to grow more' not that 'innovators are more likely to grow'. Again, the findings for this section of the analysis suggest that technological innovation reduces productivity, at least in the short term. For technological innovations productivity is lower, but product and service innovation has no productivity effect, this provides strong support for the disruption effect of innovation. Hence, based on the analysis of performance measures, innovative service firms' do perform better than non-innovators.

In conclusion, it will be important to point out that overall the R-squared are pretty low for all of the regressions. This is common in studies of this nature (see Roper, 1998; Love and Roper, 1999; Love and Roper, 2002; Roper and Love, 2002; Love and Roper, 2005). The low R-squared are probably also a function of the fact that is difficult to model firm performance, which tends to be very heterogeneous. Nevertheless, this analysis attempts to shed light on the innovative factors which impact business performance, refer to the summary table which shows overall which variables are significant (Table 6.7). The next chapter will introduce hypothesis three.

Table 6.4 Correlation Matrix: Service & Product Innovation (Performance)

Variable	1	2	3	4	5	6	7	8	9	10	11	12
1. V.A.P.E												
2. Sales Growth	0.082											
3. Employment Growth	-0.044	0.835										
4. Service & Product Innovation	0.033	0.121	0.056									
5. New-to-Market	0.098	0.233	0.144	0.322								
6. New & Improved	0.062	0.186	0.110	0.577	0.529							
7. Employment	-0.046	-0.115	-0.123	0.158	0.090	0.136						
8. Employment Squared	-0.032	-0.082	-0.085	0.112	0.054	0.111	0.953					
9. Capital Intensity	0.858	0.026	-0.023	0.021	-0.021	0.016	-0.032	-0.020				
10. Exports	0.005	-0.052	-0.095	0.077	0.036	0.092	0.119	0.075	-0.014			
11. Workforce with Degree	-0.054	-0.059	-0.036	-0.067	0.091	0.016	0.083	0.041	-0.023	0.127		
12. Workforce with no Qualifications	0.210	-0.074	-0.041	0.054	-0.037	0.098	-0.026	-0.007	0.313	-0.052	-0.127	
13. Firm Vintage	-0.098	-0.181	-0.176	0.201	-0.007	0.131	0.455	0.386	-0.081	0.055	0.081	-0.080
14. Business Type	0.115	0.039	0.006	-0.172	-0.004	-0.097	-0.234	-0.220	0.083	0.025	-0.151	0.106
15. Customised Offerings for Individuals	0.022	-0.080	-0.108	0.081	-0.124	0.039	0.040	0.011	0.089	-0.134	0.030	0.119
16. Tailored Offerings for Groups	0.110	0.151	0.134	-0.028	0.098	-0.046	0.165	0.156	0.117	0.035	-0.087	0.004
17. Suitable for Large Customer Groups	0.063	-0.079	-0.052	0.077	0.108	0.087	0.174	0.156	0.090	0.152	0.014	0.066
18. Standardised Offerings	-0.061	-0.042	-0.010	-0.021	0.154	0.083	0.112	0.080	-0.060	0.099	0.062	-0.072
19. Strategic Alliance/Joint Venture	0.142	0.213	0.182	0.293	0.216	0.248	0.078	0.069	0.084	-0.025	-0.064	-0.047
20. Suppliers	-0.073	0.116	0.040	0.255	0.130	0.031	0.010	-0.011	-0.051	-0.122	0.015	-0.032
21. Subsidiaries	-0.053	-0.048	-0.058	0.184	-0.004	0.022	0.300	0.253	-0.037	0.171	0.063	-0.112
22. Customers	-0.026	0.046	0.000	0.431	0.076	0.228	0.005	-0.004	-0.030	0.103	-0.078	0.170
23. Consultancy Firms	0.179	-0.113	-0.120	0.231	0.125	0.127	0.043	-0.016	0.184	0.061	0.012	0.079
24. Competitors	-0.005	0.030	0.001	0.286	0.037	0.244	0.023	-0.001	0.039	-0.040	0.087	-0.015

Table 6.4 Correlation Matrix: Service & Product Innovation (Performance) continued

Variable	13	14	15	16	17	18	19	20	21	22	23
1. V.A.P.E											
2. Sales Growth											
3. Employment Growth											
4. Service & Product Innovation											
5. New-to-Market											
6. New & Improved											
7. Employment											
8. Employment Squared											
9. Capital Intensity											
10. Exports											
11. Workforce with Degree											
12. Workforce with no Qualifications											
13. Firm Vintage											
14. Business Type	-0.308										
15. Customised Offerings for Individuals	0.042	-0.037									
16. Tailored Offerings for Groups	0.059	-0.053	-0.178								
17. Suitable for Large Customer Groups	0.072	0.015	-0.156	0.010							
18. Standardised Offerings	0.075	-0.072	-0.178	-0.120	-0.066						
19. Strategic Alliance/Joint Venture	0.003	-0.205	0.040	0.112	-0.103	0.094					
20. Suppliers	-0.033	0.150	0.055	-0.162	-0.069	0.058	-0.054				
21. Subsidiaries	0.231	-0.267	0.049	0.060	-0.035	-0.045	0.104	-0.049			
22. Customers	0.121	-0.070	0.102	0.097	-0.015	-0.063	-0.107	0.023	-0.058		
23. Consultancy Firms	0.067	-0.120	0.130	-0.080	0.006	-0.028	0.163	-0.078	0.309	-0.023	
24. Competitors	0.044	-0.060	0.052	0.002	0.028	0.033	-0.081	-0.075	-0.015	0.095	0.108

Table 6.5 Correlation Matrix: Organisational Innovation (Performance)

Variable	1	2	3	4	5	6	7	8	9	10	11	12
1. V.A.P.E												
2. Sales Growth	0.082											
3. Employment Growth	-0.044	0.835										
4. Organisational Innovation	0.086	0.192	0.132									
5. Employment	-0.046	-0.115	-0.123	-0.026								
6. Employment Squared	-0.032	-0.082	-0.085	-0.084	0.953							
7. Capital Intensity	0.858	0.026	-0.023	0.090	-0.032	-0.020						
8. Exports	0.005	-0.052	-0.095	0.096	0.119	0.075	-0.014					
9. Workforce with Degree	-0.054	-0.059	-0.036	-0.003	0.083	0.041	-0.023	0.127				
10. Workforce with no Qualifications	0.210	-0.074	-0.041	0.057	-0.026	-0.007	0.313	-0.052	-0.127			
11. Firm Vintage	-0.098	-0.181	-0.176	0.036	0.455	0.386	-0.081	0.055	0.081	-0.080		
12. Business Type	0.115	0.039	0.006	-0.128	-0.234	-0.220	0.083	0.025	-0.151	0.106	-0.308	
13. Customised Offerings for Individuals	0.022	-0.080	-0.108	0.047	0.040	0.011	0.089	-0.134	0.030	0.119	0.042	-0.037
14. Tailored Offerings for Groups	0.110	0.151	0.134	0.049	0.165	0.156	0.117	0.035	-0.087	0.004	0.059	-0.053
15. Suitable for Large Customer Groups	0.063	-0.079	-0.052	-0.080	0.174	0.156	0.090	0.152	0.014	0.066	0.072	0.015
16. Standardised Offerings	-0.061	-0.042	-0.010	0.187	0.112	0.080	-0.060	0.099	0.062	-0.072	0.075	-0.072
17. Strategic Alliance/Joint Venture	0.017	0.247	0.265	0.414	0.078	0.027	-0.010	0.064	-0.018	-0.014	0.010	-0.195
18. Suppliers	-0.052	0.202	0.124	0.402	-0.077	-0.075	-0.038	-0.059	0.085	0.017	0.023	0.023
19. Subsidiaries	-0.038	-0.026	-0.048	0.322	0.091	0.059	-0.027	0.169	0.108	-0.049	0.158	-0.285
20. Customers	0.184	0.104	0.070	0.578	-0.062	-0.092	0.109	-0.005	-0.041	0.082	-0.062	0.022
21. Consultancy Firms	0.130	-0.016	-0.028	0.456	0.037	-0.029	0.215	0.032	-0.018	0.076	0.091	-0.044
22. Competitors	0.048	0.036	0.066	0.428	-0.037	-0.059	0.100	-0.068	-0.069	0.162	-0.016	-0.059

Table 6.5 Correlation Matrix: Organisational Innovation (Performance) continued

Variable	13	14	15	16	17	18	19	20	21
1. V.A.P.E									
2. Sales Growth									
3. Employment Growth									
4. Organisational Innovation									
5. Employment									
6. Employment Squared									
7. Capital Intensity									
8. Exports									
9. Workforce with Degree									
10. Workforce with no Qualifications									
11. Firm Vintage									
12. Business Type									
13. Customised Offerings for Individuals	-0.178								
14. Tailored Offerings for Groups	-0.156	0.010							
15. Suitable for Large Customer Groups	-0.178	-0.120	-0.066						
16. Standardised Offerings	-0.054	0.167	-0.073	0.156					
17. Strategic Alliance/Joint Venture	0.011	-0.049	-0.085	0.141	0.138				
18. Suppliers	0.053	-0.004	-0.125	0.028	0.211	0.122			
19. Subsidiaries	0.070	-0.022	0.022	-0.004	0.170	0.238	0.053		
20. Customers	0.129	-0.019	-0.019	0.120	0.178	0.082	0.075	0.290	
21. Consultancy Firms	0.081	0.008	-0.067	0.159	0.028	0.212	0.045	0.297	0.147
22. Competitors									

Table 6.6 Correlation Matrix: Technological Innovation (Performance)

Variable	1	2	3	4	5	6	7	8	9	10	11	12
1. V.A.P.E												
2. Sales Growth	0.082											
3. Employment Growth	-0.045	0.835										
4. Technological Innovation	-0.078	0.087	0.097									
5. Employment	-0.046	-0.116	-0.124	0.169								
6. Employment Squared	-0.032	-0.083	-0.086	0.134	0.953							
7. Capital Intensity	0.858	0.026	-0.023	0.012	-0.032	-0.021						
8. Exports	0.005	-0.054	-0.096	-0.104	0.118	0.074	-0.015					
9. Workforce with Degree	-0.054	-0.060	-0.036	0.105	0.082	0.041	-0.023	0.126				
10. Workforce with no Qualifications	0.210	-0.075	-0.041	-0.075	-0.026	-0.007	0.313	-0.054	-0.128			
11. Firm Vintage	-0.098	-0.182	-0.177	0.153	0.454	0.386	-0.081	0.053	0.080	-0.081		
12. Business Type	0.116	0.041	0.008	-0.041	-0.233	-0.219	0.083	0.027	-0.150	0.108	-0.306	
13. Customised Offerings for Individuals	0.021	-0.082	-0.110	0.104	0.039	0.010	0.089	-0.137	0.029	0.117	0.039	-0.034
14. Tailored Offerings for Groups	0.110	0.150	0.133	0.053	0.164	0.155	0.117	0.033	-0.088	0.002	0.056	-0.049
15. Suitable for Large Customer Groups	0.062	-0.080	-0.053	0.033	0.173	0.155	0.090	0.150	0.013	0.065	0.070	0.018
16. Standardised Offerings	-0.060	-0.038	-0.007	-0.005	0.116	0.083	-0.060	0.105	0.066	-0.068	0.082	-0.080
17. Strategic Alliance/Joint Venture	-0.062	0.269	0.239	0.336	0.166	0.115	-0.047	-0.006	0.023	0.053	0.068	-0.109
18. Suppliers	-0.068	-0.074	-0.042	0.345	0.055	0.042	-0.048	-0.143	0.057	-0.047	0.043	0.109
19. Subsidiaries	-0.048	-0.054	-0.040	0.263	0.246	0.180	-0.035	-0.004	-0.045	-0.099	0.387	-0.268
20. Customers	-0.084	0.006	0.004	0.465	0.137	0.122	-0.063	0.012	0.109	-0.096	0.080	0.004
21. Consultancy Firms	0.233	0.014	0.015	0.317	0.008	-0.004	0.346	-0.049	-0.064	0.153	0.031	0.055
22. Competitors	-0.080	-0.008	0.008	0.405	0.088	0.094	-0.055	-0.079	0.133	0.049	0.134	-0.075

Table 6.6 Correlation Matrix: Technological Innovation (Performance) continued

Variable	13	14	15	16	17	18	19	20	21
1. V.A.P.E									
2. Sales Growth									
3. Employment Growth									
4. Technological Innovation									
5. Employment									
6. Employment Squared									
7. Capital Intensity									
8. Exports									
9. Workforce with Degree									
10. Workforce with no Qualifications									
11. Firm Vintage									
12. Business Type									
13. Customised Offerings for Individuals									
14. Tailored Offerings for Groups	-0.182								
15. Suitable for Large Customer Groups	-0.160	0.008							
16. Standardised Offerings	-0.172	-0.114	-0.060						
17. Strategic Alliance/Joint Venture	0.174	0.029	-0.064	-0.020					
18. Suppliers	0.102	-0.170	-0.016	0.038	0.005				
19. Subsidiaries	0.124	0.026	-0.054	-0.010	0.184	0.034			
20. Customers	0.148	0.048	0.027	-0.106	0.071	0.069	0.055		
21. Consultancy Firms	0.046	0.064	0.028	-0.002	0.053	-0.020	0.040	0.005	
22. Competitors	-0.028	-0.068	0.096	0.180	0.018	0.047	0.052	0.164	0.045

Table 6.7 Summary of Key Results
Performance Factors for Innovators v. Non-innovators

	S&P			Organisational			Technological		
	V.A.P.E	Sales Growth	Employment Growth	V.A.P.E	Sales Growth	Employment Growth	V.A.P.E	Sales Growth	Employment Growth
Internal Resource Indicators									
Employment		--	--		--	--		--	--
Employment Squared		+	++		++	++		+	++
Capital Intensity	++			++			++		
Exports	+	-	-	+	-	-	+		
Workforce with Degree									
Workforce with no qualifications									
Other Service Firm Characteristics									
Firm Vintage									
Business Type									
Customised Offerings for Individuals									
Tailored Offerings for Groups		++			+			+	
Suitable for Large Customer Groups									
Standardised					-				
External Linkages									
Service & Product Innovation Dummy		++							
Organisational Innovation Dummy					++	++		+	
Technological Innovation Dummy								+	++

Notes: ++ positively significant at 0.05 or 0.01, + positively significant at 0.1, -- negatively significant at 0.05 or 0.01, - negatively significant at 0.1

7.1 Introducing Hypothesis Three

Continuing to pinpoint the factors which determine the impact of innovation on business performance among service firms, this chapter will use the same dataset presented in the earlier analysis of the hypotheses. Hence, for this next aspect of the analysis, OLS regression models have been created with the same three performance measurements as above: V.A.P.E., sales growth, and employment growth. It is also important to note that the log of each dependent variable will be presented. Hypothesis three is more specific as it addresses service firms that are customer-driven innovators in comparison to non-innovators and states:

● Hypothesis 3:

Service firms that harness customer-driven innovation will perform better than non-innovating service firms.

This deviation from hypothesis two is important as it introduces the specific involvement of a service firms' customer for innovation. Due to the nature of this hypothesis different aspects will need to be addressed. Firstly, in part A, the main types of innovation are investigated separately in relation to the six external linkages. Thus, interaction variables have been created by means of multiplying the value of each external link by an innovation dummy. Next, only totally new-to-market innovations will be isolated and again for analysis purposes interaction variables have been created. Interaction variables will signify the extent of any relationship between those firms which introduce new-to-market innovations and six external linkages (part B). Kitson and Michie's (1998) study reports co-operative linkages are a key part of the innovation process, as half of the innovating firms had entered into collaborative partnerships compared with just 16.7 per cent of non-innovating firms. In short, their study found that establishing effective collaborative links resulted in competitive success. Furthermore, findings from Tether's (2003) analysis of CIS II report 32 per cent of innovations were developed jointly. The CIS II questionnaire asked the 'innovators': 'who developed these services or methods?' Three options were available: 'mainly by other enterprises or institutes', 'your enterprise together

with other enterprises or institutes', or mainly your enterprise'. One limitation to this simplification of responses does not detail the external enterprise or institute (i.e., suppliers, customer, etc.). This empirical research delves further as it inquires into the relationship between service firm and six external linkages: strategic alliances or joint ventures, suppliers, subsidiaries, consultancy firms, and competitors. This is important as transferring innovative information between businesses often needs a framework of a cooperative relationship or at least stimulated by such relationship (Fritsch and Lukas, 2001). Additionally, co-operative arrangements facilitate the exchange of knowledge resulting in innovations being made more quickly and efficiently (Jorde and Teece, 1992; Kitson and Wilkinson, 1996).

The final aspect of hypothesis three involves new and improved service and product innovations (part C). This aspect addresses a broader definition of innovation by also including service and product innovations previously provided by other firms and improved services and products. The use of new interaction variables signifies the extent of any relationship among innovation and their subsequent external links. For example, interaction variables will represent service firms which are customer-driven with regard to new and improved innovations. Previous research stresses the importance of absorptive capacity and external learning in order to better understand the link between collaborative relationships and innovation (Bougrain and Haudeville, 2002). Furthermore, communication systems aid a firms' absorptive capacity, specifically the interface between internal departments and the external environment. Cohen and Levinthal (1990) believe that, overlapping knowledge across individuals is essential to ameliorate internal exchanges while diversity of knowledge educes 'learning and problem solving that give way to innovation'. The next section of this analysis will briefly examine the concept and measurement of innovative business performance.

7.2 Performance Factors for Innovation

This next section will further elaborate on the factors for this hypothesis concerning customer-driven service firms and the subsequent impact on business performance. Again, the independent variables in determining the impact of innovation by a service firm on performance derive from the descriptive chapter. Similar to above, there are three main groups reflecting the performance factors for innovation:

- Internal Resource Indicators
- Other Service Firm Characteristics
- Innovation and External Linkages

The last grouping has been slightly altered to include the interaction variables of the external linkages which were included in this segment of the analysis for hypothesis three.

The reasons for incorporating the independent variables which fall under these three groups are the same as mentioned in the previous chapter. Additionally, the use of productivity and growth measurements is again used to aid in identifying business performance. Once more, the dependent variables for this analysis include: V.A.P.E., sales growth, and employment growth. The rationale for these performance measurements exists in the 'performance factors for innovation' (section 6.3).

The remaining sections will follow the same format for service and product, organisational, and technology driven innovation. Two further analyses include new-to-market innovations and a broader definition of innovation. These analyses are different from the ones for the previous hypothesis in that interaction variables incorporate the relationship of the external linkages. The first topic will examine these three performance measures individually for service and product innovation.

7.3 Customer-driven Innovators versus Non-innovators

With the explanations of the different analyses of the third hypothesis and the performance factors for innovation, the findings will now be discussed. Again, this hypothesis is addressing service firms who innovate with the input of their customers and those that do not. Once more, the three performance measures include the log of the dependent variables: V.A.P.E., sales growth, and employment growth. The first area of interest, in part A, will enquire into service and product innovation within service firms, followed by organisational and technological innovations.

7.3.1 Customer-driven Service & Product Innovation

It is hypothesised that customer-driven service firms will perform better than non-innovating service firms. It will be important to address the findings stemming from the productivity measurement (refer to Table 7.1). Firstly, under the grouping 'internal resource indicators' service firms that invest in capital equipment are more productive. In the study by Conceição et al (2003), of manufacturing and service sectors, they discover a positive relationship between innovation and the level of productivity, but a negative effect of innovation on productivity growth. Additionally, Mairesse and Mohnen's (2003)

research from CIS II data report a positive relationship between product innovation and the level of productivity while no significant impact of process innovations on productivity. Tether (2003) reports high significance for service firms' aim of reducing labour costs; this is expected given the high labour intensity of numerous services. Also, the findings suggest that those service firms which export experience a positive effect on productivity. This may be due to the characteristics of the firms' service or product offerings, although there is not any significance for those categories of the analysis (see 'other service firm characteristics', Table 7.1). Regarding the grouping 'innovation and external linkages', the only significant factor is the relationship of consultancy firms. Thus, there is a positive effect on productivity when a service firm allows for the involvement of consultancy firms in its innovative activity. Quite possibly, consultants, while providing a fresh take on the business, may be able to streamline the service and product process. Their expertise could bring new insights to the service firm which enable it to increase productivity. This expertise may be along the lines of restructuring the work process or suggesting the purchase of advanced equipment in order to increase the value-added per employee. Similarly, Beesley and Rothwell's (1987) research found 89 per cent of firms had at least one significant external link.

Moving on to the growth measures replicating the findings for hypothesis two, larger service firms' experience less growth (see Table 7.1). Lopes and Godhinho's (2005) report size has a positive impact on innovation output but a large negative effect on innovation effort intensity and no impact on labour productivity. Fritsch and Lukas (2001) state large firms with a high share of R&D are more likely to be engaged in R&D cooperation. Also, Leiponen's (2005) study on business services report firm size being weakly related to innovation outcomes. Regarding exporting, service firms which export experience lower sales and employment growth. This may be due to the present situation of the international market. Service firms may find it difficult competing with existing home countries' service firms. As a result, at home they are experiencing improved productivity while overseas they are not experiencing growth. With that said half of the innovating service firms state that opening new markets (or increasing market share) and extending the service range were 'very important' (Tether, 2003). Surprisingly, the level of education for these service firms' workforces shows no significance in any of the analyses of hypothesis three. On the other hand, Leiponen (2005) states hiring highly educated employees is useful for new services in the form of sales revenue.

Under the grouping 'innovation and external linkages', there is a positive effect on sales growth for those service firms which innovate with the support of strategic alliances or joint ventures. Relating to alliances and ventures, developing trust is an obvious aspect of any relationship especially if valuable implicit knowledge is being exchanged. Deakin et al. (1997) states that when firms share information through co-operative alliances this assists in developing innovative product or process. Innovative service firms might possibly tap into the existing customers of the firm they are forming alliances or ventures with. And often times by combining knowledge and expertise, for example marketing efforts, may lead to sales and/or employment growth. For collaborative efforts, it is only after trust replaces uncertainty and opportunism, informal obligations might constitute a more stable framework for interaction (Lundvall, 1988). Additionally, there is significance regarding growth for service firms which innovate with the input from their customer. Freel (1999) suggests firm evidence regarding the frequency of contact and established relationships as being primary importance in contributing to the success of joint activities. Of course this relates back to the issue of trust required to establish collaborative efforts. The term customer-driven innovation is specifically what hypothesis three is referring to; thus, there is support that involving ones customer in the innovation process of service and products does positively affect sales and employment growth. The final external linkage and innovation dummy variable regarding growth is consultancy firms. In this case, unlike with productivity, there is a negative effect on employment growth for those service firms which involve consultancy firms in the introduction of innovations. This may be explained by the positive impact consultancy firms bring regarding increasing the value-added per employee, thus no need for hiring new employees. Efficiently utilising ones' employees may diminish the need for employment growth. Important to note is that good consultancy depends on the establishment of effective personal and social relations which nonetheless involves trust (Bryson, 1997). Brief conclusion for this aspect of innovation will follow.

7.3.2 Brief Conclusions: Customer-driven Service & Product Innovation

This section will discuss the performance of service firms, regarding service and product innovation. In short, for 'internal resource indicators', larger service firms show signs of lower sales and employment growth. Also, service firms which invest in capital equipment experience a positive effect on V.A.P.E. Those service firms which export their services and products experience a positive effect on V.A.P.E., but experience lower growth. Evangelista and Savona (2003) found most innovative service firms, who spend more on innovation per employee, and those introducing service innovation are more prone

to report a positive impact of innovation on total employment. Regarding innovation and the six external linkages, there is a positive effect on V.A.P.E. for those service firms which utilise consultancy firms. This finding is coupled with a negative effect on employment growth for those service firms which involve consultancy firms in the innovation process. Quite possibly consultants are providing waste reduction suggestions, thus increasing value-added while minimizing the need to hire more employees. Lastly, service firms which utilise their customer for service and product innovations experience a positive effect on sales and employment growth. Thus, specifically addressing hypothesis three, there is support that a service firm which is customer-driven will perform better than non-innovating service firms, due to the growth effect. The next aspect of hypothesis three entails organisational innovation.

Table 7.1
Service & Product Innovation: Part A

Log	Model		
	(a) V.A.P.E.	(b) Sales Growth	(c) Employment Growth
Constant	10.315***	2.105***	1.804***
	(0.482)	(0.370)	(0.331)
Internal Resource Indicators			
Employment	-0.000	-0.000**	-0.000***
	(0.000)	(0.000)	(0.000)
Employment Squared	0.000	0.000*	0.000***
	(0.000)	(0.000)	(0.000)
Capital Intensity	0.000***	0.000	-0.000
	(0.000)	(0.000)	(0.000)
Exports	0.013*	-0.009**	-0.010***
	(0.007)	(0.005)	(0.004)
Workforce with Degree	-0.002	0.001	-0.000
	(0.006)	(0.004)	(0.004)
Workforce with no Qualifications	-0.010	-0.001	0.005
	(0.008)	(0.008)	(0.008)
Other Service Firm Characteristics			
Firm Vintage	0.003	-0.002	-0.004
	(0.005)	(0.004)	(0.003)
Business Type	0.301	0.352	0.163
	(0.371)	(0.252)	(0.242)
Customised Offerings for Individuals	-0.459	-0.159	-0.159
	(0.380)	(0.246)	(0.209)
Tailored Offerings for Groups	0.315	0.296	0.118
	(0.336)	(0.255)	(0.260)
Suitable for Large Customer Groups	-0.176	0.155	0.131
	(0.340)	(0.254)	(0.235)
Standardised	0.040	-0.350	-0.264
	(0.413)	(0.269)	(0.236)

Innovation and External Linkages
(Interaction Variables)
Strategic Alliance or Joint Venture x

Innovation Dummy	0.003	0.016***	0.012*
	(0.008)	(0.005)	(0.007)
Suppliers x Innovation Dummy	0.008	0.007	-0.005
	(0.008)	(0.007)	(0.008)
Subsidiaries x Innovation Dummy	0.002	0.018	0.014
	(0.013)	(0.012)	(0.010)
Customers x Innovation Dummy	0.007	0.012***	0.013***
	(0.006)	(0.004)	(0.004)
Consultancy Firms x Innovation Dummy	0.030*	-0.015	-0.015*
	(0.017)	(0.011)	(0.009)
Competitors x Innovation Dummy	0.010	-0.000	-0.001
	(0.007)	(0.006)	(0.006)
Adj. R squared	0.0687	0.1302	0.1103
Breusch-Pagan chi-squared (df)	55.01 (18)		32.04 (18)
Durbin-Watson	2.00	1.83	2.01
Rho	-0.0009	0.0856	-0.0037
Number of Observations	180	185	185

Notes: Standard Errors are in parentheses. Significant at *** 1%, **5%, *10%
Where Breusch-Pagan chi-squared is shown white-corrected covariance is used.

7.3.3 Customer-driven Organisational Innovation

This section will look specifically at organisational innovations within service firms. Again, it is suggested that customer-driven service firms will perform better than non-innovating service firms. Firstly, it will be important to address the findings stemming from the productivity measurement for this analysis (refer to Table 7.2). Under the grouping 'internal resource indicators' capital intensity is again positively affecting a service firms' V.A.P.E. Once more, it is not uncommon to find that spending on capital equipment allows employees to improve their productivity (see Love and Roper, 1999). The next grouping, 'other service firm characteristics', does not show any significance in the dependent variables. Moving on to address the role of external linkages in relation to V.A.P.E. conveys a positive effect for those service firms who utilise subsidiaries and/or customers. Possibly, a parent company's ability to combine its efforts and resources to its subsidiaries aids in increasing productivity. As for the role of customers having a positive effect on V.A.P.E., for organisational innovative service firms, this may possibly be explained by customers providing helpful ideas and/or suggestions.

Next, Table 7.2 shows the results for the growth measurements. Again, under the heading 'internal resource indicators' larger service firms are experiencing less sales and employment growth. This is represented by a u-shaped relationship when squaring

employment. Tether (2005) reports an orientation to organisational innovation to have a weak negative association with size. There are no significant dependent variables represented under the grouping 'other service firm characteristics'.

Finally, organisational innovative service firms which involve strategic alliances or joint ventures in the innovation process experience both sales and employment growth. Again, this may be due to the expansion of the service firm's customer base. Also, the external linkage, customers has a positive effect on sales growth for organisational innovative service firms. Surprisingly, innovative service firms which work jointly with their competitors experience employment growth. Previous research by Fritsch and Lukas (2001) inquired into several types of cooperative partners such as: customers, manufacturing suppliers, competitors, and publicly funded research institutions. They emphasised the nature of competitors in the cooperative as being non-vertically related and found that 32.5 per cent of manufacturing enterprises utilised competitors, while 61 per cent utilised customers. Regarding services, Tether (2003) suggests using competitors as a source for innovation signifies an imitative strategy, such as watching rivals and seeking to replicate their success. Subsequently, it is not unlikely for firms to cooperate with competitors for R&D and innovative efforts. Now, it will be important to devise conclusions concerning customer-driven organisational innovation.

7.3.4 Brief Conclusions: Customer-driven Organisational Innovation

Briefly this section will discuss the findings for this analysis which looks at organisational innovation. To begin with, the productivity measurement, those service firms which invest in capital equipment for their employees experience higher value-added. Organisational innovative service firms; experience a positive effect on productivity when they utilise their subsidiaries and/or customers. Regarding performance measures sales and employment growth, there is a u-shaped relationship. In other words, larger service firms experience less employment and sales growth. Service firms which involve the external linkages, strategic alliance or joint ventures and/or customers for their organisational innovations, experience a positive effect on sales growth. Service firms which involve strategic alliance or joint ventures in their organisational innovations experience a positive effect on employment growth. Additionally, there is an employment growth effect for service firms which utilise their competitors in organisational innovations. To address hypotheses three, there is some support of higher performance levels for those service firms which allow for customer-driven innovative efforts. This performance effect is present in both increased productivity and sales growth. Thus, there is support for hypothesis three as

it is evident that organisational innovative service firms that are customer-driven experience an increase in performance. Next, the findings from service firms that innovative by way of technology will be discussed.

Table 7.2
Organisational Innovation: Part A

Log	Model (a) V.A.P.E.	(b) Sales Growth	(c) Employment Growth
Constant	10.643***	2.379***	1.959***
	(0.446)	(0.358)	(0.357)
Internal Resource Indicators			
Employment	-0.000	-0.000***	-0.000***
	(0.000)	(0.000)	(0.000)
Employment Squared	0.000	0.000**	0.000***
	(0.000)	(0.000)	(0.000)
Capital Intensity	0.000***	0.000	-0.000
	(0.000)	(0.000)	(0.000)
Exports	0.011	-0.008	-0.007
	(0.008)	(0.005)	(0.005)
Workforce with Degree	0.002	0.002	0.001
	(0.005)	(0.004)	(0.004)
Workforce with no Qualifications	-0.005	-0.001	0.005
	(0.009)	(0.009)	(0.009)
Other Service Firm Characteristics			
Firm Vintage	0.003	-0.001	-0.002
	(0.004)	(0.004)	(0.004)
Business Type	0.245	0.273	0.080
	(0.371)	(0.256)	(0.255)
Customised Offerings for Individuals	-0.373	-0.061	-0.110
	(0.364)	(0.252)	(0.252)
Tailored Offerings for Groups	0.304	0.347	0.191
	(0.334)	(0.256)	(0.256)
Suitable for Large Customer Groups	-0.215	0.069	0.095
	(0.358)	(0.261)	(0.260)
Standardised	0.224	-0.396	-0.434
	(0.434)	(0.281)	(0.281)
Innovation and External Linkages (Interaction Variables)			
Strategic Alliance or Joint Venture x Innovation Dummy	-0.011	0.016**	0.017**
	(0.008)	(0.008)	(0.008)
Suppliers x Innovation Dummy	-0.037	-0.015	-0.019
	(0.025)	(0.014)	(0.014)
Subsidiaries x Innovation Dummy	0.020**	-0.002	-0.006
	(0.009)	(0.009)	(0.009)
Customers x Innovation Dummy	0.015*	0.011*	0.005
	(0.008)	(0.006)	(0.006)
Consultancy Firms x Innovation Dummy	-0.007	-0.006	0.004
	(0.011)	(0.009)	(0.009)

Competitors x Innovation Dummy	0.001	0.009	0.020**
	(0.008)	(0.010)	(0.010)
Adj. R squared	0.0746	0.0912	0.1019
Breusch-Pagan chi-squared (df)	39.08 (18)		
Durbin-Watson	2.02	1.86	1.99
Rho	-0.0092	0.0704	0.0055
Number of Observations	180	185	185

Notes: Standard Errors are in parentheses. Significant at *** 1%, **5%, *10%
Where Breusch-Pagan chi-squared is shown white-corrected covariance is used.

7.3.5 Customer-driven Technological Innovation

This aspect of the analysis will address customer-driven technological innovation for service firms. Again, hypothesis three states customer-driven service firms will perform better than non-innovating service firms. It will first be important to address the findings stemming from the productivity measurement (refer to Table 7.3). Firstly, under the grouping 'internal resource indicators' service firms that invest in equipment for their employees experience a positive effect on V.A.P.E. This is not unlike the findings above for service and product and organisational innovations. Also, similar to the findings for service and product innovations (see above Table 7.1), there is a positive effect on V.A.P.E., for those service firms which export. On the other hand, these exporting service firms' experience lower growth. Under the heading 'innovation and external linkages', involving strategic alliance or joint ventures is the only significant external linkage on productivity. Therefore, those service firms which involve strategic alliances or joint ventures in their technological innovations experience a negative effect on V.A.P.E. Possibly the intricacies of the technological innovation causes an initial disruptive effect for the service firm. Additionally, technological innovations may generally take more time for employees to reach efficiency levels. It is unknown whether this internal negative effect on productivity is due to the linkages' involvement. Nevertheless, perhaps due to the nature of technological innovations, a lag exists.

Now this area of the analysis will continue discussing the growth measurements for customer-driven technological innovation (refer to Table 7.3). Regarding firm size, the case is such that larger service firms' experience less sales and employment growth. This may be due to the business life cycle as it is harder for a large firm to grow exponentially. Surprisingly, none of the 'other service firm characteristics' are significant for any of the dependent variables. As for the external linkages, those service firms which link with

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strategic alliance or joint ventures experience a sales and employment growth effect. Meanwhile the only significant external factor affecting sales growth is customers. In other words, those service firms which innovate technologically with input from their customers experience growth in sales. Customer behaviour and tastes are unpredictable in relation to any changes in production technologies (Miller and Friesen, 1978). Thus, involving ones customers may aid in alleviating the disruptive effects of technological innovations. Previous empirical research shows co-operation arrangements with customers or suppliers, as a source of advanced technologies, tend to decline with firm size (Tether, 2005). The next section will draw some short conclusions for customer-driven technological innovation.

7.3.6 Brief Conclusions: Customer-driven Technological Innovation

In conclusion, this section will discuss the findings of customer-driven technological innovation. Starting with the productivity measurement, service firms that invest in equipment for their employees experience a positive effect on V.A.P.E. There is also a positive effect on V.A.P.E. for those service firms which export; meanwhile these exporting service firms' experience lower growth. Service firms which involve strategic alliances or joint ventures in their technological innovations experience a positive effect on V.A.P.E. Large service firms experience less sales and employment growth. None of the 'other service firm characteristics' are significant for any of the dependent variables. As for the external linkages, service firms who converge with strategic alliance or joint ventures experience a sales and employment growth effect. Service firms which innovate technologically with input from their customers experience growth in sales. Concentrating on the impact these findings have on hypothesis three, which enquires into the performance level of customer-driven innovative service firms and non-innovating service firms, is important. The results for technological innovation offer some support as customer-driven service firms' do experience sales growth. With the main types of innovation complete, it will be useful to delve into new-to-market and new and improved service and product innovations.

Table 7.3 Technological Innovation: Part A

Model

Log	(a) V.A.P.E.	(b) Sales Growth	(c) Employment Growth
Constant	10.733***	2.451***	1.922***
	(0.438)	(0.358)	(0.358)
Internal Resource Indicators			
Employment	-0.000	-0.000***	-0.000***
	(0.000)	(0.000)	(0.000)
Employment Squared	0.000	0.000*	0.000***
	(0.000)	(0.000)	(0.000)
Capital Intensity	0.000***	0.000	-0.000
	(0.000)	(0.000)	(0.000)
Exports	0.013*	-0.009*	-0.008*
	(0.007)	(0.005)	(0.005)
Workforce with Degree	0.002	0.002	0.000
	(0.005)	(0.004)	(0.004)
Workforce with no Qualifications	-0.001	0.000	0.006
	(0.011)	(0.008)	(0.008)
Other Service Firm Characteristics			
Firm Vintage	0.002	-0.001	-0.003
	(0.004)	(0.004)	(0.004)
Business Type	0.120	0.256	0.072
	(0.357)	(0.248)	(0.249)
Customised Offerings for Individuals	-0.304	-0.236	-0.264
	(0.343)	(0.253)	(0.254)
Tailored Offerings for Groups	0.195	0.334	0.236
	(0.335)	(0.255)	(0.255)
Suitable for Large Customer Groups	-0.270	0.011	0.050
	(0.343)	(0.257)	(0.258)
Standardised	0.077	-0.222	-0.218
	(0.392)	(0.277)	(0.278)
Innovation and External Linkages (Interaction Variables)			
Strategic Alliance or Joint Venture x Innovation Dummy	-0.028*	0.015***	0.019***
	(0.017)	(0.006)	(0.006)
Suppliers x Innovation Dummy	-0.004	-0.010	-0.005
	(0.007)	(0.008)	(0.008)
Subsidiaries x Innovation Dummy	0.014	-0.001	0.003
	(0.014)	(0.010)	(0.010)
Customers x Innovation Dummy	0.008	0.010**	0.006
	(0.006)	(0.005)	(0.005)
Consultancy Firms x Innovation Dummy	0.009	-0.001	0.003
	(0.007)	(0.007)	(0.007)
Competitors x Innovation Dummy	-0.004	0.004	0.007
	(0.006)	(0.007)	(0.007)
Adj. R squared	0.0898	0.0996	0.1094
Breusch-Pagan chi-squared (df)	105.54 (18)		
Durbin-Watson	1.97	1.84	2.04
Rho	0.0126	0.0802	-0.0189
Number of Observations	179	184	184

Notes: Standard Errors are in parentheses. Significant at *** 1%, **5%, *10%
Where Breusch-Pagan chi-squared is shown white-corrected covariance is used.

7.3.7 New-to-Market Customer-driven Service & Product Innovation

This section (part B) will address strictly new to the market innovations. New interaction variables were created; in this case the external links are being interacted with the extent of innovation. This area is different from the interaction variables previously mentioned in part A. In this case interaction variables are created by multiplying the extent of each external link by the extent of new-to-market innovations. Therefore, not just whether or not a service firm innovates is important, but the extent of innovation. As discussed previously these innovations are generally classified in a Schumpeterian sense as 'radical'. These first time service and product innovations will begin with the findings for the productivity measurement. The next section (part C) will also address 'incremental' innovations, as it is important to differentiate between the two. Similar to part B, the interaction variables here were created by multiplying the extent of each external link by the extent of new and improved innovations. Fritsch and Lukas (2001) conducted empirical research for manufacturing enterprises' and inquired into completely new products in addition to product modification that are already a part of their offerings.

As Table 7.4 shows, there is again significance for capital intensity and its positive effect on V.A.P.E. Also, those service firms which export their service and products experience greater V.A.P.E.; however both of the growth factors are negative. Next, none of the 'other service firm characteristics' are significant. Addressing the external linkages, innovative service firms which utilise consultancy firms, for new-to-market innovations, experience a positive effect on V.A.P.E. Oftentimes, consultancy firms, provide their expertise in order to streamline the service and product process for employees, thus an increase in productivity.

Under the heading 'internal resource indicators', Table 7.4 shows that there is a size effect. In other words, large service firms experience lower sales and employment growth.

Next, a service firms' relationship with external linkages will be discussed. First, service firms that coordinate innovative efforts with strategic alliance or joint ventures experience a positive effect on both sales and employment growth. Bougrain and Haudeville's (2002) research reports, access to external linkages for innovation is believed to be crucial for SMEs competitiveness. Additionally, there is a positive growth effect for those service firms which utilise customers in their new-to-market innovations. When introducing a totally new service or product, it can be important to gather input from existing or potential customers. Customers can provide valuable insight on what attributes are important. The findings for this analysis correspond with that of Tether's (2003)

investigation into the CIS II data as over 80 per cent of businesses identified customers as a relevant source of information for innovation. And, he reports suppliers and customers (or clients) were the most widely used collaboration partner, with 17 per cent and 15 per cent respectfully. Tether (2003) also reports other co-operative arrangements for innovation such as: 11 per cent of service firms' utilising their competitors and 11 per cent using consultants. The most frequently identified external source for innovation as being both relevant and very important were customers (or clients), suppliers, and competitors.

Interestingly, there is a negative growth effect for involving suppliers in totally new service and product innovations. One rationale for such a finding could be that suppliers do not know the complete intricacies of the service firms' offering. Assuming that a service firm does business with numerous suppliers, suppliers' input may not be integrated successfully for innovation. There could be a lack of coordination or implementation of innovative efforts from the suppliers' ideas and/or suggestions. Bougrain and Haudeville (2002) researched innovation and collaboration of SMEs addressing the informal relationship and exchange of tacit knowledge reporting an underestimation of these customer-supplier relations due to underreporting. Again, we are dealing strictly with new-to-market service and product innovations. Thus, as the interaction variable signifies that an external linkage relationship is present; those service firms which link up with suppliers experience a negative growth effect. These findings cannot suggest that the negative growth effect is long-term.

7.3.8 Brief Conclusions: New-to-Market Customer-driven Service & Product Innovation

This section will summarise the findings for strictly new-to-market innovations or radical innovations. Not unsurprisingly, service firms which invest in capital equipment experience higher value-added from their employees. Also, service firms that export their new service and product experience greater V.A.P.E., but also lower growth. Again, none of the 'other service firm characteristics' are significant. Innovative service firms which utilise consultancy firms' expertise, for new-to-market innovations, experience a positive effect on V.A.P.E. Large service firms experience lower sales and employment growth. Service firms that administer innovative efforts with strategic alliance or joint ventures experience a positive effect on both sales and employment growth. There is a negative growth effect for service firms who involve their suppliers in entirely new service and product innovations. A lack of coordination or implementation of innovative efforts from the suppliers' ideas and/or suggestions could be to blame. Lastly, there is a positive growth

effect for those service firms which utilise customers in their new-to-market innovations. This relates directly to hypothesis three. Therefore, due to the growth effect experienced by involving ones customer in new-to-market innovations, there is support that customer-driven service firms perform well. In this case, there is no evidence of customer-driven service firms being more productive than non-innovators; however, there is evidence of sales and employment growth. With 'radical' innovations addressed, it will not be vital to look at incremental innovations.

Table 7.4
New-to-Market Service & Product Innovation: Part B

Log	Model (a) V.A.P.E.	(b) Sales Growth	(c) Employment Growth
Constant	10.705***	2.392***	1.975***
	(0.437)	(0.341)	(0.350)
Internal Resource Indicators			
Employment	-0.000	-0.000**	-0.000***
	(0.000)	(0.000)	(0.000)
Employment Squared	0.000	0.000	0.000**
	(0.000)	(0.000)	(0.000)
Capital Intensity	0.000***	0.000	-0.000
	(0.000)	(0.000)	(0.000)
Exports	0.013*	-0.009**	-0.009*
	(0.007)	(0.005)	(0.005)
Workforce with Degree	-0.000	0.002	0.001
	(0.006)	(0.004)	(0.004)
Workforce with no Qualifications	-0.006	0.002	0.008
	(0.008)	(0.008)	(0.008)
Other Service Firm Characteristics			
Firm Vintage	0.004	-0.002	-0.003
	(0.005)	(0.003)	(0.004)
Business Type	0.153	0.298	0.073
	(0.366)	(0.240)	(0.247)
Customised Offerings for Individuals	-0.413	-0.105	-0.096
	(0.372)	(0.241)	(0.248)
Tailored Offerings for Groups	0.322	0.149	0.068
	(0.332)	(0.253)	(0.259)
Suitable for Large Customer Groups	-0.325	0.020	0.068
	(0.330)	(0.249)	(0.256)
Standardised	0.125	-0.363	-0.306
	(0.416)	(0.266)	(0.273)
Innovation and External Linkages (Interaction Variables)			
Strategic Alliance or Joint Venture x New-to-Market	-0.000	0.000***	0.000**
	(0.000)	(0.000)	(0.000)
Suppliers x New-to-Market	-0.000	-0.000**	-0.000*

	(0.000)	(0.000)	(0.000)
Subsidiaries x New-to-Market	0.000	0.000	0.000
	(0.001)	(0.001)	(0.001)
Customers x New-to-Market	0.000	0.001***	0.001***
	(0.000)	(0.000)	(0.000)
Consultancy Firms x New-to-Market	0.002***	-0.000	-0.001
	(0.000)	(0.000)	(0.000)
Competitors x New-to-Market	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)
Adj. R squared	0.0944	0.1616	0.1238
Breusch-Pagan chi-squared (df)	44.24 (18)		
Durbin-Watson	2.01	1.85	2.02
Rho	-0.0045	0.0741	-0.0086
Number of Observations	180	185	185

Notes: Standard Errors are in parentheses. Significant at *** 1%, **5%, *10%
Where Breusch-Pagan chi-squared is shown white-corrected covariance is used.

7.3.9 New and Improved Customer-driven Service & Product Innovation

Part C is the final aspect of this analysis of hypothesis three and addresses 'incremental' service and product innovation. For this analysis, interaction variables were again created in order to signify the relationship between external linkages with the extent of innovation. As 'radical' innovations appear less common than new and improved service and product, this section will explicitly allow for 'incremental' innovations. Again, hypothesis three is addressing the performance of customer-driven service firms versus non-innovating service firms. Referring to Table 7.5, under the heading 'internal resource indicators', all of the previous findings, for hypothesis three, show similar capital intensity results. Nonetheless, service firms which invest in capital equipment benefit by way of more V.A.P.E. Again, none of the 'other service firm characteristics' are significant. Similar to new-to-market innovations, there is a positive effect on V.A.P.E. for those innovative service firms which employ consultancy firms. In this case, there is no significance for service firms which use the external linkage- suppliers. However, Fritsch and Lukas (2001) found that manufacturing firms that maintain cooperative relationships with their suppliers tend to have a relatively low share of V.A.P.E.

It is now important to address the other performance measure of this analysis-growth. Also, as was the case with new-to-market innovations, large service firms' experience no sales or employment growth. Not to mention, service firms that export experience a negative growth effect. Next, innovative service firms which converge with strategic alliance or joint ventures benefit from positive sales growth. Also, service firms

which create linkages with their customers for innovative input experience a growth effect. This finding is analogous to that found for new-to-market service and product innovations. Brief conclusions for new and improved innovations will follow.

7.3.10 Brief Conclusions: New and Improved Customer-driven Service & Product Innovation

Conclusions for 'incremental' service and product innovation for hypothesis three will be important to make. Once more, hypothesis three is addressing the performance of customer-driven service firms versus non-innovating service firms. Similar to all of the capital intensity results above, service firms which invest in capital equipment experience more V.A.P.E. Again, none of the 'other service firm characteristics' are significant. Similar to new-to-market innovations, there is a positive effect on V.A.P.E. for those innovative service firms which use consultancy firms. Also, as was the case for new-to-market innovations, large service firms experience lower sales or employment growth. Service firms that export their service and products internationally experience a negative growth effect. Next, innovative service firms that join in strategic alliance or joint ventures benefit via sales growth. Nevertheless, there is support for hypothesis three regarding the role of ones customer. There is a performance effect for those customer-driven service firms regarding both sales and employment growth. Thus, regardless of whether the innovation is 'radical' or 'incremental' utilising external linkages proves fruitful. The final section under hypothesis three will attempt to make overall conclusions based on all of the findings presented.

Table 7.5
Service & Product Innovation (broad definition): Part C

Log	Model (a) V.A.P.E.	(b) Sales Growth	(c) Employment Growth
Constant	10.635***	2.392***	2.019***
	(0.435)	(0.348)	(0.353)
Internal Resource Indicators			
Employment	-0.000	-0.000**	-0.000***
	(0.000)	(0.000)	(0.000)
Employment Squared	0.000	0.000	0.000**
	(0.000)	(0.000)	(0.000)
Capital Intensity	0.000***	0.000	-0.000
	(0.000)	(0.000)	(0.000)
Exports	0.011	-0.011**	-0.012**
	(0.007)	(0.005)	(0.005)
Workforce with Degree	-0.001	-0.001	-0.001
	(0.006)	(0.004)	(0.004)

Workforce with no Qualifications	-0.012	-0.007	0.001
	(0.009)	(0.009)	(0.009)
Other Service Firm Characteristics			
Firm Vintage	0.003	-0.003	-0.005
	(0.005)	(0.004)	(0.004)
Business Type	0.281	0.330	0.085
	(0.357)	(0.246)	(0.250)
Customised Offerings for Individuals	-0.500	-0.094	-0.090
	(0.385)	(0.247)	(0.251)
Tailored Offerings for Groups	0.352	0.370	0.216
	(0.341)	(0.253)	(0.256)
Suitable for Large Customer Groups	-0.248	0.127	0.120
	(0.330)	(0.253)	(0.257)
Standardised	0.042	-0.377	-0.292
	(0.426)	(0.270)	(0.274)
Innovation and External Linkages (Interaction Variables)			
Strategic Alliance or Joint Venture x New and Improved	-0.000	0.000**	0.000
	(0.000)	(0.000)	(0.000)
Suppliers x New and Improved	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)
Subsidiaries x New and Improved	-0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)
Customers x New and Improved	0.000	0.000***	0.000***
	(0.000)	(0.000)	(0.000)
Consultancy Firms x New and Improved	0.001**	-0.000	-0.000
	(0.000)	(0.000)	(0.000)
Competitors x New and Improved	0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)
Adj. R squared	0.0759	0.1318	0.1131
Breusch-Pagan chi-squared (df)	44.54 (18)		
Durbin-Watson	1.99	1.81	2.01
Rho	0.0064	0.0973	-0.0028
Number of Observations	180	185	185

Notes: Standard Errors are in parentheses. Significant at *** 1%, **5%, *10%
Where Breusch-Pagan chi-squared is shown white-corrected covariance is used.

7.4 Overall Conclusions for Hypothesis Three

With the analysis for hypothesis three complete, it will now be imperative to draw overall conclusions from the findings. Interesting results from the performance variables will now be discussed. Again, this hypothesis is strictly addressing the performance of service firms that harness customer-driven innovation in comparison to non-innovating service firms. Although it only states customer-driven innovation five other external linkages are also of interest. This analysis consists of three parts: service and product, organisational, and technological innovation (part A); new-to- market service and product

innovation (part B); new and improved service and product innovation (part C). Looking at the performance measures V.A.P.E. (productivity measure), sales growth, and employment growth (growth measures) it is apparent that regardless of the type of innovation external linkages aid in increasing performance. That is to say that by allowing for open communications, either direct or indirect, can aid in increasing the productivity and/or growth of a service firm. The only case in which this benefit is not apparent is for technological innovations which involve strategic alliance and joint ventures. Possibly the intricacies of the technological innovation causes an initial disruptive effect in productivity for the service firm. Thus, it is suggested that this negative effect on productivity is not specifically due to the linkage or long lasting. Other than this finding, it is clear from this analysis that being innovative impacts business performance.

There is evidence that being customer-driven with regard to innovation does increase a service firms' performance. Specifically, addressing productivity, service firms that involve their customer in organisational innovations benefit from higher value-added per employee. Customers may provide insight to the firm that might have ordinarily been overlooked. Additionally, regarding employment growth, in all of the service and product innovation analyses, there is a positive effect on employment growth for customer-driven service firms. Finally, in every aspect of the analysis of hypothesis three (part A, B, and C), there is a positive sales growth effect for customer-driven service firms. Thus, regarding the performance level of customer-driven service firms in comparison to non-innovating service firms, there is a hint of effect concerning V.A.P.E. for customer-driven service firms. Furthermore, there is ample support of a growth effect when service firms are customer-driven with regard to innovative efforts. A service firms' ability to interact and access external sources of knowledge (enhanced absorptive capacity) aids in raising innovative performance (Caloghirou et al., 2002). Hence, particularly addressing customer-driven service firms, they do have the propensity to experience an increase in performance, especially in regard to growth. Refer to the summary tables for significant variables from this chapter (Table 7.6 for part A and Table 7.7 for part B and C). The next chapter will present the findings for hypothesis four.

Table 7.6 Summary of Key Results   (Part A)

Performance Factors for S&P Customer-driven Innovators v. Non-innovators

	S&P			Organisational			Technological		
	V.A.P.E	Sales Growth	Employment Growth	V.A.P.E	Sales Growth	Employment Growth	V.A.P.E	Sales Growth	Employmen Growth
Internal Resource Indicators									
Employment		--	--		--	--		--	--
Employment Squared		+	++		++	++		+	++
Capital Intensity	++			++			++		
Exports	+	--	--				+	-	-
Workforce with Degree									
Workforce with no qualifications									
Other Service Firm Characteristics									
Firm Vintage									
Business Type									
Customised Offerings for Individuals									
Tailored Offerings for Groups									
Suitable for Large Customer Groups									
Standardised									
External Linkages									
SA/JV x Innovation Dummy		++	+		++	++	-	++	++
Suppliers x Innovation Dummy									
Subsidiaries x Innovation Dummy				++				++	
Customers x Innovation Dummy		++	++	+	+				
Consultancy Firms x Innovation Dummy	+		--						
Competitors x Innovation Dummy						++			

Notes: ++ positively significant at 0.05 or 0.01, + positively significant at 0.1, -- negatively significant at 0.05 or 0.01, - negatively significant at 0.1

Table 7.7 Summary of Key Results (Part B & C)

Performance Factors for New-to-Market S&P Customer-driven Innovators v. Non-innovators (Part B)

Performance Factors for S&P Customer-driven Innovators v. Non-innovators (broad definition) (Part C)

	Part B V.A.P.E	Part B Sales Growth	Part B Employment Growth	Part C V.A.P.E	Part C Sales Growth	Part C Employment Growth
Internal Resource Indicators						
Employment		--	--		--	--
Employment Squared			++			++
Capital Intensity	++			++		
Exports	+	--	-		--	--
Workforce with Degree						
Workforce with no qualifications						
Other Service Firm Characteristics						
Firm Vintage						
Business Type						
Customised Offerings for Individuals						
Tailored Offerings for Groups						
Suitable for Large Customer Groups						
Standardised						
External Linkages						
SA/JV x New-to-Market		++	++			
Suppliers x New-to-Market		--	-			
Subsidiaries x New-to-Market						
Customers x New-to-Market		++	++			
Consultancy Firms x New-to-Market	++					
Competitors x New-to-Market						
SA/JV x New and Improved					++	
Suppliers x New and Improved						
Subsidiaries x New and Improved						
Customers x New and Improved				++	++	++
Consultancy Firms x New and Improved						
Competitors x New and Improved						

Notes: ++ positively significant at 0.05 or 0.01, + positively significant at 0.1, -- negatively significant at 0.05 or 0.01, - negatively significant at 0.1

Notes: ++ positively significant at 0.05 or 0.01, + positively significant at 0.1, -- negatively significant at 0.1, - negatively significant at 0.1

8.1 Introducing Hypothesis Four

Continuing to address the factors which determine the impact of innovation on business performance among service firms, this chapter will introduce hypothesis four. Once more, OLS regression models have been used with the same three performance measurements as above: V.A.P.E., sales growth, and employment growth. It is also important to note that the findings from the log of each dependent variable will be presented. Hypothesis four is different from hypothesis three as it enquires only about innovative service firms, thus the distinction is customer-driven innovators in comparison to innovators:

❖ Hypothesis 4:

Service firms that are customer-driven in regards to innovation will perform better than other service firms that innovate.

8.2 Performance Factors for Innovation

This next section will further elaborate on the factors for this hypothesis concerning customer-driven service firms and the subsequent impact on business performance. Again, the independent variables in determining the impact of innovation by a service firm on performance derive from the descriptive chapter. Same as above, there are three main groups reflecting the performance factors for innovation:

- Internal Resource Indicators
- Other Service Firm Characteristics
- Innovation and External Linkages

The reasons for incorporating the independent variables which fall under these three groups are the same as mentioned in the previous chapter. Additionally, the use of productivity and growth measurements is again used to aid in identifying business performance.

The remaining sections will follow the same format for service and product, organisational, and technology driven innovation (part A). In a slight change from part A of hypothesis three, where interaction variables were created by means of an innovation dummy, here the extent of involvement with the six external groups are entered directly into the

regression equations. This is, of course, because only innovators are included in hypothesis four, so that the dummy innovator variable takes the value 1 for every observation. Also, parallel to hypothesis three, further analyses include new-to-market innovations (part B) and a broader definition of innovation (part C).

Additional analyses are conducted in order to include the level of customer involvement in the introduction of service and products (part D). It may be difficult for respondents of the questionnaire to judge the degree to which certain relationships are entirely separate from innovation activities (Fritsch and Lukas, 2001). Nevertheless, for all three types of innovation, the questionnaire further probes in an attempt to decipher the role of the customers' involvement. For example, the questionnaire actually enquires into the level of involvement for six external links with a 1-5 point Likert scale (ranging from 1= very little to 5= very much). This represents an advance over previous questionnaire-based research such as CIS II. While CIS II enquires into the co-operative arrangements or sources of information for innovation as mentioned previously, unfortunately the CIS II questionnaire does not ask firms directly about the nature or purpose of the cooperative efforts with the linkages. The purpose of this questionnaires' five-point Likert scale under each of the three types of innovation is to enquire into the level of involvement. Additionally, the CIS II questionnaire does not ask firms directly how significant the nature or purpose of the collaborations are for their innovation activities (Tether, 2003).

In the final aspect of this analysis of hypothesis four, the type of interaction will be central (part E). Specifically, for service and product innovations in which customers were involved, further questions explore the mode of interaction with the customer (under grouping 'modes of interaction for innovation', see Table 8.9). If the customer was involved in the development of the new services and products, the questionnaire then enquired into the modes of interaction include formal or informal, or both. Additionally, the nature of the customer involvement, for new services and products, was addressed by means of several options: ad hoc, focus groups, marketing or customer information, and working with lead customers. Previous research also enquired into the nature of cooperative arrangements, for example with the customer as either: 'casual contact for information purposed', 'organized exchange of information and experiences', 'involvement in planning and operating of projects', and 'pilot use of an innovation' (Fritsch and Lukas, 2001). The first section under part A will examine the performance measures individually for service and product innovation.

8.3 Customer-driven Innovators versus Innovators

This aspect of the analysis of hypothesis four will concentrate on the impact of service and product innovation on business performance. Once more, what makes this particular hypothesis unique is that it attempts to differentiate between service firms which innovate. Thus, only innovators are accounted for in this analysis.

Beginning with the productivity measurement, Table 8.1 shows service firms which invest in capital equipment benefit from higher V.A.P.E. This is not unfounded as previous research has also reported a positive relationship between innovation and productivity (Conceição et al., 2003; Mairesse and Mohnen, 2003). Also, under the heading 'internal resource indicators' those service firms which export are less productive, but grow faster than those innovative service firms which export. Acquiring these resources and capabilities for exporting purposes can be expensive for a service firm. Also, competing with existing home countries' service firms may be taxing. Nevertheless, service firms are experiencing productivity at home, while there is presently lower growth. It is apparent that larger innovative service firms' experience less sales and employment growth. Additionally, large exporting service firms do not experience sales or employment growth. Reasons for such lack of growth may be that exponentially it is harder for a firm that is already large to grow further. As a result, it is SMEs which oftentimes display growth effects. König et al. (1994) find the likelihood to cooperate increases with the size of the firm (number of employees).

Moving along to the next heading 'other service firm characteristics', a significant variable relates to service firms which provide service and products customised to individual customers. This means that there is a negative effect on productivity when service firms' customise their offering to individual customers. A possible explanation for this result may be that employees are unable to quickly adapt to the changing needs or specifications of their individual customers. Possibly, the customisation of the offering is complex thus creating a lag in productivity. As a result, service firms might need to spend more per employee in order to customise their offering to individual customers. Firm vintage is also significant. This finding represents a negative effect on employment growth for older service firms; the business life cycle could aid in explaining this finding. In the case of this analysis, large service firms and older service firms are innovating, however they are not growing. Many reasons can explain this lack of growth such as managements' myopic thinking, lacking the ability to be proactive in the marketplace, or relying too heavily on 'cash cows'. Fritsch and Lukas (2001) report no statistical significance for age of the firm or share of exports in their analysis of manufacturing firms. Also, Table 8.1 shows stand alone service firms' experience

sales growth. The ability to make imperative or immediate decisions without the input from the parent company could benefit these innovative service firms. Being an independent service firm might be beneficial for sales growth as compared to a subsidiary in a group. Regarding growth, in this case service firms that offer standardised service and product experience negative sales growth. It could be that the service firms' lack of customisation of their offering negatively influences sales growth. A service firm should be able to adapt to their customers' changing needs. It might be the case that the service firm is not adhering to the changing needs of the marketplace and are content offering the same standardised services and products. Needless to say, these service firms are not experiencing sales growth.

Next, Table 8.1 shows 'innovation and external linkages', consultancy firms have a positive impact on V.A.P.E. Consultants may bring new ideas to the service firm which enable an increase in productivity. Restructuring the work process or suggesting the purchase of advanced equipment could increase the service firms' V.A.P.E. Also, those innovative service firms which partake in strategic alliance or joint ventures experience a positive effect on both sales and employment growth. Innovating with the aid of an alliance or venture allows for combining knowledge and expertise. When firms share information through co-operative alliances this assists in developing innovative product or process (Deakin et al., 1997). Additionally, innovative service firms might possibly tap into the existing customers of the firm they are forming alliances or ventures, thus increasing their sales. The importance of overcoming internal bottlenecks or the opportunity to share costs via joint projects is significant for cooperation (Brockhoff et al., 1991; Teece, 1992). The other significant external link for innovative service firms to utilise for innovations is customers. Involving customers in the introduction of service and products has a positive effect on sales and employment growth. Fritsch and Lukas (2001) found 61.6 per cent of German manufacturing firms' cooperated with their customers. Brief conclusions for this aspect of innovation will follow.

8.3.1 Brief Conclusions: Customer-driven Innovators versus Innovators

This section will formulate brief conclusions regarding innovative service firms. Innovative service firms which invest in capital equipment benefit from higher productivity. Those innovative service firms which export are less productive, but grow faster than those innovative service firms which export. Thus, these service firms are experiencing improved productivity, but lower growth. There is a negative effect on productivity when service firms' customise their offering to individual customers. In order to adapt to their customers' demands, service firms might need to spend more per employee to customise their offering to

individual customers. Consultancy firms have a positive impact on productivity; perhaps they provide valuable information for already innovative service firms.

Regarding size, larger innovative service firms experience lower sales and employment growth. There is a negative effect on employment growth for older service firms; possibly due to the firms' standing along the business life cycle. Also, innovative stand alone service firms' experience sales growth as they may be able to make instantaneous decisions without advising a parent company. Concerning growth, service firms that offer standardised service and product experience less sales growth. The lack of customisation of their offering may well influence sales growth.

Those innovative service firms which partake in strategic alliance or joint ventures experience higher sales and employment growth. Through these co-operation alliances, service firms may gain knowledge and expertise. The other significant external link for innovative service firms to utilise for innovations is customers. Innovating service firms which utilise their customers in innovation experience higher business performance by means of sales and employment growth. Thus, there is support for hypothesis four as the analysis shows significance for innovating service firms which cooperate with customers. The next section under part A will address organisational innovation.

Table 8.1
Service & Product Innovation: Part A

Log	Model (a) V.A.P.E.	(b) Sales Growth	(c) Employment Growth
Constant	10.323***	2.384***	1.746***
	(0.598)	(0.493)	(0.445)
Internal Resource Indicators			
Employment	-0.000	-0.000**	-0.000***
	(0.000)	(0.000)	(0.000)
Employment Squared	0.000	0.000*	0.000***
	(0.000)	(0.000)	(0.000)
Capital Intensity	0.000***	0.000	-0.000
	(0.000)	(0.000)	(0.000)
Exports	0.012**	-0.010*	-0.011**
	(0.006)	(0.006)	(0.005)
Workforce with Degree	-0.004	-0.002	-0.000
	(0.007)	(0.004)	(0.004)
Workforce with no Qualifications	-0.003	-0.005	0.006
	(0.008)	(0.009)	(0.009)
Other Service Firm Characteristics			
Firm Vintage	0.005	-0.002	-0.005*

	(0.005)	(0.004)	(0.003)
Business Type	0.488	0.494*	0.116
	(0.425)	(0.287)	(0.268)
Customised Offerings for Individuals	-0.639*	-0.227	-0.133
	(0.385)	(0.278)	(0.229)
Tailored Offerings for Groups	0.247	0.272	0.193
	(0.378)	(0.301)	(0.314)
Suitable for Large Customer Groups	-0.219	0.151	0.187
	(0.349)	(0.288)	(0.269)
Standardised	-0.295	-0.519*	-0.147
	(0.487)	(0.313)	(0.258)
Innovation and External Linkages			
Strategic Alliance or Joint Venture	0.005	0.015***	0.012*
	(0.009)	(0.006)	(0.007)
Suppliers	0.008	0.004	-0.004
	(0.010)	(0.008)	(0.008)
Subsidiaries	0.003	0.018	0.015
	(0.014)	(0.013)	(0.010)
Customers	0.006	0.011**	0.014***
	(0.007)	(0.005)	(0.005)
Consultancy Firms	0.030*	-0.016	-0.014
	(0.016)	(0.012)	(0.009)
Competitors	0.012	-0.001	-0.001
	(0.008)	(0.007)	(0.007)
Adj. R squared	0.0712	0.1502	0.1200
Breusch-Pagan chi-squared	38.92 (18)		30.33 (18)
Durbin-Watson	1.76	1.83	2.12
Rho	0.1190	0.0866	-0.060
Number of Observations	145	150	150

Notes: Standard Errors are in parentheses. Significant at *** 1%, **5%, *10%
Where Breusch-Pagan chi-squared is shown white-corrected covariance is used.

8.3.2 Customer-driven Organisational Innovators versus Innovators

This section will look specifically at organisational innovations within service firms that innovate. Again, it is suggested that customer-driven service firms will perform better than innovating service firms. Looking at Table 8.2, under the heading 'internal resource indicators', large innovating service firms which introduce organisational innovations experience a negative effect on productivity and growth. There is a u-shaped relationship when employment is squared. Assuming larger firms have added layers of hierarchy; these service firms are not experiencing high V.A.P.E. Freel (2000b) states that concentrated power inhibits flexibility of firms while flatter management styles structures enable firm discretion. Also, possibly the bureaucratic nature of an established service firm may not enable timely change in the employees' work process. This section of the analysis is addressing all organisationally innovative service firms, lack of responding quickly to

changes in developments may reflect in lower productivity. Furthermore, innovative service firms which invest in equipment do experience a positive effect on productivity. Linking the findings above shows that there is a negative size effect on productivity meanwhile there is a positive effect on capital intensity. However, at the same time these innovative service firms do not benefit by way of employment growth. If their current employees are efficiently utilised there may not exist a need to hire more employees. Also, organisationally innovative service firms which export their offerings experience a positive effect on V.A.P.E.

Moving along to 'other service firm characteristics', innovative service firms which offer standardised service and product experience higher V.A.P.E. (see Table 8.2). Thus, similar to manufacturing firms, offering standardised services and products allows for an increase in productivity. Additionally, innovative service firms which offer tailored offerings for groups experience a positive effect on sales growth. By offering tailored services and products to existing groups of customers this may increase a service firms' opportunity to increase sales. Retaining customers by adapting their offering to meet their needs could benefit the bottom line of a service firm.

Next, taking a look at innovative service firms which utilise external linkages will be imperative to this analysis of hypothesis four. Firstly, service firms which innovate by way of new or improved practices with the aid of subsidiaries experience higher productivity. Subsidiaries of a parent company may share their organisationally innovate ideas among other groupings of their company. Also, these service firms which link with strategic alliance or joint ventures for organisational innovations experience a positive effect on employment growth. Innovative service firms that enter into these co-operative alliances generally anticipate benefits. This finding is quite interesting as it seems unlikely for service firms to cooperate for organisational innovations. Linking with competitors for new organisational changes also has a positive effect on employment growth. Nowhere else in this analysis of hypothesis four are competitors a significant external linkage. Therefore, it cannot be assumed that, for example, technological co-operations, which are more commonly found, initiate the exchange of ideas which may also lead to organisational innovations. As the next section of this analysis shows technologically innovative service firms which link with competitors proves insignificant. Lastly, specifically addressing customer-driven organisational innovation there is a positive effect on productivity. Service firms which link with their customers for innovation experience higher V.A.P.E. than other innovators, possibly due to their useful ideas and suggestions. These beneficial linkages may be

explained by the service firms' ability to be open to external ideas and suggestions. It will be important to formulate conclusions for this part of the analysis.

8.3.3 Brief Conclusions: Customer-driven Organisational Innovators versus Innovators

Brief conclusions for innovative service firms which introduce organisational innovations will follow. Firstly, large innovating service firms which introduce organisational innovations experience less productivity and growth. This suggests the importance of larger firms' investing in equipment for their employees. Meanwhile, innovative service firms which invest in capital equipment do experience higher productivity, but these service firms' experience lower employment growth. Innovative service firms may efficiently utilise their workforce, thus no need to hire more employees. Also, organisationally innovative service firms which export their offerings experience more productivity. Innovative service firms that offer standardised service and product experience higher V.A.P.E. This is similar to the manufacturing sector in that offering standardised services and products may allow for an increase in productivity. Additionally, innovative service firms that offer tailored offerings for groups experience a positive effect on sales growth. Service firms could improve business performance by being open to adjusting their offering to meet the needs of their customers. Focusing on niche markets may benefit innovative service firms instead of standardising their service and product.

Regarding the external linkages: subsidiaries, strategic alliance or joint ventures, competitors, and customers all aid in increasing business performance. Firstly, service firms that innovate by improving their practices with the aid of subsidiaries experience higher productivity. The cross exchange of information and ideas between subsidiaries may benefit service firms' productivity. Also, linking with strategic alliance or joint ventures for organisational innovations shows a positive effect on employment growth. Innovative service firms that enter into supportive alliances usually foresee a benefit. Additionally, linking with competitors for new organisational changes has a positive effect on employment growth. Lastly, service firms that introduce customer-driven organisational innovation experience a positive effect on productivity, possibly due to implementation of their customers' useful ideas and suggestions. Thus, there is some support for customer-driven organisational innovative service firms as they do experience higher productivity than other innovative service firms. Next, findings for technological innovative service firms will be presented.

Table 8.2 Organisational Innovation: Part A

Log	Model		
	(a) V.A.P.E.	(b) Sales Growth	(c) Employment Growth
Constant	9.095***	2.766***	2.209***
	(0.853)	(0.634)	(0.611)
Internal Resource Indicators			
Employment	-0.000**	-0.000***	-0.000***
	(0.000)	(0.000)	(0.000)
Employment Squared	0.000**	0.000***	0.000**
	(0.000)	(0.000)	(0.000)
Capital Intensity	0.000***	-0.000	-0.000*
	(0.000)	(0.000)	(0.000)
Exports	0.016*	-0.012	-0.006
	(0.010)	(0.009)	(0.008)
Workforce with Degree	0.008	-0.001	-0.001
	(0.009)	(0.007)	(0.007)
Workforce with no Qualifications	-0.000	-0.002	0.011
	(0.016)	(0.014)	(0.014)
Other Service Firm Characteristics			
Firm Vintage	0.005	-0.001	-0.007
	(0.010)	(0.006)	(0.006)
Business Type	0.582	0.273	-0.119
	(0.800)	(0.450)	(0.434)
Customised Offerings for Individuals	-0.686	-0.316	-0.076
	(0.625)	(0.388)	(0.374)
Tailored Offerings for Groups	0.725	0.784*	0.616
	(0.584)	(0.417)	(0.402)
Suitable for Large Customer Groups	-0.822	0.376	0.607
	(0.537)	(0.450)	(0.434)
Standardised	1.213**	-0.336	-0.221
	(0.612)	(0.430)	(0.415)
Innovation and External Linkages			
Strategic Alliance or Joint Venture	-0.007	0.013	0.014*
	(0.008)	(0.009)	(0.009)
Suppliers	-0.037	-0.017	-0.024
	(0.024)	(0.016)	(0.015)
Subsidiaries	0.030**	-0.001	-0.003
	(0.014)	(0.011)	(0.011)
Customers	0.030***	0.010	0.003
	(0.011)	(0.008)	(0.008)
Consultancy Firms	0.011	-0.004	0.005
	(0.009)	(0.010)	(0.010)
Competitors	0.008	0.007	0.018*
	(0.011)	(0.011)	(0.011)
Adj. R squared	0.1744	0.1587	0.1842
Breusch-Pagan chi-squared	34.31 (18)		
Durbin-Watson	2.08	1.85	1.83
Rho	-0.0384	0.0752	0.0863
Number of Observations	81	84	84

Notes: Standard Errors are in parentheses. Significant at *** 1%, **5%, *10%
Where Breusch-Pagan chi-squared is shown white-corrected covariance is used.

3.3.4 Customer-driven Technological Innovators versus Innovators

Completing the analysis of part A of hypothesis four will involve innovative service firms which introduce technology driven innovations. Referring to the 'internal resource indicators' in Table 8.3, large technologically innovative service firms' experience a negative size effect as these large service firms' experience lower growth. That is to say that there is a u-shaped relationship for employment. Next, innovative service firms which invest in capital equipment experience a positive impact on their V.A.P.E. Regarding exports, innovative service firms which export are more productive, but experience lower growth. The cause of this finding is unknown; however it is suggested that either technology driven innovations could involve high initial costs or this lack of growth may also be due to the condition of the international market. Service firms may find it difficult competing with existing home countries' service firms.

The only significant 'other service firm characteristic' shows a negative effect for older innovative service firms as they do not expand their workforce as much. A possible explanation for this finding could be that well-established innovative service firms already provide work for enough employees to maintain operations. Or budgetary constraints may yield the hiring of new employees, even if more employees are necessary. Over many years now in corporations, downsizing has become fairly common used oftentimes to increase shareholders' wealth.

The final aspect of the analysis of technological driven service firms involves their relationship with external linkages. Table 8.3 illustrates the importance of strategic alliance or joint ventures for both sales and employment growth for technologically innovative service firms. Previous research shows that co-operations were more common (40 per cent) amongst firms' engaged in the more technologically dynamic activities (Tether, 2003). Again, the service firms in this data set stem from those under the business services sector. Furthermore, service firms which innovate with the aid of consultancy firms' experience a positive effect on V.A.P.E. Quite possibly, consultants may be able to streamline the service and product process. Their expertise could suggest the purchase of advanced equipment in order to increase V.A.P.E. Also, customer-driven service firms which innovate experience a positive effect on productivity and sales growth relative to other innovators. Customers are oftentimes not only users of services, but also involved in the service process. Thus customers may provide valuable insight to service firms regarding technological innovations. Conclusions for technology driven innovation will follow.

8.3.5 Brief Conclusions: Customer-driven Technology Driven Innovators versus Innovators

Connecting the findings for this final section of part A to hypothesis four is important. Conclusions will begin with the apparent size effect as large technologically innovative service firms' experience less sales and employment growth. Not unexpected, innovative service firms which invest in capital equipment experience higher productivity. Regarding innovative service firms which export, they are more productive, but experience lower growth. Basically, high initial costs of technology driven innovations could hinder performance. As a result, at home they are experiencing productivity while overseas they are not currently experiencing growth. Additionally, older innovative service firms experience less employment growth. A possible explanation for this finding could be that well-established innovative service firms already have enough employees or budgetary constraints may exist.

The final aspect of the analysis of technological driven innovative service firms involves their relationship with these external linkages: strategic alliance or joint ventures, consultancy firms, and customers. Firstly, technologically innovative service firms which form strategic alliance or joint ventures experience both sales and employment growth. Innovative service firms which cooperate with suppliers are not significant for this analysis. However, Tether (2003) reports suppliers are an important source of technology meanwhile they are not a major source of ideas behind the innovations. In addition, innovative service firms which innovate with the aid of consultancy firms' experience more productivity. Consultants' expertise may recommend the purchase of advanced equipment. Also, innovative service firms which utilise input from their customer perform better as they experience an increase in productivity and sales growth. With services, customers are oftentimes part of the service process and perhaps are more able to provide insight for service firms' technological innovations. Thus, there is support for hypothesis four as the findings suggest that innovative customer-driven service firms which introduce technological innovations perform better than other innovators. The next aspect under the analysis of hypothesis four will address only new-to-market service and product innovations.

Table 8.3 Technological Innovation: Part A

Model

Log	(a) V.A.P.E.	(b) Sales Growth	(c) Employment Growth
Constant	9.900***	2.651***	1.984***
	(0.652)	(0.505)	(0.496)
Internal Resource Indicators			
Employment	-0.000	-0.000**	-0.000***
	(0.000)	(0.000)	(0.000)
Employment Squared	0.000	0.000*	0.000***
	(0.000)	(0.000)	(0.000)
Capital Intensity	0.000***	0.000	-0.000
	(0.000)	(0.000)	(0.000)
Exports	0.015*	-0.018**	-0.016**
	(0.009)	(0.008)	(0.008)
Workforce with Degree	0.001	0.000	0.004
	(0.007)	(0.005)	(0.005)
Workforce with no Qualifications	0.025	-0.009	0.009
	(0.019)	(0.014)	(0.014)
Other Service Firm Characteristics			
Firm Vintage	0.003	-0.003	-0.007*
	(0.005)	(0.004)	(0.004)
Business Type	-0.086	0.386	0.086
	(0.508)	(0.325)	(0.319)
Customised Offerings for Individuals	-0.375	-0.296	-0.263
	(0.418)	(0.310)	(0.304)
Tailored Offerings for Groups	0.354	0.360	0.447
	(0.423)	(0.316)	(0.311)
Suitable for Large Customer Groups	-0.317	0.268	0.399
	(0.396)	(0.333)	(0.328)
Standardised	0.026	-0.344	-0.221
	(0.492)	(0.347)	(0.341)
Innovation and External Linkages			
Strategic Alliance or Joint Venture	-0.023	0.016**	0.017***
	(0.016)	(0.007)	(0.007)
Suppliers	0.010	-0.012	-0.008
	(0.011)	(0.009)	(0.009)
Subsidiaries	0.021	0.002	0.007
	(0.015)	(0.011)	(0.011)
Customers	0.017**	0.009*	0.005
	(0.008)	(0.006)	(0.005)
Consultancy Firms	0.019**	-0.001	0.000
	(0.009)	(0.007)	(0.007)
Competitors	0.004	0.004	0.005
	(0.008)	(0.009)	(0.008)
Adj. R squared	0.0798	0.1303	0.1713
Breusch-Pagan chi-squared	89.17 (18)		
Durbin-Watson	1.92	1.98	1.74
Rho	0.0406	0.0114	0.1291
Number of Observations	115	119	119

Notes: Standard Errors are in parentheses. Significant at *** 1%, **5%, *10%
Where Breusch-Pagan chi-squared is shown white-corrected covariance is used.

8.3.6 New-to-Market Customer-driven Innovators versus Innovators

This section (part B) will attend to only new-to-market service and product innovations introduced by all innovative service firms in the dataset. Again, hypothesis four is comparing customer-driven innovative service firms with other service firms that innovate. Determining the impact of strictly new innovation on business performance will be important. To begin, Table 8.4 shows a u-shaped relationship for employment. In other words, there is a negative effect on growth for large innovative service firms. Regarding productivity, there is a positive effect for those innovative service firms which invest in equipment for their employees. Next, innovative service firms which export their offerings experience productivity, but experience lower growth. It takes various resources such as time and money for a service firm to launch brand new service and product. Tastes and preferences of customers differ and understanding these differences is important when initiating innovations.

Under the heading 'other service firm characteristic', Table 8.4 illustrates innovative service firms which are stand alone companies experience higher sales growth. These innovative service firms may have the capability to make urgent decisions without the enquiring to their parent company. Not only is being a stand alone service firm important, but the type of offering proves significant. For example, there is a negative effect on sales growth for those service firms which offer standardised service and product to their customers. The ability of an innovative service firm to homogenize their offering does not prove useful for sales growth.

The final grouping, 'innovation and external linkages' displays many interesting findings for innovative service firms which utilise external links. Firstly, innovative service firms which engage in strategic alliance and joint ventures benefit from growth. Combining resources may prove beneficial for introducing new-to-market innovations. On the other hand, innovative service firms which use suppliers as an external link experience a negative effect on sales growth. Some suppliers may not fully understand the service firms' offering and thus although they are providing ideas and suggestions, they may not aid in increasing sales of new-to-market innovations. Or, there may be a time lag in the time it takes for an innovative service firm to experience a growth effect. As the complexity of the suppliers' ideas and suggestions may not immediately show growth effects. A majority of service firms do not depend on suppliers for innovations, as innovations may draw mainly on either internal business process knowledge or market knowledge (Tether, 2003). This may well be the case as new-to-market innovations are highly driven internally and/or possibly protected. On the other hand, findings from research of German manufacturing firms found 49.5 per

cent of firms' engaged in cooperative relationships with suppliers- 40.8 per cent took part in casual contact for information purposes, 31.2 per cent organised the exchange of information and experiences, 36.1 involved suppliers in planning and operation of projects, and 21.4 per cent used suppliers as a pilot use of an innovation (Fritsch and Lukas, 2001). Regarding productivity, when innovative service firms' hire consultancy firms to aid in the innovation process they experience a positive effect on V.A.P.E. relative to other innovators. Consultants may offer techniques which enable a service firm to increase its productivity. The final significant external linkage is customers. The more intensely product innovative efforts is projected at making new products instead of further development of already existing products, the higher the propensity for cooperation with customers (Fritsch and Lukas, 2001). Table 8.4 shows that innovative service firms which are customer-driven experience a positive effect on both sales and employment growth. Again, this analysis is addressing only new-to-market innovations, thus it is suggested that producing totally new offerings requires external knowledge from cooperative links. Fritsch and Lukas (2001) also report that firms that have a cooperative relationship with suppliers are more likely to also maintain a cooperative relationship with customers. However, in this analysis of new-to-market innovations, suppliers have a negative effect on sales growth. Possibly external linkages negatively influence the introduction of new-to-market innovations due to the complexity of the offering. Conclusions for new-to-market innovations will follow.

8.3.7 Brief Conclusions: New-to-Market Customer-driven Innovators versus Innovators

Brief conclusions for innovative service firms which introduce new-to-market innovations are important in order to understand part B of hypothesis four. Firstly, there is a negative growth effect for large innovative service firms. Innovative service firms which invest in capital equipment for their employees experience more productivity. Next, innovative service firms which export their service and product experience productivity at home, but experience lower growth. High introduction costs at home and overseas may hinder growth. Two characteristics that are significant for innovative service firms include: the type of business and the main type of service and product provided. Stand alone innovative service firms' experience more sales growth, possibly due to greater flexibility. The ability to directly manage the innovative efforts may prove beneficial for innovative service firms. Additionally, service firms which mass produce their service and product offering to their customers experience less sales growth. A one size fits all approach to services may not be suitable as customers may request more tailored offerings.

Next, there are a few significant external linkages for innovative efforts which impact business performance. Firstly, innovative service firms which engage in innovative efforts with strategic alliance or joint ventures experience a positive growth effect. The sharing of resources, information and/or existing customers may aid in increasing sales. Meanwhile, innovative service firms which utilise their suppliers as an external linkage experience less sales growth. It may take time for innovative service firms, which link with suppliers to introduce new-to-market service and products, to achieve growth. Fritsch and Lukas (2001) suggest that a firm's cooperation with suppliers oftentimes works as a substitute for their own innovation as these firms have a relatively low share of value added to turnover. In this case, engaging in innovative efforts with suppliers does not prove beneficial. Innovative service firms which use consultants in the introduction of new-to-market offerings experience higher productivity. Also, innovative service firms which are customer-driven, with regard to new-to-market innovations, experience a positive growth effect. There is support for hypothesis four as customer-driven innovative service firms' do experience more growth than innovative service firms. The next section will concentrate on a broader definition of innovation and view its impact on business performance for service firms which innovate.

Table 8.4
New-to-Market Service & Product Innovation: Part B

Log	Model (a) V.A.P.E.	(b) Sales Growth	(c) Employment Growth
Constant	11.037***	2.723***	2.071***
	(0.457)	(0.386)	(0.405)
Internal Resource Indicators			
Employment	-0.000	-0.000**	-0.000***
	(0.000)	(0.000)	(0.000)
Employment Squared	0.000	0.000*	0.000**
	(0.000)	(0.000)	(0.000)
Capital Intensity	0.000***	0.000	-0.000
	(0.000)	(0.000)	(0.000)
Exports	0.012**	-0.010**	-0.009*
	(0.006)	(0.005)	(0.006)
Workforce with Degree	-0.004	-0.002	0.000
	(0.006)	(0.004)	(0.004)
Workforce with no Qualifications	-0.003	-0.003	0.008
	(0.007)	(0.009)	(0.009)
Other Service Firm Characteristics			
Firm Vintage	0.004	-0.002	-0.004
	(0.005)	(0.004)	(0.004)

Business Type	0.364	0.469*	0.026
	(0.405)	(0.269)	(0.282)
Customised Offerings for Individuals	-0.588	-0.188	-0.064
	(0.394)	(0.268)	(0.282)
Tailored Offerings for Groups	0.355	0.134	0.173
	(0.374)	(0.296)	(0.310)
Suitable for Large Customer Groups	-0.425	0.008	0.100
	(0.354)	(0.276)	(0.290)
Standardised	-0.126	-0.520*	-0.176
	(0.490)	(0.306)	(0.321)
Innovation and External Linkages			
Strategic Alliance or Joint Venture	-0.000	0.000***	0.000*
	(0.000)	(0.000)	(0.000)
Suppliers	-0.000	-0.000**	-0.000
	(0.000)	(0.000)	(0.000)
Subsidiaries	0.000	0.000	0.000
	(0.001)	(0.001)	(0.001)
Customers	0.000	0.001***	0.001***
	(0.000)	(0.000)	(0.000)
Consultancy Firms	0.002***	-0.000	-0.001
	(0.000)	(0.000)	(0.000)
Competitors	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)
Adj. R squared	0.1136	0.2031	0.1375
Breusch-Pagan chi-squared	39.16 (18)		
Durbin-Watson	1.84	1.91	2.12
Rho	0.0797	0.0438	-0.0585
Number of Observations	145	150	150

Notes: Standard Errors are in parentheses. Significant at *** 1%, **5%, *10%
Where Breusch-Pagan chi-squared is shown white-corrected covariance is used.

8.3.8 New and Improved Customer-driven Innovators versus Innovators

This section will attempt to determine the impact of new and improved innovation on business performance among innovative service firms. Part C is addressing incremental innovations as they appear more commonly in the marketplace. Table 8.5 shows that even though large service firms are innovating, they may find it harder to grow exponentially. For large service firms that innovate there is a u-shaped relationship regarding employment growth. However, innovative service firms which invest in capital experience higher V.A.P.E. It seems important to invest in equipment for ones employees in order to be more productive. Innovative service firms which export are productive, but at home they experience lower sales and employment growth. At home these innovative service firms are investing in capital equipment, however when exporting their service and product abroad there is an interruption in growth. Competing abroad may be problematic as customers' tastes and preferences may differ or it may take time for marketing efforts to pay off. Possibly, initiating changes to an existing service and product may not be founded or needed.

Resistance to change may be a reason for a disruptive effect in growth for innovative service firms.

Significant findings under 'other service firm characteristics' will now be discussed. Firstly, older firms' experience a negative effect on employment growth. The business life cycle may explain why well-established innovative service firms' experience less growth. Stand alone innovative service firms' experience a positive effect on sales growth. Quite possibly these innovative service firms are more flexible in their decision making regarding new and improved innovations. Regarding the type of offering innovative service firms offers either customised offerings to individuals or standardised service and product proves significant. For example, innovative service firms which offer customised offerings to individuals experience a negative effect on V.A.P.E. A possible explanation for this finding may be that it is time consuming and/or costly to customise services and products for individual customers. Being able to meet the specific customer requirements does not enable an innovative service firm to gain economies of scale. Of course it is plausible that customers would like more tailored offerings. Such is the case that innovative service firms which offer standardised service and product experience a negative effect on sales growth. This suggests the existence of a fine line for innovative service firms either trying to cater to individual needs or to the needs of a mass market.

Looking at Table 8.5 there are several external linkages which significantly impact the performance of innovative service firms. Innovative service firms which partner with strategic alliance or joint ventures experience sales growth when introducing new and improved offerings. Innovative service firms that enter into these co-operative alliances generally anticipate remuneration. Research by Fritsch and Lukas (2001) suggest various reasons for becoming involved in cooperation such as effects of positive spillovers, opportunity to realise cost-savings, to overcome internal bottlenecks, and to reduce time to market. Thus, engaging in alliance or ventures can greatly benefit an innovative service firm. Also, innovative service firms which hire consultants experience a positive effect on V.A.P.E. Consultants oftentimes bring new information to service firms which enable an increase in productivity, such as restructuring the work process or suggesting the purchase of advanced equipment. Lastly, Table 8.5 shows the performance benefit of utilising customers. Thus, innovative service firms which take ideas and/or suggestions from their customers experience a positive effect on sales and employment growth. With that said, brief conclusions for part C will follow.

8.3.9 Brief Conclusions: New and Improved Customer-driven Innovators versus Innovators

Again, hypothesis four is comparing customer-driven innovative service firms with service firms that innovate. This section addresses incremental innovations introduced by innovative service firms, brief conclusions will be important to make. Firstly, there is an apparent size effect as large innovative service firms' experience lower growth. There is a productivity effect for innovative service firms which introduce incremental innovations. The investment in capital equipment for innovative service firms aids in increasing V.A.P.E. Innovative service firms which export are productive, but at home they experience lower sales and employment growth. These innovative service firms are investing in capital equipment, however currently abroad there is an interruption in growth. Possibly due to the business life cycle, older firms' experience less employment growth. Stand alone innovative service firms' experience more sales growth; perhaps they are more flexible regarding new and improved innovations. Regarding the type of offering, innovative service firms which offer customised offerings to individuals experience a negative productivity effect. A probable explanation may be that they are unable to gain economies of scale while customising their services and products for individual customers. Additionally, innovative service firms which offer standardised service and product experience less sales growth. This suggests a more strategic sales position for innovative service firms to offer either services or products tailored to specific customer groups and/or suitable for large customer groups.

There are several external linkages which significantly impact an innovative service firms' ability to experience higher performance. Innovative service firms which cooperate with strategic alliance or joint ventures experience more sales growth. Also, innovative service firms which hire consultants to initiate new developments increase their productivity. Innovative service firms which utilise their customers experience more sales and employment growth. Thus, from a growth perspective there is support for hypothesis four. An introduction of part D will follow.

Table 8.5 Service & Product Innovation (broad definition): Part C

Log	Model (a) V.A.P.E.	(b) Sales Growth	(c) Employment Growth
Constant	10.928***	2.740***	2.131***
	(0.447)	(0.398)	(0.412)
Internal Resource Indicators			
Employment	-0.000	-0.000**	-0.000***
	(0.000)	(0.000)	(0.000)
Employment Squared	0.000	0.000	0.000**
	(0.000)	(0.000)	(0.000)
Capital Intensity	0.000***	0.000	-0.000
	(0.000)	(0.000)	(0.000)
Exports	0.010*	-0.013**	-0.013**
	(0.006)	(0.006)	(0.006)
Workforce with Degree	-0.004	-0.005	-0.002
	(0.006)	(0.005)	(0.005)
Workforce with no Qualifications	-0.007	-0.012	0.000
	(0.008)	(0.009)	(0.009)
Other Service Firm Characteristics			
Firm Vintage	0.004	-0.004	-0.006*
	(0.005)	(0.004)	(0.004)
Business Type	0.508	0.500*	0.042
	(0.406)	(0.276)	(0.286)
Customised Offerings for Individuals	-0.710*	-0.178	-0.055
	(0.409)	(0.276)	(0.286)
Tailored Offerings for Groups	0.376	0.410	0.360
	(0.385)	(0.291)	(0.301)
Suitable for Large Customer Groups	-0.359	0.116	0.149
	(0.345)	(0.281)	(0.290)
Standardised	-0.225	-0.514*	-0.141
	(0.506)	(0.311)	(0.322)
Innovation and External Linkages			
Strategic Alliance or Joint Venture	-0.000	0.000**	0.000
	(0.000)	(0.000)	(0.000)
Suppliers	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)
Subsidiaries	-0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)
Customers	0.000	0.000***	0.000***
	(0.000)	(0.000)	(0.000)
Consultancy Firms	0.001**	-0.000	-0.000
	(0.000)	(0.000)	(0.000)
Competitors	0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)
Adj. R squared	0.0874	0.1718	0.1284
Breusch-Pagan chi-squared	41.51 (18)		
Durbin-Watson	1.81	1.85	2.11
Rho	0.0964	0.0743	-0.0551
Number of Observations	145	150	150

Notes: Standard Errors are in parentheses. Significant at *** 1%, **5%, *10%
Where Breusch-Pagan chi-squared is shown white-corrected covariance is used.

8.3.10 Customer Involvement: Service and Product Innovation

This section will concentrate on a new aspect for this entire analysis of service innovation. An investigation into the level of customer involvement for the main types of innovation and its impact on business performance will follow. As previously mentioned, a five-point Likert scale measured the level of involvement for each of the external links for each type of innovation. Respondents were asked to tick a five-point Likert scale for each of the six external linkages. So unlike the previous analysis, which concentrated on *how much* of the firm's new products or services came from suggestions or ideas from external links, this section examines the *extent* of the external links' involvement in the process of developing new services. The first area will address service and product innovation followed by organisational and technology driven innovations. Because the results for 'internal resource indicators' and 'other service firm characteristics' are similar to those of the previous tables, the analysis from this point will concentrate only on the effects of external linkages.

Linking with external co-operatives sometimes proves useful when introducing new and improved service and product offerings (see Table 8.6). For example, being highly involved with strategic alliances or joint ventures has a positive effect on growth. Tapping into the resources and gathering new ideas and suggestions from these co-operative partnerships benefits innovative service firms. Also, close involvement with consultants proves beneficial; in this case there is a positive effect on productivity. Regarding the customer-driven nature of innovative service firms, Table 8.6 shows that being highly involved with ones customers proves significant. In other words, innovative service firms which personally utilise their customer in innovations experience a positive effect on employment growth. The next section of part D follows the same format except organisational innovations will be analysed.

Table 8.6 Service & Product Innovation: Part D

Log	(a) V.A.P.E.	(b) Sales Growth	(c) Employment Growth
Constant	9.982***	1.978***	1.263*
	(0.719)	(0.669)	(0.681)
Internal Resource Indicators			
Employment	-0.000	-0.000**	-0.000*
	(0.000)	(0.000)	(0.000)
Employment Squared	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)
Capital Intensity	0.000***	-0.000	-0.000
	(0.000)	(0.000)	(0.000)
Exports	0.015*	-0.007	-0.006
	(0.009)	(0.006)	(0.006)
Workforce with Degree	-0.009	0.002	0.004
	(0.007)	(0.005)	(0.005)
Workforce with no Qualifications	-0.008	-0.001	0.013
	(0.007)	(0.009)	(0.009)
Other Service Firm Characteristics			
Firm Vintage	0.006	-0.005	-0.008**
	(0.006)	(0.004)	(0.004)
Business Type	1.003**	0.264	-0.292
	(0.489)	(0.301)	(0.307)
Customised Offerings for Individuals	-0.477	-0.173	-0.115
	(0.343)	(0.299)	(0.305)
Tailored Offerings for Groups	0.717**	0.170	0.115
	(0.377)	(0.319)	(0.325)
Suitable for Large Customer Groups	0.054	-0.095	0.046
	(0.352)	(0.297)	(0.302)
Standardised	-0.209	-0.635*	-0.420
	(0.438)	(0.342)	(0.348)
Innovation and External Linkages			
Level of Involvement with Strategic alliances or JVs	-0.034	0.351***	0.260**
	(0.182)	(0.110)	(0.112)
Level of Involvement with Suppliers	-0.032	-0.062	-0.052
	(0.152)	(0.110)	(0.112)
Level of Involvement with Subsidiaries	0.264	0.028	-0.051
	(0.178)	(0.125)	(0.127)
Level of Involvement with Customers	-0.081	0.170	0.292***
	(0.142)	(0.115)	(0.118)
Level of Involvement with Consultants	0.332*	-0.202	-0.189
	(0.190)	(0.128)	(0.130)
Level of Involvement with Competitors	0.014	0.021	0.002
	(0.154)	(0.111)	(0.113)
Adj. R squared	0.1271	0.2030	0.1652
Breusch-Pagan chi-squared	56.74 (18)		
Durbin-Watson	1.58	1.94	2.11
Rho	0.2113	0.0303	-0.0557
Number of Observations	126	131	131

Notes: Standard Errors are in parentheses. Significant at *** 1%, **5%, *10%
Where Breusch-Pagan chi-squared is shown white-corrected covariance is used.

8.3.11 Customer Involvement: Organisational Innovation

This segment of the analysis will specifically address innovative service firms which introduce organisational innovations. Again, due to the similarity in the analyses, only significant factors of the level of involvement with various external linkages will be discussed. Regarding organisational innovation and the involvement of several external linkages, there are significant factors impacting productivity (see Table 8.7). For example, there is a positive effect on V.A.P.E. for innovative service firms which allow for the involvement of subsidiaries and/or customers. Subsidiaries may share similar internal structures or culture, thus ideas are easily passed from one subsidiary to another. It could be that a common understanding of the inner workings enables a firm to prosper by way of productivity. As for innovative service firms which are highly involved with their customers, there is a positive effect on V.A.P.E. This finding is quite interesting as it seems unlikely that a service firms' customer would be able to aid in increasing productivity. One possible explanation for the role of customers in organisational innovations would be that customers are providing general suggestions which are elaborated on internally for effective change. On the other hand, there is a negative effect on V.A.P.E. when innovative service firms' involve suppliers in organisational innovations. This may be due to the internal nature of organisational innovations and/or trying to combine efforts. Differing corporate cultures of these partnerships may not enable organisational changes to take place so readily. Or the result of the involvement with suppliers may conversely impact productivity. However, it is not known if, possibly due to resistance to change internally, involving suppliers positively affects productivity in the long-run. The next section will introduce the findings of technological innovations for service firms which allow for involvement of external linkages.

Table 8.7 Organisational Innovation: Part D

Model

Log	(a) V.A.P.E.	(b) Sales Growth	(c) Employment Growth
Constant	8.420***	3.104***	2.605***
	(1.204)	(0.915)	(0.863)
Internal Resource Indicators			
Employment	-0.000	-0.000**	-0.000
	(0.000)	(0.000)	(0.000)
Employment Squared	0.000	0.000*	0.000
	(0.000)	(0.000)	(0.000)
Capital Intensity	0.000***	-0.000	-0.000***
	(0.000)	(0.000)	(0.000)
Exports	0.027***	-0.013	-0.012
	(0.009)	(0.009)	(0.009)
Workforce with Degree	0.002	0.002	0.001
	(0.011)	(0.007)	(0.007)
Workforce with no Qualifications	0.017	0.003	0.030
	(0.028)	(0.020)	(0.019)
Other Service Firm Characteristics			
Firm Vintage	-0.008	-0.007	-0.017**
	(0.012)	(0.008)	(0.007)
Business Type	1.011	-0.227	-0.483
	(0.884)	(0.480)	(0.453)
Customised Offerings for Individuals	-0.062	-0.070	0.044
	(0.574)	(0.431)	(0.407)
Tailored Offerings for Groups	1.743***	0.912*	1.003**
	(0.701)	(0.517)	(0.488)
Suitable for Large Customer Groups	-0.185	0.325	0.802*
	(0.460)	(0.524)	(0.494)
Standardised	1.670***	-0.319	-0.344
	(0.610)	(0.512)	(0.483)
Innovation and External Linkages			
Level of Involvement with Strategic alliances or JVs	-0.128	-0.032	-0.040
	(0.167)	(0.160)	(0.151)
Level of Involvement with Suppliers	-0.743**	-0.123	-0.323
	(0.357)	(0.226)	(0.213)
Level of Involvement with Subsidiaries	0.691**	0.012	0.150
	(0.346)	(0.230)	(0.217)
Level of Involvement with Customers	0.578**	0.092	-0.028
	(0.262)	(0.191)	(0.180)
Level of Involvement with Consultants	0.028	-0.042	0.093
	(0.218)	(0.155)	(0.146)
Level of Involvement with Competitors	-0.311	0.046	0.147
	(0.217)	(0.196)	(0.185)
Adj. R squared	0.1719	0.0920	0.1472
Breusch-Pagan chi-squared	38.98 (18)		
Durbin-Watson	1.95	1.89	1.95
Rho	0.0250	0.0550	0.0270
Number of Observations	68	71	71

Notes: Standard Errors are in parentheses. Significant at *** 1%, **5%, *10%
Where Breusch-Pagan chi-squared is shown white-corrected covariance is used.

8.3.12 Customer Involvement: Technological Innovation

This final aspect of part D will discuss innovative service firms which introduce technology driven innovations. The element of involvement of several external linkages will be the focus, specifically customers. Regarding technological innovations with involvement from external linkages, the only significant factor is subsidiaries (refer to Table 8.8). Those innovative service firms which are involved with their subsidiaries experience a positive effect on productivity. Utilising similar efficient techniques may increase V.A.P.E. It may be beneficial to be highly involved with subsidiaries for ideas. Again these firms are innovating by way of technology, thus participative arrangements may be needed and more common among these types of service firms. At the same time, these innovative service firms are experiencing a negative effect on both sales and employment growth. The lasting effect of this result of lower growth however is not known. Possibly there is a disruptive effect in the introduction of new and improved technological developments in the marketplace. Nevertheless, being highly involved with subsidiaries proves beneficial for increasing productivity; however, little growth is experienced for these innovative service firms. The final aspect of this analysis will concentrate on the modes of interaction specifically for service and product innovations.

Table 8.8 Technological Innovation: Part D

| | Model | | |
Log	(a) V.A.P.E.	(b) Sales Growth	(c) Employment Growth
Constant	9.846***	3.231***	2.669***
	(1.278)	(0.762)	(0.761)
Internal Resource Indicators			
Employment	-0.000	-0.000***	-0.000**
	(0.000)	(0.000)	(0.000)
Employment Squared	0.000	0.000**	0.000**
	(0.000)	(0.000)	(0.000)
Capital Intensity	0.000***	0.000	-0.000
	(0.000)	(0.000)	(0.000)
Exports	0.020***	-0.013	-0.013
	(0.008)	(0.008)	(0.008)
Workforce with Degree	-0.003	0.000	0.005
	(0.007)	(0.006)	(0.006)
Workforce with no Qualifications	0.006	0.006	0.020
	(0.012)	(0.017)	(0.016)
Other Service Firm Characteristics			
Firm Vintage	0.002	-0.001	-0.006
	(0.007)	(0.005)	(0.005)
Business Type	0.512	0.139	-0.141
	(0.483)	(0.338)	(0.338)
Customised Offerings for Individuals	-0.451	0.057	0.079
	(0.405)	(0.349)	(0.349)
Tailored Offerings for Groups	0.446	0.074	0.151
	(0.481)	(0.363)	(0.362)
Suitable for Large Customer Groups	-0.139	0.155	0.513
	(0.361)	(0.391)	(0.390)
Standardised	0.302	-0.518	-0.393
	(0.571)	(0.404)	(0.403)
Innovation and External Linkages			
Level of Involvement with Strategic alliances or JVs	-0.180	0.183	0.186
	(0.235)	(0.119)	(0.119)
Level of Involvement with Suppliers	0.113	-0.168	-0.102
	(0.234)	(0.151)	(0.151)
Level of Involvement with Subsidiaries	0.324*	-0.221*	-0.245*
	(0.185)	(0.134)	(0.134)
Level of Involvement with Customers	-0.020	0.121	0.049
	(0.196)	(0.124)	(0.124)
Level of Involvement with Consultants	0.045	-0.009	-0.004
	(0.191)	(0.133)	(0.133)
Level of Involvement with Competitors	-0.056	-0.169	-0.179
	(0.179)	(0.140)	(0.140)
Adj. R squared	-0.0247	0.1450	0.1533
Breusch-Pagan chi-squared	90.21 (18)		
Durbin-Watson	2.10	1.87	1.85
Rho	-0.0478	0.0628	0.0758
Number of Observations	97	100	100

Notes: Standard Errors are in parentheses. Significant at *** 1%, **5%, *10%
Where Breusch-Pagan chi-squared is shown white-corrected covariance is used.

8.3.13 Modes of Interaction for Service and Product Innovation

This section, part E, will incorporate a portion of the questionnaire which enquires into the modes of interaction with customers for service and product innovation. This section of the analysis is therefore restricted to those respondents which had customer involvement in innovation, and is concerned with the nature rather than the extent of the involvement. Several modes were available to enquire into the nature of the involvement such as: formal or informal, ad hoc, focus groups, marketing or customer information, and working with lead customers. Simple dummy variables are used to indicate the nature of the involvement with customers (refer to Table 8.9).

There is no significance for those innovative service firms which interact, either informally or formally, with their customer. Other research differs as service firms' engaged in collaborative arrangements for innovation report formal collaborations with customers were not very common, but informal interactions were frequent (Tether, 2003). Again, Fritsch and Lukas (2001) found 52.6 per cent of firms' engaged in 'casual contact for information purposes' meanwhile 40 per cent did organise an exchange of information and experiences.

Not surprisingly, there is a positive effect on sales growth for innovative service firms which take part in ad hoc involvement with customers on new products and services. Maybe due to the interactive nature of services ad hoc relationships are significant. Possibly there exists some sort of guarantee of sale when innovative service firms work spontaneously with their customer. Working jointly allows for needed adjustments and changes to be made to the offering in order to satisfy the customer. Along the innovative process, the customer is requesting changes and/or suggestions to fit their unique needs.

Also, conducting focus groups has a positive effect on productivity for innovative service firms. In marketing research, focus groups are remarked for their advantages, such as their ability to provide in-depth information via group interaction, stimulate creative concepts, diagnosing potential problems, and generating customer impressions. Thus, gathering valuable first-hand information from focus groups can impact a service firms' productivity. Perhaps the way in which the service and product is offered can be made more efficient with direct input from focus group participants. With that said, the main benefit of conducting focus groups is that in-depth information can be gathered as further probing is accessible. Fritsch and Lukas (2001) report 44 per cent of firms involving customers in cooperative planning and operation of projects, meanwhile 32.2 per cent used customers for a pilot use of an innovation.

Also impacting V.A.P.E. is customer and marketing information. However, in this case utilising customer and marketing information has a negative effect on productivity. Marketing research is prevalent, so 'it might be incorrectly evaluated or possibly it is outdated information. The marketplace is continuously changing, thus customer and marketing information should be gathered regularly. Updated customer information is valuable as it aids in strategic decision making. Or the case may be innovations are introduced based upon customer and marketing information and there is a lag in production. The case may be that employees take time to adapt to the service offering and thus a negative effect on productivity. Overall conclusions for hypothesis four will be necessary for this analysis.

Table 8.9 Service & Product Innovation: Part E

Log	(a) V.A.P.E.	(b) Sales Growth	(c) Employment Growth
Constant	10.570***	2.908***	1.723***
	(0.686)	(0.587)	(0.565)
Internal Resource Indicators			
Employment	-0.000	-0.000**	-0.000***
	(0.000)	(0.000)	(0.000)
Employment Squared	0.000	0.000*	0.000***
	(0.000)	(0.000)	(0.000)
Capital Intensity	0.000***	0.000	-0.000
	(0.000)	(0.000)	(0.000)
Exports	0.009	-0.009	-0.008
	(0.007)	(0.006)	(0.006)
Workforce with Degree	-0.001	-0.003	-0.001
	(0.008)	(0.005)	(0.005)
Workforce with no Qualifications	-0.006	-0.002	0.010
	(0.007)	(0.010)	(0.009)
Other Service Firm Characteristics			
Firm Vintage	0.004	-0.002	-0.003
	(0.005)	(0.004)	(0.004)
Business Type	0.392	0.222	-0.009
	(0.477)	(0.309)	(0.298)
Customised Offerings for Individuals	-0.576	-0.313	-0.155
	(0.413)	(0.303)	(0.291)
Tailored Offerings for Groups	0.186	0.458	0.186
	(0.366)	(0.323)	(0.311)
Suitable for Large Customer Groups	-0.650*	0.043	0.068
	(0.404)	(0.320)	(0.309)
Standardised	-0.043	-0.644**	-0.368
	(0.437)	(0.335)	(0.323)
Modes of Interaction for Innovation			
Formal Interaction	0.671	0.026	0.021
	(0.560)	(0.338)	(0.326)
Informal Interaction	0.738	-0.141	0.251
	(0.496)	(0.433)	(0.417)
Ad hoc	-0.286	0.500*	0.462
	(0.416)	(0.308)	(0.297)
Focus Groups	0.635*	0.034	0.232
	(0.404)	(0.342)	(0.330)
Marketing & Customer Information	-0.636*	-0.081	-0.281
	(0.386)	(0.298)	(0.287)
Working with Lead Customers	-0.389	0.227	0.440
	(0.410)	(0.332)	(0.319)
Adj. R squared	0.0890	0.1004	0.1105
Breusch-Pagan chi-squared	53.13 (18)		
Durbin-Watson	1.97	1.90	2.26
Rho	0.0151	0.0493	-0.1277
Number of Observations	125	130	130

Notes: Standard Errors are in parentheses. Significant at *** 1%, **5%, *10%
Where Breusch-Pagan chi-squared is shown white-corrected covariance is used.

8.4 Overall Conclusions for Hypothesis Four

This entire analysis of hypothesis four enquired into the impact of innovation on service firm performance. Two groups of innovators were of interest, those that are customer-driven and those that are not. Various types of innovation and modes of interaction were individually analysed in order to better understand if any differences do exist among innovators. Overall conclusions will be vital to make. Firstly, in every case there is a negative growth effect for large innovative service firms. Consistently innovative service firms which invest in capital equipment for their employees experience higher productivity. At the same time, organisational innovative service firms, which invest in capital intensity, experience less employment growth. Exporting innovative service firms are more productive, but they experience less growth overall. The education level or lack there of for innovative service firms' workforce is not significant in any of these analyses. Older innovative service firms' experience less employment growth. Just because a service firm is innovative does not mean that it will experience growth effects. However, innovative service firms which are stand alone experience more sales growth. Stand alone service firms which introduce service and product innovations experience higher productivity.

The main type of service and products supplied is significant. For example, innovative service firms which offer customised service and product experience less productivity. Innovative service firms which tailor their offerings for groups experience more growth and productivity. Also, organisationally innovative service firms which provide service and products suitable for large customer groups experience higher employment growth (see part D). Similarly, under the analysis for modes of interaction these innovative service firms' experience less productivity. Lastly, innovative service firms which offer standardised service and product experience less sales growth, but enjoy higher productivity.

Regarding innovation and external linkages, there were quite a few significant findings. Although, hypothesis four is specifically addressing customer-driven innovative service firms other external linkages prove significant. For example, innovative service firms which engage in strategic alliance or joint ventures experience positive growth effects. Utilising suppliers results in lower sales growth and lower productivity. Subsidiaries benefit innovative service firms by helping to increase their productivity; however, for involvement in technological innovations there is negative growth. Next, consistently, consultancy firms positively impact innovative service firms by aiding in increasing productivity. Only organisationally innovative service firms which involve competitors in their innovations experience higher employment growth. Lastly, specific to hypothesis four is the role of the

customer. There is support for innovative service firms which utilise their customer for innovations experience more growth. Additionally, customer-driven innovative service firms, which introduce technologically driven innovations, experience higher productivity. Further analysis into the level of involvement shows higher productivity for innovative service firms which involve their customer for innovations. Thus, customer-driven service firms experience positive effects on business performance. The final analysis into the modes of interaction for customer-driven innovative service firms offers support for ad hoc innovations. As a consequence, innovative service firms which partake in ad hoc innovations experience higher sales growth. Additionally, innovative service firms which participate in focus groups experience higher productivity. On the other hand, innovative service firms which use marketing and customer information for innovations experience lower productivity. Overall, lessons concerning the nature and extent of involvement of external linkages prove the importance of service firms being open and flexible to new ideas and/or suggestions regardless of where they stem from. Service firms having such qualities enable performance benefits. Concluding the analysis of hypothesis four, there is support for customer-driven innovative service firms as better performance is uncovered. Refer to the summary tables to grasp an overall understanding of the significant variables for the different aspects of this chapter (Tables 8.10, 8.11, 8.12, and 8.13).

Table 8.10 Summary of Key Results

Performance Factors for S&P Customer-driven Innovators v. Innovators

	S&P			Organisational			Technological		
	V.A.P.E	Sales Growth	Employment Growth	V.A.P.E	Sales Growth	Employment Growth	V.A.P.E	Sales Growth	Employment Growth
Internal Resource Indicators									
Employment		--	--	--	--	--		--	--
Employment Squared		+	++	++	++	++		+	++
Capital Intensity	++			++		-	++		
Exports	++	-	--	+			+	--	--
Workforce with Degree									
Workforce with no qualifications									
Other Service Firm Characteristics									
Firm Vintage			-						-
Business Type	-	+							
Customised Offerings for Individuals									
Tailored Offerings for Groups					+				
Suitable for Large Customer Groups									
Standardised		-		++					
External Linkages									
Strategic Alliance or Joint Venture		++	+			+		++	++
Suppliers									
Subsidiaries				++					
Customers		++	++	++			++	+	
Consultancy Firms	+						++		
Competitors						+			

Notes: ++ positively significant at 0.05 or 0.01, + positively significant at 0.1, -- negatively significant at 0.05 or 0.01, - negatively significant at 0.1

Table 8.11 Summary of Key Results

	Performance Factors for New-to-Market S&P Customer-driven Innovators v. Innovators			Performance Factors for S&P Customer-driven Innovators v. Innovators (broad definition)		
	V.A.P.E	Sales Growth	Employment Growth	V.A.P.E	Sales Growth	Employment Growth
Internal Resource Indicators						
Employment		--	--		--	--
Employment Squared	++	+	++			++
Capital Intensity	++			++		
Exports	++	--	-	+	--	--
Workforce with Degree						
Workforce with no qualifications						
Other Service Firm Characteristics						
Firm Vintage			+			-
Business Type		+			+	
Customised Offerings for Individuals				-		
Tailored Offerings for Groups						
Suitable for Large Customer Groups						
Standardised		-			-	
External Linkages						
SA/JV (New-to-Market)		++				
Suppliers (New-to-Market)		--				
Subsidiaries (New-to-Market)						
Customers (New-to-Market)		++	++			
Consultancy Firms (New-to-Market)	++					
Competitors (New-to-Market)						
SA/JV (New and Improved)					++	
Suppliers (New and Improved)						
Subsidiaries (New and Improved)						
Customers (New and Improved)				++	++	++
Consultancy Firms (New and Improved)						
Competitors (New and Improved)						

Notes: ++ positively significant at 0.05 or 0.01, + positively significant at 0.1, -- negatively significant at 0.05 or 0.01, - negatively significant at 0.1

Table 8.12 Summary of Key Results

Performance Factors for Customer-driven Innovators v. Innovators
(broad definition)

	S&P			Organisational			Technological		
	V.A.P.E	Sales Growth	Employment Growth	V.A.P.E	Sales Growth	Employment Growth	V.A.P.E	Sales Growth	Employment Growth
Internal Resource Indicators									
Employment		--	-		--			--	--
Employment Squared					+			++	++
Capital Intensity	++			++		--	++		
Exports	+			++			++		
Workforce with Degree									
Workforce with no qualifications									
Other Service Firm Characteristics									
Firm Vintage			--			--			
Business Type	++								
Customised Offerings for Individuals									
Tailored Offerings for Groups	++			++	+	++			
Suitable for Large Customer Groups				++					
Standardised		-							
External Linkages									
Level of Involvement with SA/JV		++	++						
Level of Involvement with Suppliers				--					
Level of Involvement with Subsidiaries				++			+		
Level of Involvement with Customers			++	++					
Level of Involvement with Consultants	+							-	-
Level of Involvement with Competitors									

Notes: ++ positively significant at 0.05 or 0.01, + positively significant at 0.1, -- negatively significant at 0.05 or 0.01, - negatively significant at 0.1

Table 8.13 Summary of Key Results

Performance Factors for S&P Customer-driven Innovators v. Innovators (broad definition)

	V.A.P.E	Sales Growth	Employment Growth
Internal Resource Indicators			
Employment		--	--
Employment Squared		+	++
Capital Intensity	++		
Exports			
Workforce with Degree			
Workforce with no qualifications			
Other Service Firm Characteristics			
Firm Vintage			
Business Type			
Customised Offerings for Individuals			
Tailored Offerings for Groups			
Suitable for Large Customer Groups	-		
Standardised		--	
Modes of Interaction for Innovation			
Formal Interaction			
Informal Interaction			
Ad hoc		+	
Focus Groups	+		
Marketing & Customer Information	-		
Working with Lead Customers			

Notes: ++ positively significant at 0.05 or 0.01, + positively significant at 0.1, -- negatively significant at 0.05 or 0.01, - negatively significant at 0.1

Overall Conclusions

9.1 Introduction

The aim of this research was to provide guidance for management of business service firms to improve the likelihood and extent of innovation, with regard to harnessing the potential role of the customer to increase business performance. It is important to specify where and how the findings from this analysis contribute to existing knowledge. It is the intention of undertaking research to serve the purpose of adding something of value to the body of accumulated knowledge. Tether (2003) states the extensiveness of services, in conjunction with the diversity of their innovation activities, means it is difficult to generalise about what findings to expect from empirical research. Thus, this chapter will attempt to draw overall conclusions regarding the findings from this entire research.

To begin, addressing where this research ties in a broad scheme, the obvious place is among the realm of innovation research. More specifically, under a synthesis approach, service innovation is of particular interest. A more dynamic approach to the service firm/customer relationship was of importance and insufficient research exists, thus the role of the customer for innovation was ultimately of interest. However, generalisations may be made from these findings for not only service innovation but innovation in general. It will be important to recap the chapters comprising this thesis prior to the final conclusions and contribution to knowledge.

The structure of this thesis commenced with a concise review of the literature which attempted to bring together relevant innovation research, consequently the conceptual framework for this research was presented. In chapter three, research methods were explained along with a glimpse into the data by means of descriptive statistics. A uni-variate analysis was provided in chapter four which highlighted initial findings. Furthermore, chapter five addressed the determinants of innovation which applied to hypothesis 1a and 1b. The next analyses encapsulated the impact of innovation on performance which was presented in chapters six, seven, and eight. For service firms, the performance factors involved the level of sales and employment growth in addition to productivity. As for the overall conclusions, a review of the research methods presented in chapter three will follow.

9.2 Research Methods

Under a positivist approach, quantitative methods were utilised by means of a self-administered postal questionnaire in order to quantify phenomenon and generalise reality. Primary data was collected from U.S. business service firms in order to provide generalisations regarding their responses. In particular, business service firms were obtained from the Dunn & Bradstreet database and were selected for participation. After pre-testing and pilot testing, 3,140 questionnaires were mailed and 206 useable responses were received equating to a response rate of 6.56 per cent. The questionnaire had validity in that it measured what it is intended to measure while providing correct information (Litwin, 1995). No sectoral bias was found concerning the Dunn & Bradstreet database and the responses to the questionnaire. Statistical techniques such as uni-variate regression, probit and tobit with truncation analysis were utilised to enhance understanding of the likelihood and extent of innovation. In later analyses, OLS regression models were utilised in order to better understand which factors were relevant to innovation's impact on business performance. The next section will discuss only the significant findings for this analysis.

9.3 Empirical Chapters

Once more, essentially the analysis chapters comprised two aspects: the determinants of innovation and the impact of innovation on performance. It was by means of several hypotheses that the following important conclusions will derive. Generalisations draw from the results of the previous hypotheses discussed in earlier chapters. Again there were essentially five different hypotheses each uniquely developed in order to obtain a deeper understanding of service firms. Specifically, comparisons were made in order to differentiate between innovative and non-innovative service firms. Supplementary in-depth analyses were also made in an attempt to better realise if any differences exist between those service firms which categorised themselves as innovators. The structure will naturally follow a synthesis approach by devising findings for each of the three major types of innovation. Specifically addressing the findings for this thesis' hypotheses refer to Table 9.1 for an immediate recap. Firstly, the determinants of innovation will be addressed followed by the impact of innovation on performance.

Table 9.1 Conclusions for the Hypotheses

Hypothesis		Type of Innovation	Individualised Innovative	Richness of Innovation
Hypothesis 1a	Service firms that are customer-driven in innovation will be more innovative than other service firms.	S&P Organisational Technological	Supported Not Supported Not Supported	Supported *Not Applicable* *Not Applicable*
Hypothesis 1b	Service firms that harness customer-driven innovation will be more innovative than service firms who innovate without the aid of customer input.	S&P Organisational Technological	Not Supported Not Supported Not Supported	Not Supported *Not Applicable* *Not Applicable*
			Productivity	**Growth**
Hypothesis 2	Service firms that harness innovation will perform better than non-innovating service firms.	S&P Organisational Technological	Not Suppor... Not Supported Not Supported	...ed ...ed ...ed
Hypothesis 3	Service firms that harness customer-driven innovation will perform be... than non-innovating service firms.	S&P Organisational Technological	Not Supported Supported Not Supported	Supported Supported Supported
Hypothesis 4	Service firms that are customer-driven in regards to innovation will perform better than other service firms that innovate.	S&P Organisational Technological	Not Supported Supported Supported	Supported Not Supported Supported

The c... ...ation were of interest with aim of addressing hypothesis 1a a... ...hesis 1... ...quirin... service firm... ...rms. ... in that it sp... ...r-d... ...ive servic... ...r... s to th... ...o ir... ...r conc... i... ...

9.4.1 ...vice & Product Innovation

...of j... ...extent o... H...er, what di... ...make these research findings ...ferent are the... ...ries. For exam... ...strong... ...those... ...&D, not the... y. This is r... ...signs... ...o... ...rvice sector although the exact nature of this p... ...on... is unknown, but what i... ...nt is the

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use of R&D for innovative service firms. Nevertheless, what is apparent here is the lack of importance for the amount of R&D service firms participate in. As for the likelihood of a service firm introducing service and product innovation, formal R&D displays a positive effect. Interestingly, both formal and informal R&D contributes to the extent of innovation for a service firm when introducing service and product innovations. Perhaps the nature of services by design initiates informal R&D especially if the offering is non-technological. What is important to note is the function of R&D in service firms positively affecting the likelihood and extent of service and product innovation. Thus, it may no longer be reasonable to assume R&D is just a function of manufacturing firms.

The next area worth readdressing is the fundamental aspect of this thesis, the role of external linkages for service and product innovation, in particular customers. Linking by means of a strategic alliance or joint venture proves significant. Again, these findings are parallel to Caloghirou et al. (2002) research stating participation in collaborations is indicative of an ability for interactive knowledge sharing that may prove very beneficial for further exploitation of knowledge and thus inter-firm linkages seem to promote innovativeness. Alliances or ventures seem a plausible avenue for generating innovative ideas and are recommended for service firms.

Next, a service firm linking with ones' customer aids in the likelihood of introducing service and product innovation. The benefit presents itself to the innovative firm by positively affecting the chance of service and product innovation. Cooper (1994) also reports having a quality relationship with customers provides valuable information to new product developments for services. It is not surprising the positive impact one's customer can have on the likelihood and extent of service and product innovations (including new-to-market and new and improved) as customers are nonetheless aware of what attributes are preferred. Depending on the means implored by a service firm, their customers ultimately are a low cost source to gather these ideas and/or suggestions as they are essentially the purchasers and users of the offering. It is not uncommon for a service firm's client to initiate and stimulate innovations and oftentimes customer participation is a necessary condition for success (Preissl, 2000). It would seem inept to introduce service and product innovations without understanding the end users' preferences. In short, external linkages do aid in service and product innovations.

9.4.2 Determinants of Organisational Innovation

Again there are numerous variables affixed in the analyses of chapter five, but at this stage of the thesis it will be vital to address the most unique findings. For example, for a service firm, regarding the likelihood of organisational innovation participating in R&D is not an important factor. Moving on to external linkages, none prove to significantly influence the likelihood of introducing organisational innovations. Possibly the internal nature of organisational innovations automatically excludes external links. It is suggested that organisational innovations derive from inside the service firm stemming from any department per the strategic innovation paradigm. In other words, external linkages do not influence a service firms' likelihood of organisational innovations. As for the extent of innovation, due to the structure of the survey instrument, only service and product innovations were capable of this further analysis.

9.4.3 Determinants of Technological Innovation

Strictly addressing pertinent findings concerning the likelihood of technological innovations surprisingly show that none of the R&D variables are significant. This is interesting because one would assume technological innovations require R&D; however, in this case the analysis is addressing only the likelihood of technological innovation. Additionally, external linkages do not offer any influence toward the likelihood of technological innovations. However, in later conclusions the effect of technological innovations on service firm performance will present significant findings regarding external linkages.

9.5 The Impact of Innovation on Performance

The remaining chapters were addressing the impact of innovation on service firm performance. This section will combine the findings for the three remaining hypotheses in order to concentrate on the bigger picture of what these findings mean. In brief, hypothesis two was concerned with innovators and non-innovators. Again, hypothesis three was looking for differences among innovative customer-driven service firms and non-innovating service firms. On the other hand, hypothesis four grouped together all innovators and then, for comparison purposes, isolated customer-driven innovative service firms. Hagedoorn and Cloodt (2003) claim there appears to be a lack of clear understanding of the concept and measurement of innovative performance. Nevertheless, the performance measures included a productivity measure in addition to growth measures. The reasons as to why these performance

measurements were utilised are in the literature review and chapter six. Conclusions will follow which attempt to shed light on which innovative factors impact business performance beginning with service and product innovation.

9.5.1 The Impact of Service & Product Innovation on Performance

The next area will discuss the specifics of being customer-driven as this is the cornerstone of this research. Undisputedly, the overall findings for this research express numerous benefits for customer-driven innovative service firms. In every circumstance of this analysis, the customer positively benefited the innovative service firm. Regardless of whether the innovation was classified as new-to-market or by a broader scope, the end result did not differ as the customer proves significant in both cases. Specific findings provide evidence that customer-driven service firms do present the propensity to experience an increase in performance, especially in regard employment and sales growth. Customers may nevertheless be a no cost source of insight to a service firm that might have ordinarily been overlooked. Customers are important sources of information and can also contribute more actively to the innovation process (Sundbo and Gallouj, 2000). It is advisable for a service firm to look outward for ideas and suggestions in order to increase performance. A service firm being in touch with their end-users seems obvious, but there are specific levels of involvement that should be noted.

Again, in an attempt to investigate the role of linkages more thoroughly respondents ranked their level of involvement for each of the types of innovation. It is important to be highly involved with strategic alliance or joint ventures for service and product innovation. This is expected as meaningful and ongoing communications are important for alliances or ventures. There seems to be an understood commitment when partaking in these avenues for innovation.

Continuing with the specific aspects of this analysis will entail the modes of interaction with ones' customer. It is via informal or formal modes of communication that service innovation can ultimately be created. The close interaction between service provider and customer participation comes in various forms while creating service innovation. Maidique and Zirger (1984) state informal, continual, and in-depth contact with leading customers throughout the development process are factors for success. Not surprisingly, further analysis into the modes of interaction with ones' customer shows a benefit of ad hoc customer contact for generating innovations. As a consequence, innovative service firms which partake in ad hoc customer contact

experience higher sales growth. Palpably the interaction with the service firm and the customer is an important locus in which innovation is created and implemented. Thus, the client plays an active role along this mode of innovation, the steps shows that production, selling, and innovation take place simultaneously or are merged (Sundbo and Gallouj, 2000). Possibly there exists a guarantee of sale when innovative service firms work spontaneously with their customer. Working jointly allows for specific adjustments and changes to be made to the offering in order to satisfy the customers' unique needs. Thus, if the service offering is suitable for ad hoc developments they are highly recommended.

Additionally, innovative service firms which participate in focus groups for service and product innovations experience higher productivity. Therefore, due to the ability to extrapolate valuable in-depth information from focus groups, it is suggested that the vast benefits of focus groups makes them worthwhile.

Alternatively, innovative service firms should use marketing and customer information for innovations but carefully. Marketing research is prevalent, thus ensuring that strategic decisions stem from updated and pertinent customer information is imperative for service firms. Or perhaps there is a lag in production of these new service and product innovations, stemming from customer ideas and/or marketing information. The case may be that employees take time to adapt to the new service offering and thus a negative effect on productivity. Nevertheless, it proves useful to base strategic decisions, especially in regard to innovations, on either pre-existing or primary relevant information.

9.5.2 The Impact of Organisational Innovation on Performance

It is apparent organisationally innovative service firms are experiencing both sales and employment growth. This growth is due in part to external linkages, for example, strategic alliance or joint ventures do aid in sales and employment growth. Also, a service firm linking with their customers impacts sales growth. As mentioned previously, customers are the purchasers of the service offering and when satisfied, this should impact firms' sales. Moreover, service firms linking with competitors' effects employment growth. Obviously competitors are in the same field perhaps providing the same service offering, thus any ideas or suggestions stemming from them may result in growth. Therefore, if impacting service firm growth is a priority, external linkages are essential.

Additionally, utilising either subsidiaries and/or customers positively impacts productivity. Perhaps there is a delivery method that could be made more efficient therefore increasing productivity. In essence it is important to use outside sources even for organisational innovations as oftentimes the obvious is not visible.

Service firms that are highly involved with their customers experience higher productivity. Again, customers are users of the service offering and should not only be queried regularly but also understood. Furthermore, results from service firms being highly involved with suppliers for organisational innovations show a negative effect on productivity. Conversely, overall suppliers may be able to provide invaluable information and thus it is not suggested that service firms not link with their suppliers. However, allowing ample time for the organisational innovations to successfully take place seems important to service firms as employees are often initially resistant to change within the firm. Perhaps, this negative effect may be due to the internal nature of organisational innovations and/or differing corporate cultures of these partnerships. As Meyer-Krahmer and Reger (1999) state the importance of informal instruments and the formation of a corporate culture are often underestimated in innovation. Thus, it is suggested to not only allow for external linkages for organisational innovations, but to intensely be involved with them.

9.5.3 The Impact of Technological Innovation on Performance

For technological innovation there is positive employment and sales growth effects. There is however some evidence of a disruptive effect regarding technological innovations as lower productivity levels is found. However, it is suggested that this disruption effect will most probably be experienced in the short term for these innovative service firms. In other words, being innovative helps service firms grow, but not more productive at least in the short-term. On the other hand, previous research has reported a positive relationship between innovation and productivity (Conceição et al., 2003; Mairesse and Mohnen, 2003). Thus, it is suggested for service firms to continue with technological initiatives despite initially lower productivity levels.

As for involving external linkages, the findings show that linking with strategic alliance or joint ventures positively impacts both sales and employment growth. Additionally, a customer-driven innovative service firm can enjoy positive sales growth and productivity when introducing technological innovations. Kandampully (2002) states that among other networks, internal and external

customers have become an essential perquisite to achieve the capabilities and knowledge required to serve the needs of customers. So, not only are alliance or ventures and customers recommended for linking with, but consultancy firms prove to aid in increasing productivity.

Innovative service firms which are highly involved with subsidiaries are experiencing a negative effect on both sales and employment growth. Again there may be a disruptive effect in the introduction of new or improved technological developments in the marketplace; again it is suggested to be short-term. Nevertheless, the findings also show being highly involved with subsidiaries, for technological innovations, proves beneficial for increasing productivity.

Overall it is apparent, from a performance standpoint, regardless of the type of innovation, innovative service firms do perform better than non-innovators (see chapter six). Therefore it would behove a service firm to actively partake in innovative efforts. Based upon the performance findings for the three types of innovation, it is apparent that the impact of linking and being highly involved with external sources proves beneficial for service firms. These findings nevertheless show the numerous benefits that can stem from linkages. The next section will offer recommendations for management of service firms.

9.6 Recommendations for Management

It is undoubtedly useful to interpret empirical research for practical use in the business realm. Important to take into consideration is that these recommendations are not exclusively for business service firms or service firms, it is suggested that these findings are expandable across all types of firms. Thus, below you will find several recommendations for management which have derived from the findings for this research.

To begin, service firms should not overlook the importance of both informal and formal R&D. This is a significant recommendation as other research underestimates the role of R&D in services. Innovation is largely understood from a manufacturing point of view, but this need not interfere in advancing service innovation. For U.S. services' participating in R&D is important, thus signifying a more practical approach to service innovation than previously thought. Even initiating informal R&D within your firm will possibly ignite future innovations.

Next, it appears imperative for service firms to understand the benefits sought then seek external linkages for innovation. Gathering a perception of what your firm

expects from the link could alleviate any issues in the exchange process. Due to the probable benefits, it would appear worthwhile to engage in a cooperative relationship which is long lasting. This recommendation is evident from the findings from being highly involved with external linkages (see chapter eight). Nevertheless, forging relations with external linkages involves many elements which enable an advantageous exchange of ideas and/or suggestions for innovation. Trust is an obvious aspect of any relationship particularly when valuable knowledge is being shared. Allowing ample time for trust-based relationships to develop may allow a freer exchange of initiatives for innovation. Not to mention, as a result of the linkage, your firm might gain access to the linking firms' existing customers. Thus, clearly understanding the purpose of the external linkage may well be the first step towards innovation.

Furthermore, it is vital to engage in external linkages, especially with your customers, for innovations. Perhaps less formalised than mentioned previously, it is imperative to harness open communication with your customers. Customers can be an inexpensive means to generate ideas and/or suggestion for innovative efforts. Be careful not to overlook the importance of your customers, thus provide interactive means to involve your customers in the innovation process. For example, the field service employees have direct contact with customers and can also facilitate propositions for innovation. Customers are nonetheless users and purchasers of your service offering and should be queried frequently. Lastly, stay attuned to your customers changing needs and proactively adapt your service and product accordingly (via improved innovations). New-to-market innovations are important, but they too will serve as the foundation for further improvements for your firms' service and product offerings. In other words, innovation is an ongoing process involving constant fostering and attention.

In short, do not overlook the importance of both formal and informal R&D. Next, be insightful as to why your firm is seeking external linkages. Lastly, involve your customers, in addition to other external linkages, in the innovation process through reciprocal communications. The final section will offer a closing for this thesis.

9.7 Final Conclusions & Contribution to Knowledge

In conclusion, this research was unique because it delved into U.S. business service firms hence providing interesting and helpful information regarding numerous

factors involved in innovation. As previously mentioned, the findings fill a gap in existing research which is exceedingly European-driven. The role of ones customer for service firms' innovative efforts is paramount as much research has not been conducted prior. Consequently, the term customer-driven with regard to innovation was analysed for further understanding of their potential role. Initially the determinants of innovation were of interest which was followed by the impact of innovation on performance. Findings undisputedly show that customer-driven service firms' experience productivity and growth. Additionally, the results show that external linkages may well serve as the gateway towards these successes. That is to say that by allowing for open communications, either direct or indirect, can assist in increasing the productivity and/or growth of a service firm. Of course, forgoing any linkage without full understanding of what advantage is sought may prove troublesome. Also, the time it takes to forge beneficial relationships was not researched but is nonetheless an important aspect to consider. Lastly, relying on linkages for innovation alone does not insure that a service firm will experience growth or performance effects as other factors do play a role. Overall lessons concerning the nature and extent of involvement of external linkages, especially the customer, prove imperative for innovative service firms.

It is essential to look back at the fundamental aspects of the conceptual framework for this research. Once more, the diagram (refer back to page 51) represented a synthesis approach under the strategic innovation paradigm proposed by Sundbo (1997). Unlike the technology-economic paradigm which is most adequate for explaining technological innovations and the entrepreneur paradigm which one-dimensionally emphases the entrepreneurial act as the core innovation process, the strategic innovation paradigm incorporates the firm's strategy as the core innovation determinant. Although SMEs were also of interest for the initial stage of this research, the strategic innovation paradigm is relevant as essentially the characteristics of these firms are important, not size. Nevertheless, a more tactical approach does seem appropriate for studying innovative efforts of all firms. Therefore imploring the strategic innovation paradigm is justified for this research.

Coinciding with the paradigm utilised for this research, the synthesis approach is also applicable due to its ability to include all major forms of innovation. Furthermore, a synthesis approach consisting of manufacturing and service firms' also applying technological and non-technological innovation is appropriate. As noted

above it was imperative to explore all major forms of innovation within the U.S. business service sector, albeit both the strategic innovation paradigm and the synthesis approach are applicable to all innovation studies. Not to mention the proposition of remaining true to Schumpeter's (1934) definition of innovation as it was considered broad enough to include service and manufacturing innovations (see Drejer, 2004).

The distinguishing features of services in addition to the convergence of manufacturing and services are important aspects. Once more, under the strategic innovation paradigm, an attribute of top strategic organisations involves the tendency to modularise the service offering. It was under the assimilation approach (see chapter two) that this term was elaborated upon. Preissl (2000) claims modularisation appears to be an important trend with specific implications for the direction of innovation efforts. Based on the findings for this research, it appears service innovation may be more similar to manufacturing firms than has previously been recognised. As interestingly both formal and informal R&D was found to be important for service firms; with informal R&D being principally important for the introduction of services which are new to the firm or improvements on offered services.

With that said, fundamentally an assimilation approach, allowing for these issues mentioned above, could have been used for this research. It does however appear essential to take a conceptually solid view on innovation. This is due to the underlying fact that although signs of modularisation exist within the service sector, ample evidence does not show this phenomenon is extensive, thus it seems imperative to conduct research under a synthesis approach. Again, a major weakness of the assimilation method is that it offers a narrow perception of innovation, especially with regard to technological innovation (Coombs and Miles, 2000; Djellal and Gallouj, 2000; Drejer, 2004). The primary purpose of this research was not to exclude technological innovation or to assume service firms do not introduce technological innovations. Hence, for numerous reasons applying a synthesis approach under the strategic innovation paradigm is relevant. Also, the use of Schumpeter's (1934) definition of innovation is still applicable for innovation studies. In short, the conceptual framework is justified not only for the purpose of this particular research, but it may well be reapplied in future contexts.

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Appendices

1987 SIC	1987 U.S. SIC Description	2002 NAICS	2002 NAICS U.S. Description
73	B...... services		
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	Except quick printing	56143(C...... .... C...... ......)	
7335	Commercial Photo......		
	....	481219 C...... ...... ir	
	....	541922 Commerci... ...phy (part)	
	....		
......	C......	541430 C...., ...	
73..	Secretarial and ....,		

	Secretarial services	561410	Document Preparation Services (part)
	Court reporting services	561492	Court Reporting and Stenotype Services

734 Services to dwellings and other buildings

7342 Disinfecting and Pest Control Services

	Exterminating and pest control	561710	Exterminating and Pest Control Services (part)
	Except exterminating and pest control	561720	Janitorial Services (part)

7349 Building Cleaning and Maintenance Services, NEC

	Janitorial services	561720	Janitorial Services (part)
	Services to buildings and dwellings, except janitorial services	561790	Other Services to Buildings and Dwellings (part)

735 Miscellaneous equipment rental and leasing

7352 Medical Equipment Rental and Leasing

	Home health furniture and equipment rental and leasing	532291	Home Health Equipment Rental
	Medical machinery and equipment, except home health furniture and equipment, rental and leasing	532490	Other Commercial and Industrial Machinery and Equipment Rental and Leasing (part)

7353 Heavy Construction Equipment Rental and Leasing

	Rental of construction equipment [except cranes] with operator	238910	Site Preparation Contractors (part)
	Crane rental with operator	238990	All Other Specialty Trade Contractors (part)
	Heavy construction equipment rental without operators	532412	Construction, Mining, and Forestry Machinery and Equipment Rental and Leasing (part)

7359 Equipment Rental and Leasing, NEC

	Appliances; TVs, VCRs, and other consumer electronic equipment rental	532210	Consumer Electronics and Appliances Rental
	Except aircraft; industrial truck and equipment; TV, VCR, and other consumer electronic equipment; appliances; general rental centers; portable toilets; office machines; oil field and oil well drilling equipment; and home and garden equipme	532299	All Other Consumer Goods Rental
	General rental centers and home and garden equipment rental centers	532310	General Rental Centers
	Aircraft rental and leasing	532411	Commercial Air, Rail, and Water Transportation Equipment Rental and Leasing (part)

Oil field and well drilling equipment	532412	Construction, Mining, and Forestry Machinery and Equipment Rental and Leasing (part)
Office machine rental and leasing	532420	Office Machinery and Equipment Rental and Leasing (part)
Industrial truck and equipment rental and leasing	532490	Other Commercial and Industrial Machinery and Equipment Rental and Leasing (part)
Portable toilet rental	562991	Septic Tank and Related Services (part)

736 Personnel supply services

7361 Employment Agencies

| Executive placement services | 541612 | Human Resources and Executive Search Consulting Services (part) |
| Except executive placement services | 561310 | Employment Placement Agencies (part) |

7363 Help Supply Services

| Temporary help services | 561320 | Temporary Help Services |
| Employee leasing services, professional employer organizations | 561330 | Professional Employer Organizations |

737 Computer programming, data processing, and other computer related services

| 7371 | Computer Programming Services | 541511 | Custom Computer Programming Services |

7372 Prepackaged Software

| Mass reproduction of software | 334611 | Software Reproducing |
| Software publishing | 511210 | Software Publishers |

7373	Computer Integrated Systems Design	541512	Computer Systems Design Services (part)
7374	Computer Processing and Data Preparation and Processing Services	518210	Data Processing, Hosting, and Related Services (part)
7375	Internet service providers and Internet access providers	518111	Internet Service Providers
7376	Computer Facilities Management Services	541513	Computer Facilities Management Services
7377	Computer Rental and Leasing	532420	Office Machinery and Equipment Rental and Leasing (part)

7378 Computer Maintenance and Repair

| Sales locations providing supporting repair services as major source of receipts | 443120 | Computer and Software Stores (part) |
| Except sales locations providing supporting repair services as major source of revenue | 811212 | Computer and Office Machine Repair and Maintenance (part) |

7379 Computer Related Services, NEC

	Disk conversion services	518210	Data Processing, Hosting, and Related Services (part)
	Computer systems consultants	541512	Computer Systems Design Services (part)
	Except computer systems consultants and disk conversion services	541519	Other Computer Related Services
738	**Miscellaneous business services**		
7381	Detective, Guard, and Armored Car Services		
	Detective services	561611	Investigation Services
	Guard services	561612	Security Guards and Patrol Services
	Armored car services	561613	Armored Car Services
7382	Security Systems Services	561621	Security Systems Services (except Locksmiths)
7383	News Syndicates		
	Except independent news correspondents	519110	News Syndicates
	Independent news correspondents	711510	Independent Artists, Writers, and Performers (part)
7384	Photofinishing Laboratories		
	Except one-hour	812921	Photofinishing Laboratories (except One-Hour)
	One-hour	812922	One-Hour Photofinishing
7389	Business Services, NEC		
	Tobacco sheeting service	312229	Other Tobacco Product Manufacturing (part)
	Sponging, shrinking, etc. fabric for tailors and dress makers, batik work	313311	Broadwoven Fabric Finishing Mills (part)
	Embroidery of advertising on shirts and rug binding for the trade	314999	All Other Miscellaneous Textile Product Mills (part)
	Aerosol packaging, solvent recovery service-contract	325998	All Other Miscellaneous Chemical Product and Preparation Manufacturing (part)
	Yacht brokers	425120	Wholesale Trade Agents and Brokers (part)
	Driving services, e.g., auto or truck delivery and pilot car services	488490	Other Support Activities for Road Transportation (part)
	Post office contract stations	491110	Postal Service (part)
	Recording studios	512240	Sound Recording Studios
	Audio taping services	512290	Other Sound Recording Industries (part)
	Microfilm services	518210	Data Processing, Hosting, and Related Services (part)
	Press clipping services and stock photo agencies	519190	All Other Information Services

Credit card and check validation service	522320	Financial Transactions Processing, Reserve, and Clearinghouse Activities (part)
Process services, patent agents, notaries public, paralegal services	541199	All Other Legal Services
Drafting service	541340	Drafting Services
Home and building inspection services	541350	Building Inspection Services
Map making services	541370	Surveying and Mapping (except Geophysical) Services (part)
Interior design	541410	Interior Design Services
Industrial design	541420	Industrial Design Services
Fashion, furniture, and other design services	541490	Other Specialized Design Services
Distribution of telephone directories on a fee or contract basis	541870	Advertising Material Distribution Services (part)
Sign painting and lettering, showcard painting, mannequin decorating service and other advertising related business services	541890	Other Services Related to Advertising (part)
Translation and interpretation services	541930	Translation and Interpretation Services
Appraisers except insurance and real estate, outplacement services, and miscellaneous professional, scientific, and technical services	541990	All Other Professional, Scientific, and Technical Services (part)
Radio transcription services	561410	Document Preparation Services (part)
Telephone answering services	561421	Telephone Answering Services
Telemarketing bureaus and telephone soliciting	561422	Telemarketing Bureaus
Private mail centers and mailbox rental	561431	Private Mail Centers
Other business service centers, except private mail centers and mailbox rental	561439	Other Business Service Centers (including Copy Shops) (part)
Tax collection for federal, state, or local agencies	561440	Collection Agencies (part)
Recovery and repossession services	561491	Repossession Services
Business support services except telephone answering, telemarketing bureaus, private mail centers and repossession services	561499	All Other Business Support Services
Convention and visitors bureaus, tourist information bureaus	561591	Convention and Visitors Bureaus
Reservation systems for hotels, restaurants, and time-share condominium exchanges	561599	All Other Travel Arrangement and Reservation Services (part)
Swimming pool cleaning and maintenance	561790	Other Services to Buildings and Dwellings (part)

Packaging and Labelling services	561910	Packaging and Labeling Services
Convention and trade show services	561920	Convention and Trade Show Organizers
Other support services except packaging and Labelling, convention and trade shows services, convention and visitor bureaus, tourist information bureaus	561990	All Other Support Services (part)
Promoters of air shows, heritage festivals, and ethnic festivals with facilities	711310	Promoters of Performing Arts, Sports, and Similar Events with Facilities (part)
Promoters of air shows, heritage festivals, and ethnic festivals without facilities	711320	Promoters of Performing Arts, Sports, and Similar Events without Facilities (part)
Agents and brokers for authors and artists and speaker bureaus	711410	Agents and Managers for Artists, Athletes, Entertainers, and Other Public Figures (part)
Apparel pressing service for the trade	812320	Dry cleaning and Laundry Services (except Coin-Operated) (part)
Bail bonding	812990	All Other Personal Services (part)

Source: U.S. Census Bureau

NEW SERVICE AND PRODUCT DEVELOPMENT INITIATIVE

Aston University – Aston Business School, Birmingham, U.K. © 2003

1. Background

Please indicate whether this b... is: 'Please check rele... x)

A...	
A...	
A...	
Other	

...who ...ty is...

In what year did your busin...

What is the prin... ...ivity of your...

...your average employment ... ...g 2003

...at proportion of your sale... (by ...lue) were outside

Employm...	2003

...n type of services ...suplied by your business: (check relevant box)

Service ...	
Service ...	
Service ...	

...owhat this b...

Please ... ...ate approx... ...hat proportion of the people who work in your business ...
...based ...d implies on ...

	% ...	...
No knowledge		%
...School ...		%
A...		%
...		%
... (for higher)		%

(Note: percentages should sum to 100%)

For the 2003 business year...

	your side	
T... va...		$
T...	and Salary payments	$
...ables)		$
C...	...s and Buildings)	$

W... ...les (... typically:

		%
T... ...stome...	...	%
...households)		

...ld sum to 100%

...earch and Development...

...ck as appropriate:

...y ...busin... in your business in 2003?

...artment in your busin...?

	Yes	No

...o... s (full-ti... ...t employees) were al...

...s total R ... ...y your business

...e if any, of t ...t ...penditure was used to buy-in R&D services
fr...

%:

3. Service and Product Development

Have you introduced <u>ANY</u> new or improved services or products at this business since 2000?

	Yes	No
Service/Product Changes since 2000		

IF <u>NO</u> SKIP TO SECTION 5

Please <u>estimate</u> the proportion of your current sales (by value) that consist of:

(Note: percentages should sum to 100%)

	% of Sales
New services/products introduced to the market *for the first time* since 2000 by your business	%
New services/products introduced by this business since 2000 but *previously provided by other firms*	%
Improved services/products which were being provided by this business in 2000	%
Services/products which have remained *unchanged* since 2000	%

4. Service and Product Links

What percentage of your business's new services or products derive from **suggestions** and/or **ideas** from the following?

Strategic alliances or joint ventures	%
Subsidiaries	%
Suppliers	%
Consultancy firms	%
Competitors	%
Customers	%

To which extent are the following involved in the development of your business's new services or products?

	Very Little				Very Much
	1	2	3	4	5
Strategic alliances or joint ventures					
Subsidiaries					
Suppliers					
Consultancy firms					
Competitors					
Customers					

<u>IF</u> customers were NOT involved, **SKIP TO SECTION 5.**

With regard to involvement, <u>IF</u> the **customer** was **involved** in the development of the new services or products, were the mode(s) of interaction formal or informal, or both?

	Yes	No
Formal Interaction		
Informal Interaction		

If **customers** were **involved** in the development of your business's new services or products, what was the nature of the involvement? (check relevant boxes)

Ad hoc	
Focus groups	
Marketing or customer information	
Working with lead customers	
Other , please specify:	

5. Organizational Practices

Have you introduced <u>ANY</u> significant new or improved organizational practices (changes in work practices), that did NOT include technology, at this business since 2000?

	Yes	No
Organizational changes since 2000		

IF <u>NO</u> SKIP TO SECTION 6

What percentage of your business's new organizational practices (changes in work practices) derive from **suggestions** and/or **ideas** from the following?

Strategic alliances or joint ventures	%
Subsidiaries	%
Suppliers	%
Consultancy firms	%
Competitors	%
Customers	%

To which extent are the following involved in the development of your business's new organizational practices (or changes in work practices)?

	Very Little				Very Much
	1	2	3	4	5
Strategic alliances or joint ventures					
Subsidiaries					
Suppliers					
Consultancy firms					
Competitors					
Customers					

6. Technology Based Developments

Have you introduced ANY significant new or improved technological driven developments at this business since 2000? (e.g. real-time sales monitoring, e-commerce)

	Yes	No
Technological changes since 2000		

IF NO SKIP TO SECTION 7

What percentage of your business's new or improved technological driven developments derive from suggestions and/or ideas from the following?

Strategic alliances or joint ventures	%
Subsidiaries	%
Suppliers	%
Consultancy firms	%
Competitors	%
Customers	%

To which extent are the following involved in the development of your business's new or improved technological driven developments?

	Very Little				Very Much
	1	2	3	4	5
Strategic alliances or joint ventures					
Subsidiaries					
Suppliers					
Consultancy firms					
Competitors					
Customers					

7. Strategy

Do you have a formal plan for the development of your business over the next 3 years or more?

	Yes	No
Formal Development Plan		

IF NO SKIP TO SECTION 8

Does your development plan include targets for:

	Yes	No
The introduction of new services/products		
The development of improved services/products		
Research and development investment		
R&D joint ventures or partnerships		

How important will the following be in enabling you to achieve your business targets (please check as appropriate)?

	Not Important				Very Important
	1	2	3	4	5
Strategy Development & Implementation					
People/Skills Development					
Operational Process Improvement					
Supply Chain Development					
Improving Customer Service					
Improving Marketing					
Improving Productivity/Efficiency					

8. Constraints on Service/Product Development

Please indicate if any of the following factors have reduced or hindered service or product development in your business: (Please check relevant boxes)

	Not Important				Very Important
	1	2	3	4	5
Riskiness of service/product development					
Low rate of return					
Attitudinal barriers in this business					
Lack of necessary finance					
Few market opportunities					
Lack of information about technologies					
Lack of funding for new technologies					
Lack of technical expertise in this business					
Lack of managerial expertise in this business					
Legislative or regulatory requirements					
Lack of ability to meet customer specifications					
Lack of partners					

Appendix V

Variable Definitions:

Probits & Tobits

Innovative Measures

New Service & Product Dummy	A dummy variable taking the value of 1 if the service firm introduced a new service or product
New Organisational Innovation Dummy	A dummy variable taking the value of 1 if the service firm introduced a new organisational innovation
New Technological Innovation Dummy	A dummy variable taking the value of 1 if the service firm introduced a new technological innovation
New-to-Market Innovation	Proportion of new-to-market service and product in total sales
New & Improved	Proportion of new & improved service and product in total sales

Internal Resource Indicators

Employment	Service firm employment in 2003
Employment Squared	Service firm employment in 2003- squared
Workforce with Degree	The percentage of the service firms' workforce with a bachelor's degree
Workforce with no qualifications	The percentage of the service firms' workforce with no post-school vocational training
R&D	A dummy variable taking the value of 1 if the service firm undertook R&D in 2003
Formal R&D	A dummy variable taking the value of 1 if the service firm has a formal R&D department and 0 otherwise
Informal R&D (only)	A dummy variable taking the value of 1 if the service firm was undertaking informal R&D and 0 otherwise
R&D Intensity	R&D employment in the service firm as a percentage of total employment

Other Service Firm Characteristics

Firm Vintage	Age of the firm in 2003
Business Type	A dummy variable if the service firm is stand-alone and a 0 otherwise
Customised Offerings for Individuals	A dummy variable represents the service/product offering is customised to individual customers
Tailored Offerings for Groups	A dummy variable represents the service/product offering is tailored to specific customers
Suitable for Large Customer Groups	A dummy variable represents the service/product offering is suitable for large customer groups
Standardised	A dummy variable represents the service/product offering is standardised

External Linkages

Strategic Alliance or Joint Venture	Percentage of new S&P derived from a SA/JV
Suppliers	Percentage of new S&P derived from suppliers
Subsidiaries	Percentage of new S&P derived from subsidiaries
Customers	Percentage of new S&P derived from customers
Consultancy Firms	Percentage of new S&P derived from consultancy firms
Competitors	Percentage of new S&P derived from competitors
	~ the same holds true for organisational and technological innovation

Performance Analyses (not defined above)

Performance Measures

V.A.P.E. (value-added per employee)	Calculated as revenue minus operating costs divided by number of employees
Sales Growth	The percentage of sales growth since 2000
Employment Growth	The percentage of employment growth since 2000

Internal Resource Indicators

Capital Intensity	The percentage of service firms' employees divided by capital spending
Exports	A dummy variable representing service firms which export and 0 otherwise

External Linkages

Level of Involvement with SA/JV	Signifies the level of involvement between service firm partaking in a SA/JV for S&P innovation (Likert scale 1-5)
Level of Involvement with Suppliers	Signifies the level of involvement between service firm participating with their suppliers for S&P innovation (Likert scale 1-5)
Level of Involvement with Subsidiaries	Signifies the level of involvement between service firm participating with their subsidiaries for S&P innovation (Likert scale 1-5)
Level of Involvement with Customers	Signifies the level of involvement between service firm participating with their customers for S&P innovation (Likert scale 1-5)
Level of Involvement with Consultants	Signifies the level of involvement between service firm participating with their consultancy firms for S&P innovation (Likert scale 1-5)
Level of Involvement with Competitors	Signifies the level of involvement between service firm participating with their competitors for S&P innovation (Likert scale 1-5)

~ the same holds true for organisational and technological innovation

Formal Interaction — Designates whether the service firms' interaction with their customer was via formal interaction (dummy variable)

Informal Interaction — Designates whether the service firm's interaction with their customer was via informal interaction (dummy variable)

Ad hoc — Expresses ad hoc customer involvement (dummy variable)

Focus Groups — Expresses focus groups with customers are utilised (dummy variable)

Marketing & Customer Information — Expresses marketing and customer information are utilised (dummy variable)

Working with Lead Customers — Expresses a service firm working with their lead customers (dummy variable)