

Causal and exploratory associations between
manufacturing outsourcing and innovation performance
in the UK furniture industry

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Abstract

While the cost advantages associated with outsourcing are accepted, the impact that outsourcing may have on innovation performance is ambiguous. One perspective suggests that firms outsourcing low value-adding activities will achieve higher innovation performance (that is, better designed or more technologically advanced products or more substantive process improvements) than firms that perform these activities in-house. Another view holds that firms that outsource high value-adding activities may have lower innovation performance than those firms that perform these activities in-house. While these two positions are not contradictory, neither are they complimentary. Moreover, superior innovation performance can be achieved through the effective use of innovation, or dynamic, capabilities.

The relationships between outsourcing and innovation performance in the UK furniture manufacturing industry are investigated in this study. A mixed-methods approach is employed, which includes three case studies and a survey of 66 manufacturers. Industry analysis and case interviews document the critical value added activities in the industry and contribute to the formulation of a questionnaire. Non-parametric statistical techniques are applied to test the survey results.

This study contributes to the discourse by showing that innovation performance is affected by outsourcing decisions. Outsourcing peripheral activities has no impact on innovation. However, performing core activities has a positive impact on innovation. The findings support the previous documented relationship between capabilities and product and process innovation by revealing enablers, which are particular to the furniture industry. Interestingly, there is a strong correlation between customer-focus strategies and innovation performance. Furniture manufacturers are attuned to customer design preferences through critical buyer channels. Other key findings highlight the association between firm size and innovation and the importance of innovation capabilities for medium size firms.

The rationale for investigating one industry is conducive to interrogate organisations performing similar business activities. The findings are relevant not only to the UK furniture industry but also to other traditional manufacturing industries, which demonstrate similar innovation performance and outsourcing patterns.

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Declaration

I declare that the research contained in this thesis, unless otherwise formally indicated within the text, is the original work of the author. The thesis has not been previously submitted to this or any other university for a degree, and does not incorporate any material already submitted for a degree.

Jeff Readman

Date

Chapter 1. Introduction

The transformation of UK manufacturing commenced in the post 1945 period but change was slow initially. The UK Government noted the accelerated pace of deindustrialisation in the 1970s as employment in the manufacturing sector decreased by seven percent from 1970 to 1974 (Singh 1977). Manufacturing continued to recede while the service sector has expanded ever since. In the first decade of the twenty-first century, manufacturing employment decreased by 38 per cent from 4.6 million workers in 2000 to 2.8 million workers in 2011 (OECD 2013). During this period, employment in the service sector grew by 15 percent (from 20.1 million to 23.2 million workers). Tellingly, the number of UK manufacturing firms declined by over 15 per cent from 2000 to 2007 and a further eight per cent from 2009 to 2011 (ONS 2011b)¹.

The scope of innovation in manufacturing also changed. For example, while total Business Expenditure on Research and Development (BERD) increased in real terms by 16.4 per cent, the share of BERD performed by UK manufacturing fell from 80.2 per cent in 2000 to 72 per cent in 2011 (ONS 2011a). The loss of local manufacturing enterprises and foreign-owned production facilities combined with the sector's fall in R&D activities suggest that both operational capacity and manufacturing innovation capability has depleted.

Low productivity, particularly compared to the advances made by firms from the USA and Germany and latterly Japan, contributed to the decline of UK manufacturing (Broadberry and Crafts 2003). Years of under investment in process technologies, outdated management practices and labour unrest have culminated in uncompetitive behaviour. (Broadberry 1997). Competition from outside the UK hollowed out most industries with business bankruptcies and mergers and

¹ The UK Office for National Statistics (ONS) changed the industry classification system in 2007 and again in 2009. Businesses were classified as VAT based enterprises using SIC (2003) from 2000 to 2007. From 2007 to 2009, businesses were reported as VAT and PAYE based enterprises using SIC (2003). Since 2009, businesses are counted as VAT and PAYE based enterprises using SIC (2007). A concordance algorithm among the different systems is unavailable.

acquisitions accounted for a large share to the decline. Those remaining manufacturers have relocated parts of or entire operations to lower cost localities.

Outsourcing business operations is not new. Firms with a high cost base (usually labour costs) can choose to reduce costs by contracting work to lower cost suppliers. The scale of outsourcing at the national or global level is imprecise however. Trade in parts or semi-finished goods can measure production sharing in export-oriented industries. Export data are based on broad product classifications, which often overlook detailed product markets and services. A method used to measure outsourcing trends overlooked by trade flows are bespoke business surveys on business activities. For example, the USA Bureau of Labor Statistics (BLS) draws attention to the effects of business transferring to non-USA firms by measuring extended mass layoffs (over 50 employees). The findings from these surveys show business relocation fluctuating annually. However, this data underreports outsourcing trends in small businesses and is relevant to business activities in the USA. Trade data and relocation surveys are incomplete attempts, which do not capture the dynamics of business outsourcing. While the effects on the macro economy may be ambiguous, as a business strategy, outsourcing is a viable tool used to improve the financial performance of firms.

I became interested in the outsourcing phenomenon when I worked on a 2001 university research project. The project team was investigating the implementation of agile manufacturing in small and medium size enterprises and my role was to conduct a series of 'before' and 'after' case studies. The conversations with staff and managers of the six case firms focused on supplier relationships and, increasingly, new product development. Many of these dedicated manufacturers were embarking on strategic collaborations for the first time. Managers highlighted the risks associated with these partnerships but were excited by the benefits of tapping into different capabilities and utilising productive business operations. The outcomes of the collaborative projects varied among the case companies: for example, delays and substandard supplies held up new product launches for two companies; one business buyer acquired another case company while two case firms were entering into alliances with suppliers with superior technological capabilities. Since 2012, operational outsourcing has increased among all six firms with five of the six

companies directing immediate production to non-UK suppliers while the sixth company has vacated manufacturing for advanced engineering services. Financial performance remains strong in these companies. The question for strategists is whether business outsourcing affects measurable performance other than finance.

This study is an inquiry into the relationship between governance and firm performance. Specifically, the causal association between manufacturing outsourcing and product and process innovation performance is investigated. UK furniture manufacturing, a traditional technology base industry, is the case example. The focus on firms in one industry, which performs similar value adding activities, supports comparative analysis. An underlying parallel objective is to establish a research framework, which can be replicated in different industries and countries. The thesis is structured in eight chapters and includes this introductory chapter (Chapter 1).

In Chapter 2, a review of the academic literature reveals the current theoretical and research issues. Outsourcing is defined as either production or strategic. The two fundamental frameworks, which explain why firms outsource, are explored. The transaction cost economics and resource –based view are discussed in terms of governance. Firms which implement strategic outsourcing aspire to affect firm performance, particularly financial performance. A second review of the literature considers innovation performance. Previous studies on outsourcing and innovation performance identified three possible outcomes: (i) outsourcing can have a negative effect on innovation; (ii) outsourcing, if managed selectively, can improve performance and finally, (iii) no noticeable association can be found between innovation and outsourcing. The influencing factors can include capabilities and external moderating factors.

The literature review leads to three research questions. The first question draws explicit attention to possible outsourcing and innovation associations. The second question asks about the application of capabilities which support outsourcing and innovation. The third research question considers alternative factors to explain innovation performance. Answering these questions can bridge the knowledge gaps arising from previous studies.

In Chapter 3, the three research questions are transformed into testable hypotheses. Directional and non-directional hypotheses are introduced. The first research

question on outsourcing and innovation performance is explored by two hypotheses. The second research question related to outsourcing, innovation performance and capabilities is investigated by three hypotheses. Finally, three hypotheses set out to test alternative explanations for innovation performance and include firm size, buyer preferences and agency.

The research methodology, strategy and the sequential mixed research methods are introduced in Chapter 4. The project prescribes to a post-positivist worldview, a view which abides to objective knowledge production within a bounded reality. The limits placed on human behaviour and social organisations research mean that knowledge is only plausibly accepted. Nevertheless, as this study explores possible cause and effects, a scientific protocol is followed.

Integrated mixed research methods are used to collect and analyse data. The structure of industry and value adding functions are identified through qualitative interviews with industry experts and case companies from the furniture industry. The findings from the qualitative research mode formulate the questionnaire applied in the second research mode. The purpose of the second research stage is to test the research propositions in those firms that display similar – or potentially similar - organisational structures.

The findings from the first research mode are reported in Chapter 5. Secondary material drawing on government data and marketing reports present the industrial organisation of the UK furniture industry. The expert interviews and three case studies reveal the critical operational and other value adding activities in furniture manufacturing. An experimental research proposition arises from the case studies, which suggests a possible optimal outsourcing strategy for production activities. This proposition is tested alongside the hypotheses in Chapter 7.

The first level findings from the questionnaire are presented in Chapter 6. This second research mode follows a survey template to collect data from a representative sample of manufacturers. The survey questions are presented with the emphasis directed towards those questions which form the variables used to support the hypotheses testing. The findings show that UK furniture manufacturers are introducing new product designs and implement incremental process improvements while instituting a variety of governance structures.

The research propositions are interrogated in Chapter 7. The descriptive statistics are reported and the test statistics support or reject the eight hypotheses and the one experimental research proposition. The findings indicate a strong correlation between outsourcing and innovation performance, namely that firms that hold onto critical parts of production demonstrated greater performance in product development initiatives.

Finally in Chapter 8, the implications of the findings and the theoretical consequences of this study are discussed. This study shows that outsourcing can influence innovation performance. Furthermore, specific capabilities to the furniture industry support product innovation and process innovation. Buyer preferences are significant to innovation performance while firm size can also be a factor. Further research is proposed to advance the application of the outsourcing/ innovation framework.

1.1 The contributions of this study

This inquiry provides a deeper understanding of outsourcing. First, while the transaction cost and capability framework is a useful device to assist firms with outsourcing decisions, the outsourcing rubric currently propagated overlooks innovation performance. The findings from this study indicate that outsourcing affects innovation performance directly and indirectly. The direct outcome shows that firms should hold onto critical core production activities. The indirect outcome infers to the effort to release resources tied to peripheral activities. The findings show that outsourcing peripheral activities will not affect innovation performance; firms do not direct the released resources towards innovation.

The second significant contribution is methodological. One failing of previous studies was the reliance of a singular method. The sequential research approach applied in this study illustrates how a grounded perspective of business organisations can facilitate quantitative investigations. Associating the business functions and activities from one industry, and drawn in one period and setting, can reveal a dynamic industrial organisation structure. This design is recommended to support further business research.

Chapter 2. Literature Review

Knowledge contribution is an intricate process which often builds upon previous work. A review of the academic literature positions the research towards current theoretical contributions, applications and methods. The limitations to this exercise are noted upfront. This is not a systematic review such as the Cochrane Handbook for Systematic Reviews of Interventions , which established guiding principles for reviewing health care research (Higgins and Green 2008). Reviews of health studies entail a stated methodology, a search process to identify all studies that would meet the inclusion criteria, assessment of the findings of the included studies, and the synthesis of these findings (Higgins and Green 2008 p. 6). The health systematic review protocols interrogate experimental research primarily and, although qualitative research can be included, the procedures are best suited when reviewing similar methodologies and measurements. The research findings undertaken of business and social phenomenon do not abide by standardised methodologies or measurements however. Management and social science research follow deductive, inductive and hybrid approaches and establishing objective criteria to evaluate different worldviews is speculative.

A standard approach to management literature reviews is recognised (Denyer and Neely 2004). For example, the evidence review advocated by Tranfield (Tranfield, Denyer and Smart 2003) proposes similar protocols outlined in the Cochrane Handbook. A management literature review should include clear objectives, a stated method, comprehensive search of available articles, a selection criteria which can be re-produced (i.e. an audit trail), a synthesis and appraisal of the research and presentation of the results (Tranfield, Denyer and Smart 2003; Adams, Bessant and Phelps 2006). These guidelines recognise the different research cultures and accompanying methods used in management research. This approach remains ambitious in scope.

While following the intent prescribed by Tranfield, this literature review is closer to the practices laid out by Creswell (Creswell 2003). Creswell's recommendation is for a literature review to be informed by the study's research methodology. Quantitative studies should make use of bibliometrics or statistical analysis in the review,

particularly if past findings are to be evaluated. Conversely, a narrative examination of the literature would support qualitative research. The literature can be entwined with the primary research findings, or at the end of study if a grounded approach is followed. This study follows a mixed research methodology and, therefore, both a (minimal) quantitative and narrative assessment of the literature is reported.

This literature review provides an overview of the pertinent and current academic research in the field of outsourcing and innovation. The objective is to identify findings from previous research and to guide and advance the research questions (Creswell 2003). The period under study includes material published up to 2012 and available in the Web of Knowledge and Web of Science databases. This literature review follows a causal narrative. The first section defines outsourcing, which is the independent variable in this study. A distinction is drawn between short-term production outsourcing and strategic outsourcing: strategic outsourcing is the primary focus. The accompanying literature survey on outsourcing explores the principles that underpin the governance of business activities. Transaction costs and capabilities not only affect governance but can also influence performance.

The second section discusses the possible relationship between outsourcing and innovation performance. Established definitions for process innovation and product innovation are used in this study along with accepted performance metrics. The literature survey identifies the most cited articles and summarises the critical themes. Previous findings are vague. One line of inquiry argues that outsourcing low value functions can improve the performance of high value functions. Other studies raised concerns that outsourcing can deplete technological capabilities. Other studies fail to find any association between outsourcing and innovation. A separate field of inquiry explored R&D outsourcing and open innovation. Collaborative and contractual endeavours in the early innovation stages are relevant business strategies. The singular research methods employed in these studies could be one limiting factor and this review supports a proposal for a mixed research approach. Finally, the research questions are drawn together and summarised in the last section of this chapter.

2 Outsourcing and the boundary of the firm

The concept of outsourcing is defined in this section. The definitions are used to guide the literature survey in the next section. To start, it may be helpful to first define a firm, and by extension, the activities a firm performs. The modern business firm in the USA emerged in the late 19th century with the advances of industrialisation and effective administrative systems (Chandler 1977). According to Chandler, business firms have four characteristics:

- (i) legal entities with responsibilities towards employees, customers and suppliers;
- (ii) administrative entities that co-ordinate and manage an array of different activities particularly pertaining to the development, production and delivery of goods and services;
- (iii) once established, firms are a collection of skills and routines, physical assets and (financial) capital; and finally
- (iv) firms are profit seekers by producing and then distributing (i.e. selling) goods and services while planning future production and distribution (Chandler 1992).

The examples cited by Chandler are closely associated with manufacturing.

Nonetheless, these attributes are applicable to services firms and are a good starting point to investigate what a firm actually does.

Chandler's attributes of the firm are informative but they do not indicate the evolutionary process of change. Besides the quest for profits, it is the development, production, distribution and innovation of goods and services which distinguish firms from other social entities such as families, social enterprises and the civil service. Firms organise people and technology to fulfil unique outcomes. Secondary activities such as administration and human resource development are also part of this remit but are not considered essential as their added value is indirect. In manufacturing, production encompasses the activities that are required to make goods. These activities include the transformation of raw materials, semi-finished components and parts into a marketable artefact. Distribution is the sales and marketing of products and services to buyers.

Improving the productivity of each activity is associated with process innovation. Innovation also includes the development of new products and services and is an evolutionary process that incorporates learning routines. The dynamics of innovation are associated with risks and uncertainties. From a static perspective, production and distribution are the core activities of firms; the value of goods and services is attributed to the contribution of each activity, i.e. value-added.

2.1 Production outsourcing

In the simple model I have described, the firm is already operating: all the technology, skills, managerial competence and markets are established. More importantly, access to all the information which is required to set production schedules will meet (immediate) demand (Hart 1987). If demand increases beyond the volume capacity of a firm, a firm may enter into a production transaction with a competitor to alleviate temporary short-term capacity short falls. This type of transaction is production outsourcing. The firm continues to perform activities in-house but may enter into a production transaction because there is a need to meet temporarily higher demand. The short-term spike in demand necessitates the firm to place orders through a market transaction because there is a time lag to expand internal production through investments in plant and equipment. The strategic dilemma arises if this higher demand continues: the firm will have to decide whether to maintain the shared production outlay or invest in new plant and equipment to expand internal volume capacity. This static view does not provide any insight into why the firm has taken on the activities in the first place (Chandler 1992).

Outsourcing encompasses a wide sweep of business-to-business transactions. For production outsourcing, it is the supply of intermediate inputs, semi-finished products and services from independent suppliers to a firm that produces finished goods or services (Kotabe 1992). It is the value-added contributions from other firms which add to the final product or service. Outsourcing necessitates the transferability of those activities and functions that contribute to the production of goods and services. According to Zhu et al, outsourcing is the, “process of transferring the responsibility for a specific business function from an employee group to a non-employee group” (Zhu, Hsu and Lillie 2001 p.374). Outsourcing, in this sense, is not the purchase of all the inputs that go into production but those

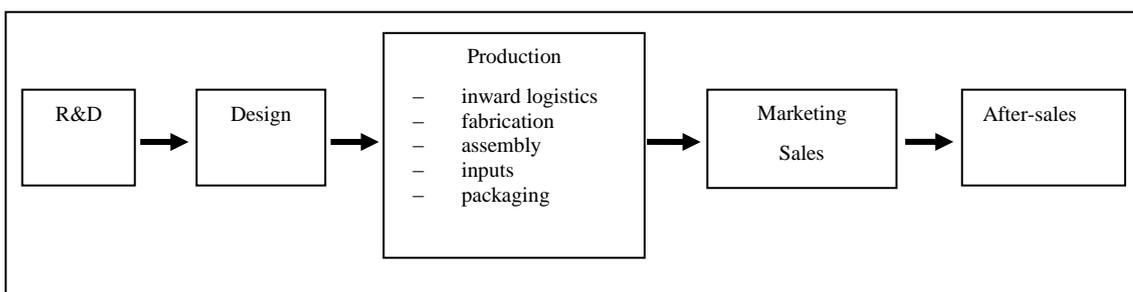
purchases that are within the range of possible activities that the contracting firm can undertake itself. The types of activities within the managerial realm are part of the value chain.

2.1.1 Value added activities, functions and value chains

So far, the discussion has considered finished or semi-finished inputs. A firm can also outsource sub-systems of activities and services which can contribute partially or fully to the goods and services. Furthermore, support activities such as human resources, logistics and other service oriented activities which reside in a firm can also be outsourced. A functional decomposition of the firm highlights areas which firms can outsource. In some cases, the entire value chain is up for consideration.

Porter popularised the value chain as a business strategy technique (Porter 1985). In its basic form, the value chain describes the full range of activities which are required to bring a product or service from conception, through the different phases of production (involving a combination of physical transformation and the input of various producer services), delivery to final consumers, and final disposal after use. Figure 1 depicts a linear and functional series of value adding stages; each function adds value until the goods are produced. In the example below, production is only one of a number of value-added links and, increasingly, manufacturers offer accompanying services. In complex products involving different technologies, the full mapping of activities within each link of the chain can often be multi-layered.

Figure 1. A basic value chain



Value chains are often more complex than Figure 1 depicts. Take, for example, the case of a low technology industry, the furniture industry. Furniture manufacturing involves the provision of seed inputs, chemicals, equipment and water for the forestry sector. Cut logs pass to the sawmill sector which gets its primary inputs from the machinery sector. From there, sawn timber moves to the furniture

manufacturers who, in turn, obtain inputs from the machinery, adhesives and paint industries and also draw on design and branding skills from the service sector. Depending on which market is served, the furniture then passes through various intermediary stages until it reaches the final customer, who after use, consigns the furniture for recycling (Kaplinsky, Morris and Readman 2002b).

In addition to the many links in the immediate value chain, typically intermediary producers in a particular value chain may feed into a number of different value chains. The value chain perspective illuminates not only the functions managed by the firm but also those functions and activities which are performed by other firms, with all value added inputs and services culminating to the final product or service. A firm may indeed purchase goods and services from suppliers or competitors if capacity is stretched. However, the modern firm may no longer produces all the required services and components in-house, even if internal capacity is within its reach. Managing these dependent schedules are integral activities of the firm and this comes at a (transaction) cost.

2.2 Strategic outsourcing

Outsourcing therefore is distinct from sub-contracting or spot market purchases. Gilley states that a transaction becomes outsourcing if it meets either a substitution and abstention criteria (Gilley and Rasheed 2000). Substitution outsourcing occurs when a firm replaces internal activities through external transactions. For example, a firm has received an order which is beyond their current production capacity, as discussed earlier. The firm could expand production capacity by investing in new plant and equipment and labour (through overtime or taking on more employees). Alternatively the firm could transfer that portion of the order, which is beyond current volume capacity, to another firm. The first option is viable if the firm expects orders to continue at this new and higher volume while the second option is more attractive if the increase is perceived to be temporary. Substitution outsourcing is the break-up of a vertically integrated value chain within a firm.

Abstention outsourcing arises when a firm purchases goods or services, which have not previously been produced in-house. This form of outsourcing differs from procurement in that, “the former (abstention) only occurs when the internalization of the good or service outsourced was within the acquiring firm’s managerial and/or

financial capabilities” (Gilley and Rasheed 2000 p. 765). Abstention outsourcing is explicitly tied to a firm’s resource base as the technological and organisational capabilities or the financial wherewithal to undertake an activity is within the grasp of the firm, i.e. the firm can make it if they want to. Firms may decide not to undertake an activity if suppliers can provide it at lower cost or provide better performance. It is the decision to relinquish internal control of activities - which are within the firm’s means - that sets abstention outsourcing apart from purchasing. Should a firm decide that vertical integration (that is, all activities performed by the firm) is not the most efficient mode to perform an activity, and then a more permanent solution is required. Strategic outsourcing is the organisational structure that emerges when a firm relies on other firms to provide unique capabilities in order to produce the final goods or services. This business-to-business transaction often supplements existing capabilities – both as a substitute or abstention. The decision to outsource becomes strategic if the substitution or abstention transaction is based, not on short-term volume capacity decisions, but rather a long term transfer of activities to other firms offering lower costs or technical or other performance advantages. Strategic outsourcing is the purposeful mix of business outsourcing and in-house activities which provide competitive advantage (Quinn 1999).

Firms can focus on their core competencies while gaining cost advantages or technical superiority by outsourcing activities which are not cost effective or where capabilities are not advanced (Prahalad and Hamel 1990). Outsourcing can include direct operational activities such as parts production and assembly. Firms can also outsource support activities that underpin production such as administration, marketing, logistics and human resource management. The underlying attribute is that the activity, which is outsourced, provides significant value: this value can take the form of accessing superior capabilities in technology or other innovative activity such as knowledge bases (both as formal intellectual property or tacit and non-codified). Firms may outsource to access strategic networks and collaboration: again for reasons related to innovation but also for market access. And finally, firms may outsource important activities for cost considerations. Even if the activity contributes significantly to final price or consists of embedded technical capabilities, firms may

benefit financially if the activity is outsourced. The consideration will be weighted by the cost of managing the transaction.

A strategic outsourcing decision has to balance costs and capabilities. Costs consist of the direct expenditure of the activity and the indirect transaction costs of managing, supervising suppliers and evaluating contracts. Capabilities are independent of costs and represent the organisational technical skills and performance. Cost consideration will be more important for activities which are not strategic. Alternatively, capabilities will be more important for strategic activities (although cost factors are not fully ignored). Costs and capabilities are the critical factors which influence the activities which should be undertaken internally or outsourced.

The cost of managing a transaction can often outweigh any benefits offered by lower direct cost suppliers. Firms will also outsource if suppliers can provide superior added value. This can be in the form of better quality, advance technical specifications, or process oriented criteria including faster or flexible delivery periods. Value added capabilities can be associated with the management of technology and other resources. Capabilities are also associated with the evolutionary process of change, whether it is business improvements or the development and launch of new products and services.

2.3 Outsourcing literature survey

A literature search was undertaken to uncover the frameworks and premises used by scholars. The search makes use of the facilities of the Web of Science database, which included seven indexes: Science Citation Index Expanded, Social Sciences Citation Index (SSCI), Arts & Humanities Citation Index, Conference Proceedings Citation Index- Science (CPCI-S), Conference Proceedings Citation Index- Social Science & Humanities , Book Citation Index– Science (BKCI-S and the Book Citation Index– Social Sciences & Humanities (BKCI-SSH). Electronic databases can lead to limited breadth of search results (Leseure, Birdi, Bauer, Denyer and Neely 2004) . The Web of Science has been criticised for a bias towards North American and English-language journals (Kulkarni, Aziz, Shams and Busse 2009). However, the database focuses on high quality journals coverage rather than citation

volume (Web of Knowledge 2013). Scholars continue to use this facility for literature surveys and bibliometric research (for example, Martin 2011).

For the outsourcing search, two filters were used: (i) citations from 1970 to 2012 and (ii) topic keyword, outsource. The search generated 7,487 results of which 4,233 were academic articles, 2,664 were proceedings paper and 590 others. What is striking is that the number of academic articles published has increased annually. In 1990, two articles, which indicated outsourcing as a topic, were published while in 2012, the number of articles published climbed to 461. Over 42% of the academic articles come under the business economics research category. The next most popular research category is computer and information systems, followed by engineering, operations research and information/ library science. Outsourcing articles are published in over 600 journals with the output not dominated by any one journal. For instance, four journals, *Lecture Notes in Computer Sciences*, the *International Journal of Production Economics*, the *International Journal of Production Research* and *Industrial Management Data Systems*, accounted for four per cent of the total number of articles published on the topic from 1990 to 2012. With publications output increasing year on year in a wide breadth of journals covering a multitude of research disciplines, outsourcing is an established topic that continues to attract interest.

The origins of the term, outsource, however, are uncertain, at least from a strategic management perspective. The first occurrence of outsourcing as a Web of Science topic is in an 1984 *Automotive Industries* article by Jim Callahan (Callahan 1984). This was a short editorial on sub-contracting in the auto industry. An anonymously written article ((Anonymous) 1990) and an article by Kelly (Kelly 1990) are the first peer reviewed articles cited in the Web of Science databases to use the term. Both articles discuss the importance of IT competences in corporations. In 1992, Bucklew noted that firms were outsourcing IT departments and back-office for strategic objectives (Bucklew 1992). Advances in computer technologies were accelerating, putting pressure on companies facing legacy technologies: should firms let go of obsolete technologies and start from scratch while facing uncertainties with technological change and the large investment outlays? One solution was to outsource IT projects to other companies in the short term until a strategic decision

could be made about technological selection. Academic interests during the early 1990s continued to focus on back office and IT support outsourcing, even in articles published in non-computer science journals. For example Westland in *Management Sciences* looked at transfer pricing and incurred costs in back office IT systems (Westland 1992).

In 1992, two articles were published which discussed wider trends of outsourcing in manufacturing. Snow explored the possible implications of organisational change (Snow, Miles and Coleman 1992). The application of internal market mechanisms could unravel large M-form (multi-divisional) corporations which had become the predominant post-1945 organisation structure in the USA. Disaggregated organisational structures would operate through different forms of strategically managed business units. Snow suggested that the co-ordination of the disparate units and suppliers are key management roles. Venkatesan extended the core competences framework introduced by Prahalad and Hamel (Prahalad and Hamel 1990) by prioritising key component manufacturing (Venkatesan 1992). Firms should focus on those parts and components which they are good at producing and procure the other, non-core commodity inputs from suppliers. These two articles drew attention that outsourcing was no longer a temporary production or IT support decision; outsourcing has medium term to permanent outcomes. In other words, outsourcing is strategic.

The themes introduced in these articles resonate throughout the research agenda. A review of the 20 most cited articles (as of 2012) have investigated (i) governing structures and business performance / productivity or (ii) competences and capabilities related to outsourcing and business performance. Given a set of external and internal factors facing firms, researchers set out to investigate the most appropriate governing structures. Contracting and organisational structures arose from the interest generated by Eastman Kodak's strategic decision to outsource their information systems activities in 1989 (Lacity and Hirschheim 1993). Information and technology service outsourcing continued to inspire research interest with scholars investigating the appropriate length and type of IT contracts available to businesses. These include relationship and trust (Poppo and Zenger 2002) and contracting and short term service fee contracts (Lacity and Willcocks 1998).

Performance outcomes as a result of IT outsourcing are also important, and include efficiency versus effective trade-offs (Earl 1996) and cost savings (Lacity, Willcocks and Feeny 1995).

Other authors took notice of non-IT outsourcing and new forms of organisational structures. Performance issues, particularly cost savings, are appraised by associating different contracting modes (Grossman and Helpman 2002). Other performance metrics include competitiveness, customer service and profitability are also associated with supply chain contracts (Gunasekaran, Patel and Tirtiroglu 2001). Supplier location and the costs associated with international sourcing is also an important consideration when formulating a supply chain strategy (Grossman and Helpman 2005).

A body of research has explored the relationships between outsourcing and firm competences and labour skills. From a macroeconomic viewpoint, Feenstra and Hanson measured the positive effects and negative effects of outsourcing on the wages for skilled workers and less skilled workers, respectively (Feenstra and Hanson 1996; Feenstra and Hanson 1997; Feenstra and Hanson 1999). In these studies, outsourcing is measured by the quantity and value of material inputs and intermediate goods flowing between countries (Feenstra and Hanson 1996). At the firm-level, Feeny revealed that firms that outsource their information services will continue to require some level of technical IT competence and (different) capabilities to manage the IT outsourcing contracts (Feeny and Willcocks 1998). For complex technological products, firms require knowledge of the outsourced technology base when they engaged in supplier transactions (Brusoni, Prencipe and Pavitt 2001). Maintaining technological competences are necessary to offset the risks associated with advances in technologies and possible supplier opportunism.

Authors have sought to integrate governing structures and supplier contracts with the competences perspectives. Scholars recognised the strategic implications of outsourcing following on from the work of Venkatesan (Venkatesan 1992). If firms discharge peripheral activities to suppliers, then freed-up resources can be used to extend and deepen core activities or competence (Hamel and Prahalad 1994; Quinn and Hilmer 1994). Outsourcing activities also lead to two different perspectives on innovation. On the one hand, firms could outsource activities including innovation-

related activities, to achieve higher performance (Quinn 2000; Thomke and von Hippel 2002). Other scholars raised warnings about over-stretching outsourcing as innovation capabilities could be eroded or, at the very least, suppliers could gain an upper hand (Teece 1986; Chesbrough and Teece 1996; Takeishi 2001; Takeishi 2002).

Outsourcing incorporates the advantages of efficient market structures and collaboration among firms with different levels and sets capabilities (Holcomb and Hitt 2007; McIvor 2009). Behind these characteristics are two theoretical views of the firm. Transaction cost economics (TCE) and the resource-based view (RBV) provide insights into why some activities are performed in-house while other activities are outsourced. Separately, the perspectives do not fully explain strategic outsourcing, but, taken as complimentary principles, TCE and RBV provide a deep understanding of the boundaries of the firm.

The guiding theoretical premises and assumptions are discussed in the next section by referring to the leading cited articles. The primary and founding treatises, which these outsourcing articles refer to, are also revisited. The theoretical foundations of outsourcing provide explanations to variances in innovation performance.

3 Transaction costs and outsourcing

Outsourcing may be a recent strategic management topic but vertical integration and the boundary of the firm have a long legacy. For example, Coase asked in 1937, why do firms perform some activities internally while other tasks are governed by market structures (Coase 1937)? Firms exist to offset the costs associated with market transactions (i.e. the price mechanism). Goods will be produced within an internally administered organisation, rather than purchased from external actors, if the costs of the transaction are prohibitive. Transaction costs are impediments to an exchange, such as the cost incurred in seeking and negotiating prices and information asymmetry. Costs also increase when there is distrust between the buyer and seller.

Coase saw firms as, “the system of relationships which comes into existence when the direction of resources is dependent on the entrepreneur” (Coase 1937 p. 393).

This early view of the firm places the entrepreneur in the role of the critical decision maker and reflects the importance of the owner/ manager organisational structure in the early 20th century. As the firm grew in size and scale and took on a wider

geographic focus and product diversification, the U-form (unitary) organisation, which is functionally managed, transformed into the M-form (multi-divisional) organisation (Chandler 1976). Chandler coined the phrase, 'the visible hand' to describe the administration and co-ordination of internal multi-stages of production (Chandler 1977).

It was Williamson's theorising that the M-form organisation was more cost efficient and more effective than the U-form organisation that led to the advancement of transaction cost economics (Williamson 1975). As a starting point, the unit of analysis is the transaction and not the firm. There are two costs associated with a transaction: costs that occur before the transaction (ex ante) and the costs associated after the transaction (ex post) (Williamson 1975). Ex ante costs include the costs associated with seeking and vetting suppliers, contract drafting, price negotiating, and the legal costs associated with safeguarding agreements. Ex post costs are the costs to implement transactions and other costs associated with monitoring and enforcing the transaction. The protection of property rights (including intellectual property) is a particularly important ex post cost (Coase 1988). The costs associated with monitoring supplier contracts and activities deemed necessary to ensure articles of the contract are fulfilled can be very prohibitive. According to North (North 1990), transaction costs may represent as much as 35% to 40% of total economic costs². The objective of managers and owners of firms, therefore, is to establish a governing structure that minimises these transaction costs.

3.1 Determinants of transaction costs

The TCE model presents five variables which determine three governing structures. The first two factors are behaviour assumptions which are not affected by technology or market characteristics in the short term. The latter three factors are external variables which are dictated by the frequency and uncertainty of demand (and capabilities) and the complexity of the transaction (McIvor 2009).

² North's study considered total economic activity between 1870 to 1970 North, D. C. (1990). Institutions, institutional change and economic performance. Cambridge, Cambridge University Press, North, D. C. (1994). "Economic Performance Through Time." The American Economic Review **84**(3): 359-368..

Firms are social organisations and the decisions planned and acted upon will depend on the capacity of managers of firms (Williamson 1989). Bounded rationality is the limited capacity of management to remember the past and the cognitive processing power when dealing with complex issues (McIvor 2009). Firms are unlikely to evaluate every possible outcome associated with a transaction. Decisions are made and acted upon based on the information available and information is often out of date or inaccurate. Strategy should be seen as a speculative guide, therefore, rather than a formal rational process partly because information is neither wholly available information or accessible to all parties (Mintzberg 1987). In other words, information is asymmetrical.

The second assumption infers that a firm will act in their own self-interest. A firm will also, on occasion, be dishonest and break informal and formal relations if they perceive the rewards of their new transaction outweigh the negative outcome that may arise from the broken transaction. Trust and costs are inversely related: the cost to monitor and enforce contracts increases as trust decreases. An integrated and improved communication network can increase trust between suppliers and buyers and thereby reduce transaction costs (Dyer and Chu 2003).

Exogenous variables are outside the immediate control of the firm – at least in the short term. The availability of alternative suppliers can influence the bargaining position of a firm. In addition, imperfect access to information (i.e. information asymmetry) between the buyer and supplier can also lead to imbalances in bargaining power. The lack of reliable information includes supplier reliability and competences (i.e. can suppliers fulfil the order?) or pricing agreements. This uncertainty affects transactional behaviour. The frequency of the transactions can also determine the governing structure. The greater the number of transactions, for instance, the more likely firms will strive to have greater control over activities rather than leave the transaction open to the market.

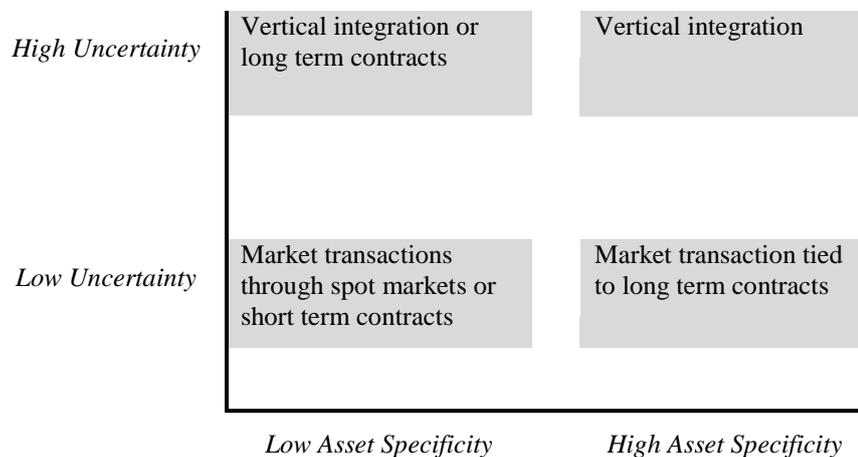
There are situations where uncertainty and frequency can be important but according to Williamson, asset specificity is the most important determinant of market structures (Williamson 1981). Asset specificity reflects the uniqueness of the product or service. The greater an asset's uniqueness, the less it will have any value outside that specific transaction. If assets are nonspecific, markets enjoy advantages in both

production cost and governance cost. The degree of asset specificity is the critical variable in determining market structure.

3.2 Governing structures

The transaction cost model follows the neo-classical economic tenet of perfect competition (i.e. markets are not oligarchic or monopolistic), which requires a firm to be a price taker (Mas-Colell, Whinston and Green 1995). However, unlike neo-classical economics, TCE recognise that firms do not always behave rationally, particularly as information is asymmetrical. TCE and neo-classical economics follows a positivist or, rather, post-positivist, worldview, which requires predictability and verification (Creswell 2003). A positivist theory sets out to identify and interrogate the causes that affect or influence outcomes. The logical outcome of the TCE behaviour variables and external variables lead to predictable governing structures. The TCE attributes inform why vertical integration (i.e. the firm), alliances or relational contracting (long term contracts) and spot market transactions are formed (Williamson 1985). Figure 2 depicts the predictive governing structures assigned by uncertainty/ frequency factors and asset specificity factors.

Figure 2. Determinants of governing structures



Source: Author's interpretation

The potential for opportunistic behaviour is most likely to occur when an exchange requires one or both parties to require unique assets investments (high asset specificity) (Klein 1983). When asset specificity and uncertainty is low, and transactions are relatively frequent, transactions will be governed by the market.

Medium level asset specificity can lead to co-operative alliances between the organizations. These long term relations can be based on trust, in as much as both partners have the potential for opportunistic behaviour but choose not pursue this course given that positive benefits may outweigh the negative costs. More likely, long term transactional relations incur higher contractual monitoring costs.

Hierarchical governance - that is, placing control of activities under the control of one firm - occurs when uncertainty and high asset specificity lead to transactional difficulties. Should the boundary of a firm be extended to include a wider spectrum of components and inputs then this will correspond to fewer transactions. This may be prudent if there is uncertainty of supplier price (i.e. opportunism), the cost of managing the price negotiations and supervising supplier production (i.e. the cost of asset specificity is high). An hierarchical or firm structure will bring about a savings in transaction costs (Pitelis and Pseiridis 1999).

Spot or open markets are the other governing structures. These market transactions take place under conditions with minimal price negotiations and rarely require lengthy contracts (if any) (Kay 1993). A firm may enter into market exchanges when there are many suppliers/ sellers (to offset bargaining power of the supplier) and the product is not a customised product or service (a standard product). Examples of business-to-business transactions include standard components and material inputs. Transaction costs are low because the asset specificity and price and delivery uncertainty are low.

Williamson argues that when asset specificity is high, it is likely that hierarchical governance will be the preferred market structure as the unique assets are costly to re-deploy as an alternative (Williamson 1981) . Empirical studies have supported Williamson's view that high asset specificity leads to hierarchical governance (Shelanski and Klein 1995; Rindfleisch and Heide 1997). Lower uncertainty can mitigate the desire for vertical integration despite high asset specificity however (Harrigan 1985). High uncertainty can increase the use of hierarchical governance (Walker and Weber 1987).

The evidence, therefore, is not conclusive as to the most appropriate governance structure when firms face uncertainty (an example of which is innovation). In this light, uncertainty as to future behaviour or outcomes is a factor which can affect

governance. Current or past outcomes are affected by the existing governance structure. Further research into the relationships between specific governing structures and innovation is proposed in Section 7 (Research Questions).

3.3 Critique of transaction costs: agency

The TCE framework proposes that market structures are informed by transaction types. It is the composition and cost of these transactions – primarily the uniqueness of the product or service – which determines the boundary. The emphasis on rational decision-making and, more explicitly, transactions, is overstated in many cases. The firm should be placed in a social context, with an engrained history of routines and power relations. A firm consists of an owner(s), managers and employees. This negotiated hierarchy constitutes the roles and functions within the organisation. Principal – agent theory explores the tensions that arise between the different groups that vie for control and implementation of the firm.

Different agents acting on different levels of information, for example, deliberate decisions on production, new product development and strategy. Such information asymmetry is the central tenant in formulation of organisations. Agency theory provides insights into co-operative and competitive relationships and certain risk behaviours, particularly when groups are negotiating change (Eisenhardt 1989a). For example, internal power structures can determine which activities are undertaken and how effective the outcomes are. Power relations will have to be factored into any strategic decision involving the introduction of new skills or a negotiated wage bill especially if new activities or an expansion of the activities are considered. If the new undertaking proves to be too costly, a firm will look outside its own domain for the supply of goods. Agency theory recognises that constituents do not have equal access to information (unlike neo-classical economics) and this can handicap new developments should employees have to take on new skills and technology.

Power relations can also be a factor with buyer power steering and blocking the activities of suppliers (Gereffi, Humphrey and Sturgeon 2005). The value chain perspective extends the boundary of the firm to include buyers, suppliers and support organisations. Dominant firms ‘govern’ the chain by setting prices, quality, logistics and other targets across the entire supplier spectrum, including component suppliers, service providers and raw materials suppliers. A distinction can be made between

two types of governance: those cases where the coordination is undertaken by buyers (buyer-driven chains) and those in which producers play the key role ('producer-driven chains') (Gereffi 1994). Governing firms effectively hold power by controlling key market-access functions such as distribution, brand names and retail. Buyers leverage their purchasing power by setting value criteria, which tend to be non-negotiable. Firms can also direct the scope of innovative activity including the potential to improve or upgrade innovation performance (Kaplinsky, Morris and Readman 2002a). Industrial organisation theorists saw economic activity controlled by large firms extending ownership over vertical monopolies (Conner, 1991). In the governing context, firms can dominate supply chains by controlling access to final markets and end-users while relinquishing any financial risk of ownership.

Agency theory views of internal power and the accompanying co-ordination of suppliers and customers contribute only partially to our understanding of the boundary of the firm. What the theory does not explore are technological trajectories which are time bound by the underlying base technology. This is referred to as path dependency where organisational knowledge (and routines) project along a vector (Teece, Pisano and Shuen 1997). The TCE model does account for technological determinants through asset specificity. But technology assets are only seen through the lens of costs and market governing structures. The TCE model does not provide a satisfactory explanation why some firms have those capabilities.

The activities managed by a firm form the procedures and routines to not only produce goods and services but also entail the competence to create and design new products and services. Production capacity cannot explain the learning processes required to undertake the new. Learning by doing does contribute to increasing production efficiencies and incremental improvements, but this alone does not account for innovation (Arrow, Karlin and Scarf 1962). Deciding what new products or services to develop or the direction to improve production processes is associated with capabilities and cost factors. The power structures may be important, particularly during the idea screening and selection process (Frost and Egri 1990; Jones and Stevens 1999) and this negotiated process primarily influences the results. Firms have to have some notion of innovation capacity which agency can influence. Social power within an organisation can also support collaboration or social closure,

which can particularly fruitful in supplier-buyer innovation (Scarbrough 1995). How a firm arrives at the new outcome is less important at this point so long as it has the competences to get there.

Agency – through the extension of buyer power – may have an impact on innovation performance. Agency is included as a research question in Section 7.

4 Resource-based view and outsourcing

In the case of the TCE model, the transaction is the unit of analysis and is the defining factor which determines the boundary of the firm (Williamson 1985). Other strategy writers focus on the firm as the key agent in economic activity. This orientation does not discount asset specificity but elevates human skills and physical assets above opportunism and bounded rationality. In particular, the ability to learn and adapt organisation capabilities are critical to the growth of the firm and, specifically, to the development of new products and processes in particular. These resources and competences are significant contributing factors to defining the boundary of the firm.

The resource –based view (RBV) provides a further explanation of outsourcing. This framework emerged in the strategic management literature during the latter part of the 1980s and is applicable to decisions affecting competitive advantage. In as much as it is an instrumental management analytic framework which has been extended to an operational settings, the RBV is not part of the neo-economic discourse³. The treatment of the firm by RBV proponents complement evolutionary economics and the influential work on organisational routines and learning by Nelson and Winter (Nelson and Winter 1982),

4.1 Resources and capabilities

While the transaction cost model provides a platform to explain different governance mechanisms, the resource-based view considers the activities of the firm to determine the relative level of vertical integration by stressing that it is strategy which will determine which activities are undertaken in-house or outsourced. The resource-based view holds that high performing firms formulate strategies which

³ The work of Romel is an exception: Romer, P. M. (1986). "Increasing Returns and Long-Run Growth." *Journal of Political Economy* 94(5): 1002.

match their unique organisational resources and capabilities (Wernerfelt 1984; Barney 1991; Rumelt 1991). A successful strategy can only generate sustainable performance if the resources used to formulate a strategy are valuable to the customer; resources can be sustained and cannot be imitated by competitors (Barney 1991). This definition has two implications: first, firms configure these resources to create competitive advantages and, second, strategic resources reflect the ability of a firm to reconfigure and utilise (other) resources successfully in a future offering (Barney 1991; Spanos and Lioukas 2001). The first concerns the manifestation of current value and the second concerns the potential of future value through dynamic capabilities.

In her seminal 1959 work, Penrose recognised that firms are embedded with tangible and intangible resources (Penrose 1959). Resources that contribute to competitive advantage include tangible assets such as technology, brand-names and employees and intangible organisational routines (Nelson and Winter 1982). Moreover, Wernerfelt suggested that resources could be, “tied semi-permanently to the firm” (Wernerfelt 1984 p. 172) thereby extending the analysis beyond the formal firm boundary to include supply chains, customer relations and other contributing business partnerships. Scholars have defined resources and capabilities separately: resources are assets controlled and managed by firms while capabilities are the exploitation of these resources for a specific purpose (Amit and Schoemaker 1993; Spanos and Lioukas 2001; Mills, Platts and Bourne 2003). Resources and capabilities can also be grouped into functional categories (i.e. R&D, distribution, fabrication, marketing, etc.) which is similar to the value chain activities described by Porter (Porter 1985; Grant 1991).

Table 1 segments into two categories those resources controlled directly within and those outside the immediate boundary of the firm.

Table 1. Typology of resources and capabilities

Type	Features
Firm-specific	<ol style="list-style-type: none">i. Tangible assetsii. Primary inputs and semi-finished productsiii. Processes such as routines; systems and procedures; intangible capabilities including individual and organisation(al) knowledge
Value-chain	<ol style="list-style-type: none">i. Strategic alliancesii. Co-operative venturesiii. Inter-organisational communication webiv. Market-relationshipsv. Distribution/ logistics

Adapted from (Readman and Grantham 2006)

The unit of analysis for the RBV is the firm and this wider focus covers several tangents of management theory. Prahalad and Hamel extended their study to corporate core competences (Hamel and Prahalad 1994). Other authors restricted their analysis to smaller business units (for example, Selznick 1957; Liedtka 1999). A corporate analysis can reveal critical technological competences across subsidiaries and global brand name recognition but this large scope can overlook less obvious resources and capabilities such as those encased in project teams for instance. The business unit, on the other hand, is small enough that intangible factors can be revealed while shared corporate factors remain visible. The business unit also faces similar management issues found in small and medium size firms which allow comparisons. However, there are many legal, formal and informal types of business units which dissuade the use of large-scale surveys. Detail and exploratory studies are appropriate at the business unit level while large scale surveys should make use of the larger corporate/ business entity (unless the business unit is easily disentangles from the larger organisation).

4.2 Dynamic capabilities

The third characteristic of a RBV framework also reflects the ability of firms to change their offering. Strategic upgrading is the change process firms undertake to form a new competitive advantage through the application of capital investment, managerial coordination and dynamic capabilities (Teece, Pisano and Shuen 1997). Dynamic capabilities are the resources and capabilities that a firm draws upon to affect change such as organisational learning routines. These capabilities are limited by the history of the firm such as technological trajectories (Teece, Pisano and Shuen

1997) market (e.g. knowledge of market characteristics deter new market exploration) and relationships (e.g. dependent on buyer networks).

Firms call on dynamic capabilities to upgrade production processes, products and services, business functions (and links between functions) and inter-firm coordination and communication web (e.g. supply chain management, marketing relations, etc.). Firms can also apply these capabilities to move into new markets (and perhaps in the longer term, new value chains). Examples of dynamic capabilities include:

- i. internal capabilities which are explicit and homogeneous such as product development and strategic decision making (Eisenhardt and Martin 2000);
- ii. internal capabilities which are tacit and heterogeneous such as knowledge resources (Grant 1996; Kogut 1996); and finally
- iii. inter-relationship capabilities including commercial alliances (Lorenzoni and Lipparini 1999; Eisenhardt and Martin 2000) and firm cooperation (Schmitz and Knorrninga 2000; Bessant, Kaplinsky and Lamming 2003).

4.3 Critique of the resourced-based view

Several theorists have raised concerns about inadequate measurements and tests of the resource-based constructs. Foss and Knudsen argue that the RBV can be reduced to two properties, namely uncertainty and immobility (Foss and Knudsen 2003). The themes which resonate for strategists are competitive advantage and how such advantage can be sustained. Critics of the resource framework point out that the RBV is a tautology since 'valuable' and 'competitiveness' is often interchangeable (Barney 2001; Priem and Butler 2001a; Priem and Butler 2001b). However, as Foss notes, definitions are important and RBV proponents mix terms needlessly (Foss and Knudsen 2003).

The second RBV property, sustainability, is affiliated with the barriers of entry characteristic found in the value chain framework. Mills and Platts (Mills, Platts and Bourne 2003) suggests three variations of the theme *sustainability*: resources and capabilities must be difficult to copy, they cannot be substituted and they must be durable. The first two attributes relate to competitors and are similar to the threat of new entrants and the threat of product substitution (Porter 1985). The third sustainability attribute refers to the long-term reliance firms place on these resources.

Resources that require high maintenance or degrade quickly are also high risk resources. In this light, sustainable strategic resources should be viewed as knowledge resources which can provide increasing returns rather than physical resources which provide diminishing returns once used.

The third RBV property denotes strategic resources with transferability characteristics. Transferability implies that strategic resources are not tied to one market and can be applied to open up new markets (Hamel and Prahalad 1994). Examples of this property tend to focus on competences particularly the depth of technical and organisational knowledge required to mould and manipulate technology for new products and processes. This technology emphasis downplays the importance of the more market-oriented resources such as customer networks and other market-based knowledge resources.

Williamson notes that the empirical evidence presented by RBV pundits cannot be falsifiable and questions the theoretical claims (Williamson 1999). Preim (Priem and Butler 2001b) attempted to apply the theory testing threshold proposed by Bacharach: a theory should be falsifiable through empirical testing and be used to explain and predict using empirical data (Bacharach 1989). According to Preim, the RBV does not meet the theory qualification because the inclusive list of competences which could be strategic cannot be measured until the application has first taken place (Priem and Butler 2001b). Barney retorted that the resource based view provides the attributes of what the resources should hold and it was up to the firm to apply this attribute framework rather than follow a list of ready-made resources (Barney 2001). This debate has not been resolved to date.

Finally, the RBV suggests that resources must increase in efficiency and effectiveness over time in order to be valuable (Barney 1991). Value is an expression of worth placed on goods and services by the purchaser (the firm may place a starting value based on costs and an expected profit rate but it is the buyer that confirms the transaction and thereby legitimises real value). Do firms create value through the configuration of resources without reference to buyers as RBV theorists appear to suggest? Customer interfaces such as relationship marketing are recognised but there is no explicit process in the formal RBV literature which alludes to the preferences of buyers.

The relationship between customer preferences and innovation form one of the research questions raised in Section 7.

5 Resource-based and transaction cost model of outsourcing

According to the TCE model, firms integrate activities to minimize the costs that could arise from supplier opportunism and uncertainty and frequency in market exchanges. Within the transaction costs model, outsourcing occurs when the transactions costs associated with asset specific investments and information asymmetry (e.g. uncertainty) are lower than the cost advantage associated with production costs charged by the outsourced agent. From a RBV standpoint, firms implement make-or-buy decisions by identifying the resources and capabilities which provide high value (i.e. strategic resources and capabilities) and then outsourcing which provide little or no added value (D'Aveni and Gunther 1994; Greco 1997; Quinn 1999). The decision to outsource is based partially on the comparative capabilities of rivals, customers or suppliers. These capability evaluations are revealed through proxies criteria such as price and quality measures (Jacobides and Winter 2005).

In fact, TCE and RBV are complimentary frameworks and contribute to a deeper understanding of the outsourcing phenomena (Williamson 1999). This does not necessarily mean that the TCE and RBV characteristics of outsourcing are identical: empirical studies suggest that an inverse correlation may exist between the two models and that any decision to outsource is partially deliberated through a capability-costs trade-off analysis (Jacobides and Winter 2005).

McIvor proposes that outsourcing is the interaction between a TCE and RBV analysis of distinct functional activities (McIvor 2009). Activities can include production, design and marketing, which are often considered core to the business. Non-essential activities can include administration and logistics. The most probable TCE factors, which influence outsourcing decisions, are the costs associated with asset specificity and the potential for opportunism. The greater the asset specificity – that is, an activity which is unique and essential – and the potential for suppliers to pursue opportunistic paths which may place firms at a disadvantage, the greater the attempt by firms to bring this activity or asset under an internal hierarchy (in-house). The costs associated with asset specificity include the direct costs of performing the

activity and the costs of managing the transaction. The RBV factors refer to the formal or informal capability assessments of the different activities performed by the firm and suppliers: if the firm has greater internal capabilities than suppliers do, then it will keep the activity within the internal boundary.

McIvor proposes two situations where TCE and RBV factors coincide (McIvor 2009 p.60):

- i. there will be a greater the likelihood that an activity will be performed internally when firms have a superior resource position and there is a high potential for opportunism (i.e. high asset specificity). Positions can be determined by firm-specific and value chain resources (Readman and Grantham 2006); and
- ii. alternatively, a greater likelihood that an activity will be outsourced will occur when firms have a weaker resource position and there is low potential for opportunism (low asset specificity).

Furthermore, two ambiguous positions can also occur:

- iii. when firms have a superior resource position and a low potential for opportunism (low asset specificity); and
- iv. when firms have a weak resource position and there is high potential for opportunism (high asset specificity).

When these latter two situations occur (Position iii and Position iv), other factors can influence an outsource decision, such as principal-agent relations (McIvor 2005).

The outcomes arising from these decisions can often lead to inconsistent performance.

6 Outsourcing and innovation performance

Continuing from the tradition established by Coase, management strategists and industrial economists inquired why performances differ amongst firms. The external environment can be one determining factor which affects performance. For management scholars like Porter, business strategies are the responses to outside forces: firms can direct resources to exploit a market niche in order to achieve higher entry barriers (Porter 1985). The resolution of a market niche position is a sensible strategic framework for firms to follow in mature industrial structures that

are characterised by sluggish technological change, for example traditional manufacturing industries such as furniture. Of course, factors other than technology can interrupt a steady state. For instance, customer demand, new market entrants and shifting power among suppliers and buyers can upend differential strategies (D'Aveni and Gunther 1994).

In markets which are experiencing technological change such as research-intensive industries like the pharmaceutical industry, firms which can draw upon strategic resources and capabilities particularly through dynamic capabilities, that are particularly effective. It is the superior utilisation of internal and value chain resources and capabilities which brings about higher rents according to the RBV perspective (Peteraf 1993). From this position, an optimal governing structure can be applied to core and peripheral activities. Firms that follow an optimal TCE-RBV outsourcing strategy should generate superior performance.

The most sought after outcome from an outsourcing strategy is improved financial performance, specifically through lower cost bases. Cost advantages typically arise through outsourcing rather than vertical integration (Bettis, Bradley and Hamel 1992; Quinn 1992; D'Aveni and Ravenscraft 1994; Lei and Hitt 1995; Kotabe and Murray 2004). For example, consider a firm that outsource production activities to low cost producers. This firm expects manufacturing costs to decline but total costs will only decrease if the transaction costs incurred to manage the outsourced transaction do not offset any savings gained from the lower manufacturing costs. Outsourcing will reduce further investment in manufacturing capacity and lower fixed costs should lead to a lower break-even point. The cost improvements justify most outsourcing decision. Seen in this light, outsourcing is an attractive method to improve a firm's financial performance, especially in the short run (Harrigan 1985).

Holcomb and Hitt suggest that strategic outsourcing provide advantages besides cost (Holcomb and Hitt 2007). Firms can provide unique capabilities along the value chain through standardization and which simplify supply chain co-ordination (Jacobides and Winter 2005). For example, outsourcing can provide firms with production flexibility: firms can change suppliers to take advantage of new technologies and better capabilities or more cost effective technologies. Supplier flexibility can enable firms to respond faster to market variations (Dess, Rasheed,

McLaughlin, Priem and Robinson 1995). Outsourcing can also affect innovation performance.

6.1 Innovation performance

The OECD defines three types of innovation: process; product and marketing (OECD 2005). Process innovation involves changes to the methods in which products and services are made and delivered. New products are associated with new designs or new technological characteristics. Design features can include cosmetic, colour, and other visible features. Technological product innovation can include components, modularity, and architectures and platforms (Henderson and Clark 1990). New marketing concepts include the introduction of brand-names and marketing strategies, which are new to the firm or industry, are integral activities to successful firms. This study is particularly interested in product and process innovation and not marketing innovation.

Measuring innovation performance at the organisational level includes input measures, process measures and outcome measures (Godin 2004; Adams, Bessant and Phelps 2006). While some indicators can be used to measure both, it is important to distinguish between product innovation measures and process innovation measures. Not only are the outcomes obviously very different, different input assets and capabilities are required. Production often encompasses incremental process innovations, which can lead to higher productivity. Process innovation can lead to lower production costs, improved production times, i.e. produce goods and services faster, and higher quality. The management drive for total quality management (TQM), continuous improvement (CI) and lean manufacturing, has established quality performance as the pinnacle of process innovation (Slack, Chambers and Johnston 2010).

Historically the costs associated with new product and service development, as a proportion of total costs, have been lower in traditional manufacturing than in research-intensive industries (Von Tunzelmann and Acha 2005). Low technology industries such as furniture, shoes and apparel entail design and incremental product changes. Advanced technology firms, with high levels of engineering and applied science research activity, incur significant development costs and lowering these costs is a management priority (DiMasi, Hansen and Grabowski 2003). Accelerating

the development process can also be a priority, especially when first to market is seen as a competitive strategy (Gupta and Wileman 1990). Output measures centre around ratios such as turnover of new products as a share of total sales, etc.(Page 1993).

Innovation performance metrics can also reveal patterns across countries and industries (Brown and Eisenhardt 1995). Science and technology indicators, which focus on technology bases and not specific product and process innovations, include the following:

- i. R&D data such as R&D expenditure as a share of total expenditures and the number of scientists and technicians as a share of total employed (Smith 2005);
- ii. patent data including applications, grants and patent citations (for example, Meyer 2000), and finally
- iii. bibliometric data (publications and citations by organisation and scholars) (Coombs, Narandren and Richards 1996; Fagerberg, Fosaas and Sappasert 2012).

Industry benchmarking exercises and self-assessed surveys are also used to measure innovation performance. Firms evaluate their product and process innovation activities in terms of an industry average or relative position. For example, the Community Innovation Survey, which is launched every three years in the UK and other European countries, ranks innovation along a innovativeness scale (DTI 2005). Ordinal scales are used to compare outcomes with competitors, whether initiatives were successful and if firms are innovation active.

6.2 Outsourcing and innovation literature survey

A second search of the Web of Science databases was undertaken using two search filters: (i) articles published from 1970 to 2012 and (ii) topics: outsource AND innovation. The search identified 380 peer reviewed articles, 173 proceeding papers and 25 books/ book chapters. The search was refined to include only articles and books/ book chapters.

An *h*-index is applied which provides ranking criteria to the research findings. This algorithm discounts the disproportionate weight of highly cited papers, or papers that

have not yet been cited (Hirsch 2005). The *h*-index can be used as a filter for citation and article selection exercises and is, “a reliable indicator of scholarly impact and influence” (Cronin and Meho 2006 p. 1278). The *h*-index results for outsource AND innovation is 34. An *h*-index of 34 signifies there are 34 articles that have 34 citations or more. Upon examination, five articles from the top 34 articles were not relevant. A follow-up search revealed an additional three articles which discussed performance and outsourcing but did not highlight innovation as a topic (N=32).

The survey results are presented in Table 2. This table lists the authors, the main findings and the applied research method. The articles are ranked by the number of citations (as of 2012).

Table 2. Summary of academic articles on outsourcing and innovation ranked by number of citations, 1970-2012

Article	No. of citations	Findings	Research methods
(Brusoni, Prencipe and Pavitt 2001)	290	Technology knowledge and innovation capabilities are needed when outsourcing in multi-technology complex products	Case studies
(Chesbrough and Teece 1996)	189	Outsourcing decisions should consider innovation outcomes. There is no one strategy which supports innovation and outsourcing	Case studies
(Feeny and Willcocks 1998)	173	Firms require unique capabilities to manage their IT outsourcing	Case studies
(Quinn 1999)	169	Outsourcing core activities with key collaborators can free resources for innovation	Case studies
(Gilley and Rasheed 2000)	164	No direct effect of outsourcing on innovation performance. However, both firm strategy and environmental dynamism moderated the relationship between outsourcing and performance	Survey of various industries
(Takeishi 2001)	164	Capabilities required to manage supplier involvement in new product development	Survey of Japanese auto industry
(Quinn 2000)	159	Outsource key activities and tasks of the innovation process can lower costs, accelerate development time and deliver greater impact.	Case studies
(Chesbrough and Crowther 2006)	132	Open innovation can complement existing R&D capabilities	Case studies/ interviews
(Leiblein, Reuer and Dalsace 2002)	121	Neither outsourcing nor internalisation results in higher technological performance. Technological performance is diminished when contractual safeguards are inadequate	Survey of semi-conductor industry
(Fontana, Geuna and Matt 2006)	96	Firms outsourcing R&D activities make use of RTO collaborations	Survey

Article	No. of citations	Findings	Research methods
(Takeishi 2002)	96	Outsourcing product design to suppliers still requires firms to hold technology knowledge	Survey of Japanese automakers
(Mudambi 2008)	94	Overview of vertical integration and specialisation and how these two strategies can affect innovation	Case studies of mobile phone industry
(Prencipe 1997)	70	Retain strategic production and R&D activities to ensure technological capabilities	Case study of aircraft engine manufacturer
(Rothaermel, Hitt and Jobe 2006)	69	Balanced outsourcing and integration strategies delivers superior product innovation performance	Secondary data analysis on the microcomputer industry
(Narula 2004)	62	SMEs have flexibility and agility attributes but large firms have gained advantages through collaborations and managing multi-technology complexity	Interview survey of 25 firms and descriptive data
(Christensen, Verlinden and Westerman 2002)	62	Authors suggest that vertical integration is appropriate when new technology and functionality is new	Theoretical construct
(Higgins and Rodriguez 2006)	53	Low R&D productivity can lead firms to attempt vertical integration, primarily in R&D activities	Secondary data and surveys of the pharmaceutical industry
(Sobrero and Roberts 2001)	49	The type of problem-solving activities outsourced and their level of interdependency with the rest of the project are important predictors of performance outcomes	Survey data from 50 supplier-manufacture relationships within one multi national
(MacPherson 1997)	49	External specialized technical services can support the product development efforts of innovative firms	Survey of 400 manufactures in NY state
(Miozzo and Grimshaw 2005)	48	Despite modularity , service intangibly exacerbates the conflicts between clients and IT suppliers, which may present obstacles to innovation	Qualitative data from German and UK IT services firms
(Mol 2005)	44	Outsourcing R&D becoming popular in R&D intensive industries	Empirical data from the Netherlands
(Narula 2001)	43	R&D outsourcing is most often undertaken where multiple, substitutable sources are available	Theoretical
(Linder, Jarvenpaa and Davenport 2003)	42	Strategies for outsourcing innovation	Case studies
(Carson 2007)	40	Different tasks require different levels of control by firm when outsourcing parts of NPD.	Interviews and survey data

Article	No. of citations	Findings	Research methods
(Nellore and Balachandra 2001)	38	Firms that outsource components or system development should focus on customer specifications, supplier involvement, project management, and purchasing to ensure project success	5 case studies from Euro auto industry
(Ro, Liker and Fixson 2007)	37	Modularity outsourcing is primarily cost savings in the US auto industry. Toyota uses modularity outsourcing for cost savings and mass customisation	Case studies in the auto industry
(Parker and Anderson 2002)	37	Outsourcing new product development can be supported by supply chain integrators	Case studies
(Hoecht and Trott 2006)	35	Risks of outsourcing core activities associated with information linkages and supplier opportunism in R&D and technology intensive industries	Case studies
(Scarbrough 1995)	35	TCE is incomplete and does not account for technical knowledge development. The role of social action / agency can explain why transactions succeed	Case studies
(Howells, Gagliardi and Malik 2008)	34	Outsourcing R&D is associated with applied and less core activities	Survey of pharmaceutical industry
(McIvor 2009)	33	The importance of performance management, operations strategy, business improvement and process redesign to the study of outsourcing are explored. The findings indicate contradictory prescriptions in some instances.	Case studies
(Storey, Quintas, Taylor and Fowle 2002)	30	Secure employment contracts has some association with innovation. But there are stronger connections showing flexible labour is a consequence of innovation	Survey and case studies

Source: Author's review and Web of Knowledge (www. <http://apps.webofknowledge.com> accessed 5 March 2013)

While most articles discuss outsourcing and innovation, these highly cited articles cover more than one theme. The findings, while not contradictory, do not provide clear evidence of causal associations. One set of literature raised concerns that outsourcing could lead to the depletion of technological capabilities such as technology scanning. Research in this area is overwhelmingly predisposed towards research and development, technological development and product technology innovation. Technological capabilities in production and new product technology could be under threat if outsourcing is over-extended (Chesbrough and Teece 1996; Christensen, Verlinden and Westerman 2002). Technology outsourcing can be

particularly detrimental for firms working in complex technologies or multi-technology platforms (Prencipe 1997; Brusoni, Prencipe and Pavitt 2001). In this light, firms should consider holding onto production and R&D competences. It can even be prudent for firms to retain technology capabilities even if production is outsourced in order to deter supplier opportunism (Brusoni, Prencipe and Pavitt 2001). Findings suggest a middle path to outsourcing is advisable. Chesbrough found that no one strategy supports innovation and outsourcing (Chesbrough and Teece 1996) However, outsourcing decisions should at least consider innovation outcomes.

Capabilities and how they are affected by outsourcing is a topic explored by a number of studies. Two viewpoints emerge: first, firms should retain technology capabilities even if outsourcing is pursued and second, firms should develop new capabilities to manage outsourcing. Firms which collaborate with suppliers in new product development ventures in the auto industry should control key tasks (Takeishi 2002). Success can depend on which tasks of the project are retained and how the outsourced tasks are integrated (Sobrero and Roberts 2001; Carson 2007). Successful implementation of projects may also require new management capabilities. For example, capabilities which support supplier involvement in new product development are very different than managing supplier procurements (Takeishi 2001). Supply chain integrators are one solution to managing many outsourcing partners (Parker and Anderson 2002). Leiblein found that capabilities to monitor and enforce supplier contracts can enable microprocessor technology developments rather than following specific outsourcing or vertical integration strategies (Leiblein, Reuer and Dalsace 2002). Other enablers, particularly component modularity, have facilitated outsourcing. While modularity is mostly used to assist cost reductions, Toyota has succeeded to integrate suppliers into its mass customisation strategies through component modularity and production sharing (Ro, Liker and Fixson 2007). Other authors have noted that social obstacles may have to be overcome despite technology enablers (Scarbrough 1995; Nellore and Balachandra 2001).

Several studies found no association between innovation performance and outsourcing. Gilley surveyed several industries and found no effects of outsourcing

on financial and innovation performance (Gilley, Greer and Rasheed 2004). Evidence suggests that governing structures per se do not affect performance so long as greater effort is placed on managing and monitoring contracts. Leiblein reported that technology performance did not differ among firms which outsourced or performed activities in-house in the micro processing industry (Leiblein, Reuer and Dalsace 2002). Performance improves if contract safeguards are in place however. Carson also noted that firms should focus on the early stages of contract negotiations when outsourcing creative tasks in new product development projects (Carson 2007). The nature of innovation can even guide governing structures. For example, vertical integration is appropriate when new technology and functionality is evolving (Christensen, Verlinden and Westerman 2002).

The number of studies investigating outsourcing and process innovation is minimal. McIvor explored the relationship between outsourcing and business improvement performance (McIvor 2009). He applied a TCE/ RBV framework to case firms but did not find any association between outsourcing and innovation was inconclusive. Storey explored the role of employment contracts and their impact on product and process innovation. Secure employment does show some positive association with innovation (as security should facilitate loyalty and effort). Firms made use of flexible labour contracts to meet production spikes, to reduce labour costs or to access difficult to attain capabilities. Innovation is not an objective when taking on contract employees: “the potential impact (negative or positive) on innovative capacity was usually not taken into account (Storey, Quintas, Taylor and Fowle 2002). There are opportunities for future research to explore the possible association between outsourcing effects on process innovation, as this topic is underdeveloped. Outsource innovation and open innovation is an important business strategy. Quinn wrote extensively about outsourcing. Building on the core competence framework introduced by Prahalad and Hamel (Prahalad and Hamel 1990), Quinn introduces a particular perspective on strategic outsourcing (Quinn and Hilmer 1994). This article introduced a framework which firms could use to identify and select activities to manage internally and those activities to outsource. The paper differentiated production activities as core or peripheral to a firm’s performance. The resources released from not performing peripheral activities could be directed to advancing

core activities. Quinn followed up by suggesting that outsourcing knowledge related services could generate greater innovation performance such as lowering development time, lowering costs and sharing risks (Quinn 1999)⁴. A full innovation outsourcing model is finally advanced by Quinn in which new ideas can be generated faster and costing less than if R&D, product development or business improvements are performed internally (Quinn 2000).

The changing governance structure of R&D activities now includes collaboration and innovation outsourcing. Innovation collaboration has taken the form of open innovation where external knowledge sources can complement existing innovation capabilities (Chesbrough and Crowther 2006). Outsourcing is particularly prevalent in industries that require intensive R&D, which was found to be new trend in the Netherlands (Mol 2005). Outsourcing R&D succeeds when a competitive market, which offers a number of service providers, is available (Narula 2001). The emergence of knowledge intensive business services (KIBS) can facilitate R&D performance for those firms outsourcing innovation activities (MacPherson 1997; Fontana, Geuna and Matt 2006). Howell noted that despite the increase in R&D outsourcing, core tasks are retained by the lead firms, at least in the pharmaceutical industry (Howells, Gagliardi and Malik 2008).

6.2.1 Outsourcing and innovation literature: research methods

Most studies limited their inquiries to similar organisations or industries. Nonetheless, the research remains limited by the chosen methods. From the threshold selected articles, the number of research queries include 16 qualitative studies, 12 quantitative studies, two mixed research modes and two theoretical constructs. Case studies and interviews are important for theory building in the social sciences. Qualitative methods reveal insights in managerial practices and draw attention to possible trends and tacit dynamics which a blunt instrument such as a survey can overlook. There are limitations to case study research however. For instance, case studies can accumulate large volumes of details, and while this approach recognises complexity, such detail can lead to theory building which is narrow and overtly specialised (Eisenhardt 1989b). Unlike quantitative methods,

⁴ Proponents of new business model should be wary of relying on case examples as their sole research mode. Quinn cites Enron as an example of knowledge service provider.

case studies do not have gauges to recognise patterns and relationships. On the other hand, survey instruments require a common language and terminology to ensure comprehension. Survey questions make use of accessible and easy-to-understand concepts, which can support scale coding but can also dilute complexity. Variable selections and variable transformation can often be tenuous; for example Leiblein introduced a proxy for transistor density in order to measure technological performance and capabilities in the semiconductor industry (Leiblein, Reuer and Dalsace 2002). The authors did recognise that technology characteristics differ at the industry level however.

A mixed approach was undertaken by one study from the human resource field and one study from the marketing field. Notwithstanding both studies did not reveal strong causal links between outsourcing and innovation, the findings are enlightening. Storey undertook a comprehensive study which included case work and a survey (Storey, Quintas, Taylor and Fowle 2002). In another study, Carson showed that, in new product development initiatives, highly creative tasks performed by suppliers should be governed with more control at the preliminary (ex ante) transaction stage (Carson 2007). Attending to the contract terms of reference can lead to superior performance outcomes. Both studies used qualitative fieldwork to inform their survey questions but only Storey integrated the case material and quantitative findings.

Mixed research approaches are useful modes as they can account for unique firm and industry characteristics while quantifying variances in firm performance. A mixed study combines the strengths of qualitative and quantitative research. Qualitative research can provide details about firms and industries characteristics, including the type of activities performed, the structure of the supply chains, buyer preferences and the scope and nature of innovation. A follow-on quantitative approach could apply these attributes to a large sample.

7 Research questions

The preceding literature review raised several important issues. The core competence framework was particularly pertinent to management scholars in the 1990s (Prahalad and Hamel 1990). Their case studies provided evidence that attention to specific activities can bring benefits. By directing more resources to core

competencies, firms can support internal learning routines and extend these competences to (Dess, Rasheed, McLaughlin, Priem and Robinson 1995; Kotabe and Murray 2004). Quinn suggested that outsourcing can improve innovation performance, specifically R&D capabilities (Quinn 1999). Firms can reap rewards by collaborating with firms with complimentary or greater capabilities. The open innovation and customer-innovation frameworks suggest that outsourcing can enable innovation performance (Quinn 2000; Thomke and von Hippel 2002; Chesbrough and Crowther 2006). Future research should attempt to generalise these outsourcing patterns.

Gilley points out that evidence on the effects from outsourcing on innovation performance are mixed and firms could actually be at a disadvantage if they incorrectly outsource the wrong activity (Gilley and Rasheed 2000). This cautious strategy is supported by (Chesbrough and Teece 1996; Christensen, Verlinden and Westerman 2002; Rothaermel, Hitt and Jobe 2006). For example, outsourcing scanning and problem solving activities can lead to a depletion of research and development capacity as firms lose touch with new technological advances (Teece 1986; Chesbrough and Teece 1996; Brusoni, Prencipe and Pavitt 2001). Production outsourcing can also be detrimental as suppliers may gain technical knowledge and marketing insights. Asset specificity would suggest that firms would hold onto these activities but the evolutionary process of future technological developments cannot always be evaluated against short-term financial benefits.

These varying perspectives of the connections between outsourcing and innovation inform the first research question:

Is outsourcing associated with process and product innovation performance?

Unintended consequences can arise from outsourcing and affect future performance. As firms outsource production activities, firms can save on any expenditure required for future investments in plant and equipment (Bettis, Bradley and Hamel 1992). Alongside the savings of production technology investments will be the reduction of the wage bill; the total number of workers previously employed are no longer required to support the outsourced activities. Firms may require capabilities to manage outsourcing contracts but, will the loss of production capacity affect innovation performance? (Feeny and Willcocks 1998; Takeishi 2001).

When production capacity is relinquished, firms also release the capabilities required to perform these production tasks. The capabilities to perform production are closely associated with the capabilities to innovate. Process innovation and incremental product and design improvement are invariably tied to in-house production activities: innovation capabilities cumulative through a sand cone effect which requires continues application (Ferdows and Demeyer 1990). Production capabilities in complex or multi-technology industries also require capabilities to capture ever-changing (evolutionary) technological developments (Prencipe 1997). Therefore, the loss of production capacity could ultimately lead to the decline in process innovation capacity. The depletion of innovation performance from outsourcing presents a stark alternative to the strategic effort of upgrading operational capabilities over time (Wheelwright and Hayes 1985; Hayes and Pisano 1994). Again, these assertions arise from case material and an attempt to move this research towards a general theory necessitates a more robust method.

The second research question considers whether outsourcing can affect performance and the effective use of capabilities.

Are outsourcing, innovation capabilities and process and product innovation performance associated?

Studies have also shown that firm performance can be affected by strategy and external dynamics (Gilley and Rasheed 2000). Innovation performance can also be affected by these factors. The literature identified three alternative factors and include firms size (Cohen, Levin and Mowery 1987; Rothwell and Dodgson 1993; Narula 2004), strategy (Gilley and Rasheed 2000) and agency (Eisenhardt 1989a; Scarbrough 1995; Kaplinsky, Morris and Readman 2002a).

Do alternative factors influence process and product innovation performance?

The research questions are transformed into a set of testable research propositions in the next chapter.

Chapter 3. Setting the Hypotheses

The literature review presented in the previous chapter highlighted the importance placed on outsourcing decisions. The transaction cost and capabilities considerations tend to support financial performance (Harrigan 1985). Innovation performance outcomes arising from outsourcing are mixed, however. The literature review raised a number of research questions and in this chapter these are developed into testable hypotheses.

Research hypotheses are introduced to support theory testing. This study makes use of alternative hypotheses and include directional hypotheses (in which a predicted outcome is made) and non-directional hypotheses (in which no prediction is made). The null hypotheses predict that no relationships or no difference exists between groups (Creswell 2003). The first research question asks whether outsourcing and innovation performance are associated. A second set of inquiries explore the possible linkages among outsourcing, innovation performance and the effective use of innovation capabilities. Alternative explanations are introduced in the third set of research questions, which may offer complimentary explanations for any variances to innovation performance.

8 Associations between outsourcing and innovation performance

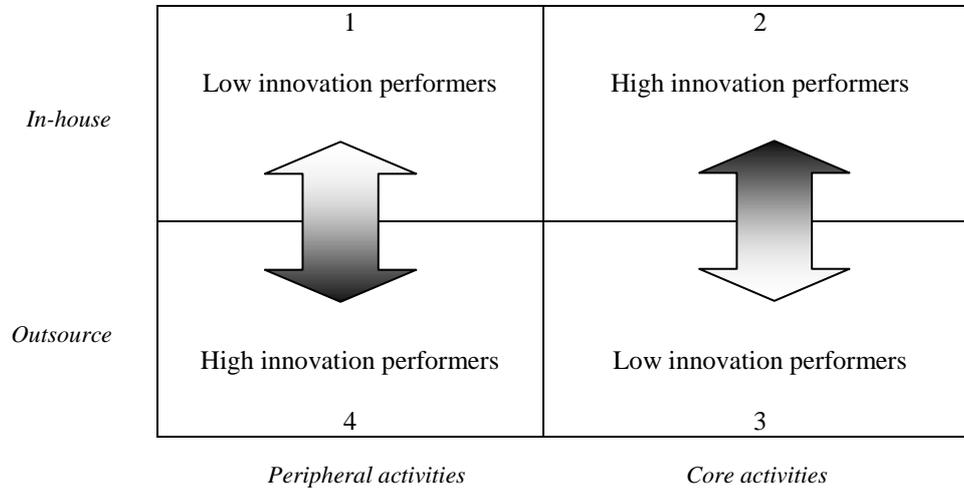
This study follows a post-positivist prescriptive view of strategy which draws causal associations between actions and outcomes. The objective of this study is an inquiry into possible relationships between outsourcing and innovation. Innovation is narrowly defined as new products (which include new designs) and improvements to production processes (OECD 2005). The first research question emerged from the literature:

Is outsourcing associated with process and product innovation performance?

Figure 3 presents an outsourcing and innovation-positioning model, which draws attention to the first two research propositions. Activities are classified using an outsourcing – value matrix. The y-axis indicates if activities are performed in-house or outsourced. Activities are registered as peripheral or core along the x-axis. The shaded arrows indicate the predicted outcomes. The darker shades of the up-down arrows indicate high innovation performers. The predictions for the first research

question compare two groups: (i) firms which outsource peripheral activities compared to firms which perform peripheral activities in-house , and (ii) firms which perform core activities in-house compared to firms which outsource core activities.

Figure 3. Proposed relationships between outsourcing and innovation performance



The literature provides two complementary but different perspectives on the relationship between outsourcing and innovation. The first perspective indicates that outsourcing can have a positive influence on innovation (Quinn and Hilmer 1994; Quinn 1999; Gilley and Rasheed 2000). The rationale underpinning this viewpoint is that firms outsource those activities which are peripheral (activities which are cheaper or performed equally or better by suppliers). Firms will be free to devote more resources towards innovation rather than activities that are not part of the core business (Bettis, Bradley and Hamel 1992). The decision to outsource peripheral activities follows the assumption that the resource position is weak and the costs associated with entering a market relationship are lower than maintaining the activity in-house. This proposition is shown in Figure 3 with the performance of firms in Quadrant 4 being greater than the performance of firms located in Quadrant 1.

This research inquiry is summarised in the first hypothesis (H1a).

H1a: Firms outsourcing peripheral activities are higher innovation performers than firms performing peripheral activities in-house.

The null hypothesis predicts no difference between the groups.

H1a₀: Innovation performance is not significantly different between firms outsourcing peripheral activities and firms performing peripheral activities in-house.

The second proposition offers an alternative perspective, namely, outsourcing has a negative effect on innovation activity. However, the focus in this inquiry is on activities which have high value to firms. Quinn suggests that collaboration or even outsourcing core activities, including innovation activities, can improve innovation performance (Quinn 1999; Quinn 2000). The open innovation and customer-innovation advocates also support this possibility (Thomke and von Hippel 2002; Chesbrough and Crowther 2006).

There is evidence, however, which contradicts this outcome. Firms which outsource core or strategic activities may have lower innovation performance than firms that keep core activities in-house (Chesbrough and Teece 1996; Gilley and Rasheed 2000; Hoecht and Trott 2006; Rothaermel, Hitt and Jobe 2006). Outsourcing core activities are associated with information linkages and supplier opportunism, especially in R&D and technology intensive industries (Hoecht and Trott 2006). Outsourcing production was noted to place aircraft technology firms at a disadvantage and Prencipe suggested strategic production and R&D activities should be retained to ensure technological capabilities (Prencipe 1997). Plambeck and Taylor draw attention to the example of contract manufacturing in the U.S. electronics industry. Innovation investment in this industry tends to be lower in those original equipment manufacturers (OEM) which outsource production (Plambeck and Taylor 2005).

Keeping core activities in-house follows the assumption that the resource base is strong and the costs of market or collaborative relationships are prohibitive. This predicted relationship is portrayed in Figure 3 with firms in Quadrant 2 outperforming firms in Quadrant 3. The second research hypothesis is summarised as:

H1b: Firms performing core activities in-house are higher innovation performers than firms outsourcing strategic activities.

The null hypothesis predicts that performance does not differ.

H1b₀: Innovation performance is not significantly different between firms performing core activities in-house and firms outsourcing core activities.

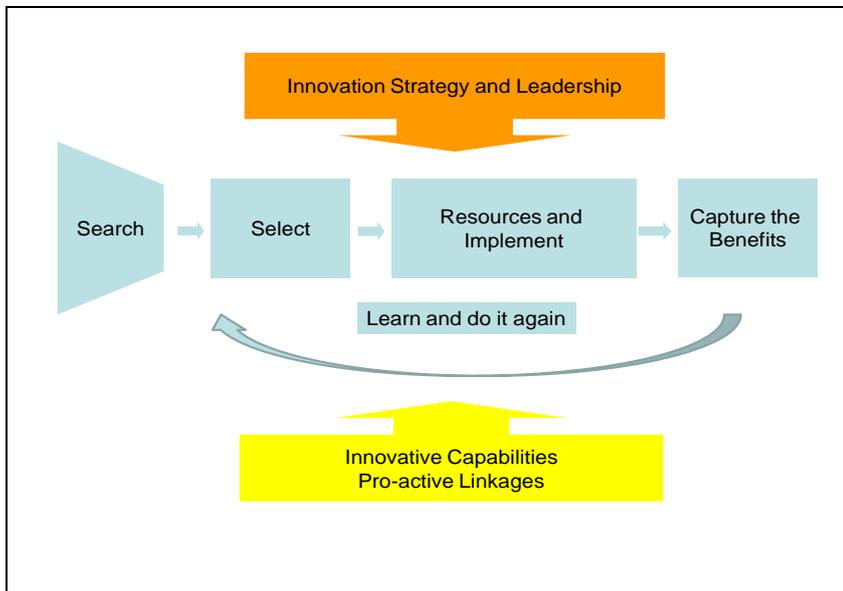
9 Dynamic capabilities and innovation

One possible explanation for superior innovation performance is the effective use of innovation or dynamic capabilities (Rothwell 1994; Eisenhardt and Martin 2000; Tidd, Bessant and Pavitt 2005). Figure 4 presents a simplified innovation process. At first glance, the innovation management model, proposed by Tidd and Bessant (and modified by the author), suggests innovation is an input-output process. In reality, innovation is not a linear process. Several reiterations, stop-gap steps and failures occur during the process which a straight line process cannot capture (Rothwell 1992). Nonetheless, this model is instructive as it illustrates the broad stages firms should consider in order to manage innovation effectively. The stages are informative rather than prescriptive and suggest several good practices to support successful innovation.

The innovation process entails moving an idea or concept through many steps to reach the market place; this process is steered by an innovation strategy supported by senior management. The first step in this process requires scanning capabilities in order to search for new ideas, concepts or technological developments. Searching entails internal and external exploration. The selection stage includes prioritisation of the different ideas and possible scenarios. This step includes an opportunity cost analysis of other uses of the resources (e.g. different applications of staff, financial investments, and plant and equipment). The implementation stage is critical to the whole exercise: on-going learning and technical improvements occur during the transformation from concept to proto-type to design and ready for manufacturing (Leonard-Barton 1995). Good practices which support the implementation stage include stage-gate project management and cross-functional team working (Cooper and Kleinschmidt 1995). The market launch includes the realisation of the financial benefits of a new product or the performance improvements derived from new and improved production processes (e.g. cost savings, improved quality, and faster production). Finally, effective innovators recognise that innovation is a process that can be improved. Learning mechanisms such as post project reviews are mechanisms

to ensure technical and organisational experiences can be emulated in future endeavours.

Figure 4. The innovation management process



Source: Adapted from (Tidd, Bessant and Pavitt 2005)

Successful innovators make use of adaptive practices and routines – or capabilities. Firms that succeed at developing and introducing new products/ services or improving production processes will often make use of a combination of internal practices and routines and external collaborations. These practices are not necessarily ‘best’ nor should the practices be copied unquestioned. Rather, firms should introduce and adapt the key themes of the practices to fit their particular organisational paths and trajectories (Kahn, Barczak and Moss 2006; Kleinschmidt 2006).

Capabilities are required for each stage of the innovation process. Searching capabilities, whether they are to support external or open source scanning (Chesbrough and Crowther 2006) or internal scanning (Howell and Shea 2001) are necessary. Selection and prioritisation capabilities, including idea champions, provide firms with choices that steer resources towards particular goals (Twiss 1992; Howell and Shea 2001). Knowledge and skills are also required to interact with specific technology bases and support wider problem solving activities (Adler and Shenhar 1990; Brown and Eisenhardt 1995; Eisenhardt and Martin 2000). Firms

have to keep abreast of new developments and technology capabilities are required even if specific related activities are outsourced (Brusoni, Prencipe and Pavitt 2001).

Enabling skilled workers to use information and communication technologies such as computer aided design and engineering systems can improve quality, lower costs and accelerate the innovation process. These systems have advanced from electronic drafting boards to a complete systems approach where design, technical and marketing data can be shared electronically among functions and other organisations (Wheelwright and Clark 1992; Rothwell 1994). The contribution of an effective mix of people and enabling technologies cannot be underestimated.

Successful innovating organisations manage the implementation process using a range of managed routines. Examples include appropriate organisational structures; many firms follow project management practices and introduce project team structures and planning systems (Clark and Wheelwright 1992; Cooper and Kleinschmidt 1995). Intra-organisational communication processes are necessary to share information among different functions (Gupta and Wileman 1990; Cooper and Kleinschmidt 1995). Other implementation practices include reviews and post project reviews which can improve future innovation initiatives (Bessant 1997).

External collaboration is also important for innovators. External collaboration can include customers, suppliers, and third-party technology experts. Buyers are key information gateways which can include product preferences, quality evaluations and, increasingly, innovation partners (Lengnick-Hall 1996; Readman and Grantham 2006). At the very least, maintaining contact with key customers during the product development process, for example, can ensure market relevancy (Cooper and Kleinschmidt 1995). Suppliers are also important innovation partners and will often work with firms on component design specifications (Handfield, Ragatz, Petersen and Monczka 1999). Suppliers can also impart important insights which can affect process innovation (Bessant, Kaplinsky and Lamming 2003). Supplier involvement in the innovation process requires other sets of capabilities, particular contractual skills and to ensure technological knowledge can be assimilated (Takeishi 2001).

Firms have to be equipped with appropriate absorptive capacities to support internal and external knowledge creation processes (Cohen and Levinthal 1990; Zahra and George 2002). Universities are valuable sources of innovation, particularly for firms

in high technology sectors (Laursen and Salter 2004). Intermediate organisations such as consultants and research institutes provide services to firms which lack resources and capabilities (Bessant and Rush 1995). Problem solving and applied research services are often supplied by these bridging organisations in focused technology fields (Readman, Bessant and Neely 2009). For instance, research and technology organisations (RTOs) can translate and adopt knowledge generated from university – industry- government collaborations for SMEs (for example, see Leydesdorff and Meyer 2006). Triple helix collaborations have particular challenges for firms in low wage countries (Saad and Zawdie 2008). This could deter supplier upgrading unless lead firms take an active role to support supplier participation in innovation (Nellore and Balachandra 2001; Kaplinsky, Morris and Readman 2002a). The second set of research propositions aim to reveal possible associations between the practices and routines (innovation capabilities), innovation performance and outsourcing.

Are outsourcing, innovation capabilities and process and product innovation performance associated?

Innovation performance is expected to be associated with specific innovation capabilities. This is an exploratory enquiry as the literature does not propose that any one capability should outweigh others. Innovation surveys such as the UK Community Innovation Survey clearly show internal sources are more important than external sources in the support of innovation endeavours, however (DTI 2006).

H2a: High innovation performing firms make use of specific innovation capabilities to a greater extent than lower innovation performing firms.

The null hypothesis predicts no difference in the use of capabilities.

H2a₀: The use of specific innovation capabilities does not differ significantly between high innovation performing firms and low innovation performing firms.

Links between outsourcing and innovation capabilities may be more indirect. Innovation capabilities may not reside in a specific business function, although some functions are more conducive to support innovation. For example, while product innovation capabilities will probably be embedded in the design function, other key

development capabilities may rest in the marketing and operations functions (Ulrich, Sartorius, Pearson and Jakiela 1993). Firms that outsource peripheral activities should free up resources, which can be devoted to innovation activities (Quinn and Hilmer 1994; Quinn 1999). For example, outsourcing firms will focus on key scanning innovation capabilities in order to retain knowledge of new and evolving technologies (Brusoni, Prencipe and Pavitt 2001).

H2b: Firms that outsource peripheral activities make use of specific innovation capabilities to a greater extent than firms that perform activities in-house.

The null hypothesis predicts no difference.

H2b₀: The use of specific innovation capabilities does not differ significantly between firms that outsource peripheral activities and firms that perform peripheral activities in-house.

Alternatively, firms that focus on core activities should have more innovation capacity than firms that outsource core activities (Wheelwright and Hayes 1985; Hayes and Pisano 1994).

H2c: Firms that perform core activities in-house make use of specific innovation capabilities to a greater extent than firms that outsource core activities.

The null hypothesis predicts no difference between firms.

H2c₀: The use of specific innovation capabilities does not differ significantly between firms that outsource core activities and firms that perform core activities in-house.

10 Alternative explanations to account for variances in innovation performance

The factors affecting innovation performance are complex and no one factor can completely explain the extent of this phenomenon. Innovation studies have noted that innovation performance can be influenced by factors other than outsourcing. The following exploratory research questions suggest complimentary or even alternative explanations for any differences in innovation performance.

Do alternative factors influence process and product innovation performance?

10.1 Firm size, innovation performance and outsourcing

First, firm size can be associated with different innovation performance. For instance, large firms may have access to financial resources and can organise internal assets accordingly and these assets are important particularly in research and development undertakings (Cohen, Levin and Mowery 1987). New SMEs, emerging in frontier technology markets, on the other hand, do not have technology legacies to defend (Rothwell and Dodgson 1993). Recent work by Narula, however, suggests that large firms have acquired levels of flexibility through collaboration in complex technological developments (Narula 2004).

A non-directional hypothesis is proposed that tests for possible associations and does not predict which size category has greater or lower innovation performance.

H3a: Firm size is associated with innovation performance and outsourcing.

The null hypothesis predicts no difference in performance.

H3a₀: Innovation performance and outsourcing do not vary among different sized firms.

10.2 Customer-focus strategies and innovation performance

Market and operational strategies can have an impact on innovation performance. A successful strategy ensures that operations, new product and market development plans are aligned with the competitive environment (Dyer and Song 1998). Strategic consideration such as customer-focus strategy and rival strategies can lead to different outcomes. For instance, can cost leaders that follow an outsourcing strategy out-perform firms that follow differential strategies (Gilley and Rasheed 2000; Sturgeon 2002)?

Customer preferences provide insights into the operational priorities of producers. Measurable preferences can inform manufacturers of the appropriate production processes, (e.g. order quantities will determine if large volume processes, batch production or a customised set-up is required), the level of attention required to support product and service quality and the type of distribution set-up (e.g. on-time, fast or flexible delivery). The three 'order winner' criteria of cost, quality and delivery are the most common selection factors used to inform operations (Berry, Hill and Klompmaker 1995). Recently, with the advent of advanced manufacturing

techniques, this list of operational criteria has expanded and now includes time compression and flexibility of volume production, product innovation, and new service support (Squire, Readman, Brown and Bessant 2004). Technology enablers, particularly component modularity, can facilitate the integration of suppliers in advanced strategies such as mass customisation and agility (Squire, Brown, Readman and Bessant 2006; Ro, Liker and Fixson 2007).

H3b: Buyer preferences/ customer-focus strategies are associated with greater innovation performance.

The null hypothesis predicts no significant difference between customer-focus strategies and innovation performance.

H3b₀: Buyer preferences/ customer-focus strategies are not associated with greater innovation performance.

10.3 Agency and innovation performance

Finally, agency theory suggests that power relationships can determine the scope and type of vertical integration (Eisenhardt 1989a). Scarborough also noted that social action can influence the success of transactions (Scarborough 1995). These influences are particularly apparent in buyer-driven value chains and by unique buyer types (Kaplinsky, Morris and Readman 2002a; Gereffi, Humphrey and Sturgeon 2005). Buyer types can support or hinder different forms of innovation (Kaplinsky, Morris and Readman 2002a).

The non-directional hypothesis is proposed to reveal possible associations but not predict which buyer type has the greatest influence.

H3c: Buyer types are associated with innovation performance.

The null hypothesis predicts no difference between buyer types and innovation performance.

H3c₀: There is no significant difference between buyer types and innovation performance.

11 Summary of the research hypotheses

The research questions and hypotheses discussed in this chapter are summarised in Table 3.

Table 3. Summary of the research questions and hypotheses

Research question	Hypotheses
(1) Is outsourcing associated with process and product innovation performance?	<p>H1a: Firms outsourcing peripheral activities are higher innovation performers than firms performing peripheral activities in-house.</p> <p>H1b: Firms performing core activities in-house are higher innovation performers than firms outsourcing strategic activities.</p>
(2) Are outsourcing, innovation capabilities and process and product innovation performance associated?	<p>H2a: High innovation performing firms make use of specific innovation capabilities to a greater extent than lower innovation performing firms.</p> <p>H2b: Firms that outsource peripheral activities make use of specific innovation capabilities to a greater extent than firms that perform activities in-house.</p> <p>H2c: Firms that perform core activities in-house make use of specific innovation capabilities to a greater extent than firms that outsource core activities.</p>
(3) Do alternative factors influence process and product innovation performance?	<p>H3a: Firm size is associated with innovation performance and outsourcing</p> <p>H3b: Buyer preferences are associated with innovation performance</p> <p>H3c: Buyer types are associated with innovation performance</p>

The next chapter presents the research programme, which provides details on the approaches used to test the highlighted hypotheses.

Chapter 4. Research Methodology and Mixed Research Methods

Not everything that counts can be measured. Not everything that can be measured counts (Cameron 1963 p. 13).

The discussion turns from establishing the research questions and hypotheses described in the previous chapters to the framing of the research programme. Specifically, Chapter 4 sets out the research strategy and methods used in this study. The strategy follows a sequential mixed research course and includes qualitative and quantitative methods. Before the methods are discussed, the underpinning worldview is introduced which guides the entire process.

12 Social organisational theory

The transaction costs economic and competence framework presented in the literature review provides a plausible explanation as to why firms outsource business activities. However, and despite the recent undertaking of scholars, the relationship between outsourcing and innovation performance remains ambiguous and necessitates a deeper exploration about the possible outcomes arising from firm strategy. Before further primary research can commence however, a particular worldview should be acknowledged. A worldview is the belief system that steers individual action and, in this particular instance, the research methodology (Guba 1990). This belief system draws upon a set of primary premises, which inform the direction of the research; these premises are accepted and not strictly tested empirically⁵. The research methodology informs the researcher how to make use of the data collection methods and, instrumentally, how to interpret the findings.

The spotlight of this inquiry is on the outcomes arising from the decisions made by firms. Firms are social organisation, which are formed by people and not found in nature. Social organisational theory, as with social science theory in general, draws on the philosophical views of reality and fundamental characteristics of knowledge. Burrell and Morgan (Burrell and Morgan 1979) define social organisational theory as consisting of three underlying assumption and premises.

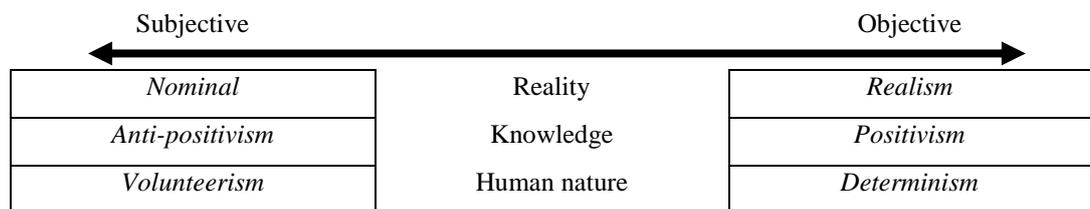
⁵ In this situation, I use the terms, *tested* and *empirically* to convey the possibility of delving deeper into a subject.

First, the nature of what is real –ontological –should be considered. There are two polar views to how one envisions reality: (i) reality is constructed from an internal interpretation perceived by an individual’s consciousness, or (ii) reality is an external phenomenon which a person only observes. The second assumption is the degree to which knowledge can be tangible and obtainable. Addressing the essence of understanding knowledge (epistemology), can knowledge, obtained from an investigation, be certain and verified or are the findings lucid and not to be extended (generalised)? And thirdly, the extent to which human nature interacts with the physical or social environment can influence prediction and generalisation. Do individuals volunteer or have free will in the decision making process or are outcomes (pre) determined, depending on the external factors and forces in action?

The perspective one has of these three premises can be placed along a continuum, starting from subjectivity of the inquiry to objectivity. The underlying structure (or how the terms are defined) may prevent further testing of the three concepts in their own right, thus inferring to the first premise characteristics. They can also be part of a value or belief system.

Figure 5 illustrates the three qualifying assumptions and the subjectivity-objectivity dimension. The left side of the scale indicates a strong subjectivity inclination while the right side shows stronger objectivity. An extreme perspective for any of these assumptions is rare, although, research inquiries tend to favour one dimension even if the extreme view is not fully endorsed.

Figure 5. The Burrell- Morgan subjective-objective dimensions



Source: Adapted from Burrell and Morgan (1979), p. 3

The location of where reality, knowledge and the scope of human-nature are lodged along a subjectivity - objectivity scale can influence the choices made for a particular research methodology (Burrell and Morgan 1979). For instance, if the social environment and specific interactions can be measured, and knowledge can be true (or false), then a research inquiry will focus on an objective analysis. On the other

hand, if the subjective experiences are paramount to the understanding of the reality, then the research quest will focus less on outcomes and more on the interpretation of the results from the different participating respondents.

For an objective methodological analysis, an agreed interpretation of the research findings is crucial. The attributes of the relationships among different elements occur through conceptualisation and measurement. The emphasis is on revealing patterns which could lead to prediction and generalisation. Alternatively, a subjective methodological analysis stresses the uniqueness of the results among the different participants. The subjective analysis explores individual interpretations based on their own experiences and, possibly, events and outcomes. Generalisation is not critical and there may even be a fundamental rejection that experiences can transcend individuals.

12.1 Post-positivism research

This study follows an objective methodological perspective for two reasons. First, the primary research question is an inquiry into causal relationships between two elements. The two primary variables, outsourcing business activities and innovation performance, have a research pedigree. This research builds on the existing knowledge base and accepts, for the most part, the concept definitions. Incremental knowledge building is sought through the analysis of the interaction between the two concepts and it is the general trends among participants (firms) which are critical and not the experience of outliers.

The second reason is to follow a similar methodological track used by scholars in the field in order to complement their findings. For the most part, researchers delving into outsourcing and innovation performance come from strategic management, operations or applied economics perspectives. The research interests of these subject groups are concerned with tangible outcomes situated in a reality that can be seen and measured. There is also a trend in which the selected research methods used by scholars in these fields will generate findings which can be tested and refuted. Nevertheless, this study does not advocate absolute determinism as there are limits to the scope of generalising findings arising from social research. Therefore, a post-positivists approach is applied.

Post-positivism follows, as closely as possible, the scientific method prescribed by the science disciplines (Burrell and Morgan 1979; Creswell 2003). Knowledge is obtained through observations and other empirically grounded methods such as experiments (and in the social sciences, questionnaires). An important feature to positivist and post-positivist research is that the structure of the inquiry should allow for fallibility. That is, the research question must be framed to allow for alternative outcomes.

Knowledge contribution under a post-positivist world-view prescribes to theory falsifying to ensure generalisation (Buckingham and Saunders 2004). Popper proposed that, rather than repeated observations to provide confidence in a theory or inductive reasoning, theories and predictions should be arrived at first (Popper 2002). Experiments should attempt to prove the theory wrong or false. The original hypotheses may never become an universal law, especially in the social sciences, but through refinement, theories can be accepted or trusted as behaviour norms.

Post-positivism does recognise the limits to inquiries into social entities (Creswell 2003). Whereas positivists in the material sciences strive to reveal absolute truths about a subject, proponents of positivism in the social science disciplines recognise the limits to knowledge advancement, especially when investigating human behaviour and endeavours (Phillips and Burbules 2000). A philosophical compromise is introduced in social science research that encapsulates the inclination for deductive investigations while recognising the limits to certainty. Post-positivism reflects that, while cause and effect associations may exist, outcomes may only be *plausibly* determined. Conclusions can be false through further inquiries, specifically location and time frames (Whetten 1989). The distinction between traditional positivism and post-positivism is that post-positivism place qualifying limits to any claim to generalisation. This qualifier tempers outcomes directed to social organisations such as business firms.

13 Research strategy

13.1 Empirical theory building

Organisational theory draws a distinction between a typology and taxonomy. While the former is theoretical and ideal, the latter term is empirically grounded (Whetten 1989). The exploration of outsourcing and innovation performance associations and the underlying business models form a testable taxonomy. This research agenda includes several empirically-based activities, which not only describe the phenomenon but also tests for possible relationships.

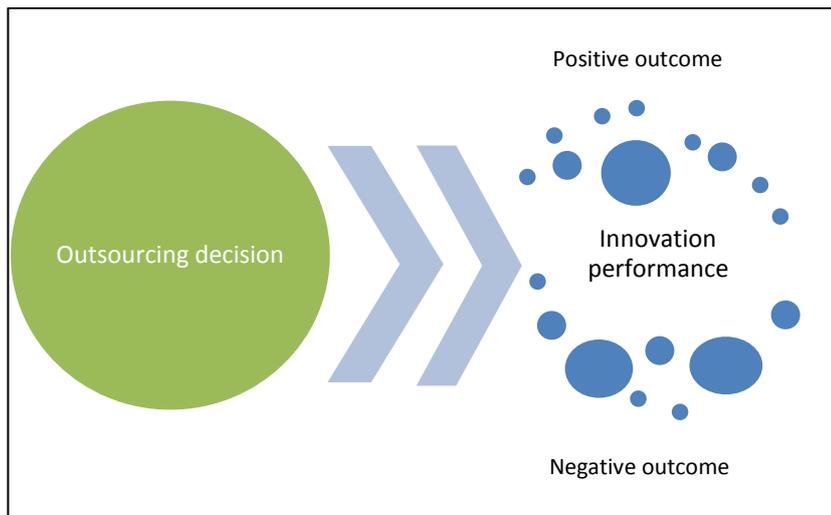
The unit of analysis in this study is the firm. Specifically, the focus is on firms in the UK wooden furniture industry. This is not a random choice, as I wanted to investigate a traditional manufacturing industry with a recognisable industry structure and value-added business activities. The rationale for investigating one industry is conducive to analysing organisations which perform similar business activities. The deep data set can contribute not only to the knowledge base of the furniture industry but also reveal some wider trends occurring in those industries which demonstrate similar industry characteristics, particularly in industries which have similar business activities, outsourcing patterns and innovation endeavours.

The research strategy is informed by a post-positivist worldview, using measurements to reveal possible associations between outsourcing and innovation performance. While this study explored some of the possible causes and effects related to outsourcing and innovation performance, it remains an inquiry into social organisations, and the findings are limited to one industry and in one period.

13.2 Testing cause and effect

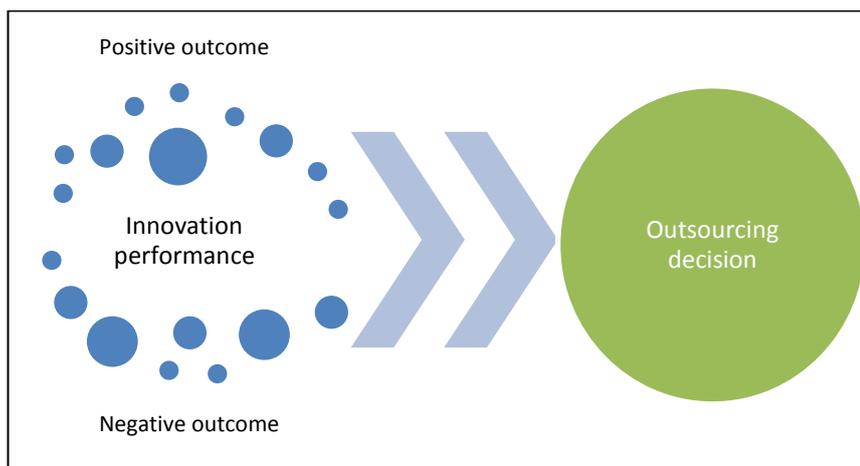
The primary research query is the relationship between business activity outsourcing and innovation performance. This study designates outsourcing as the independent variable and innovation performance as the dependent variable. The application of an independent and dependent variable descriptor infers that one factor contributes to the outcome of the other. This simple linear model, as depicted in Figure 6, represents a process in which the decision to outsource or perform in-house may affect innovation performance.

Figure 6. The test relationship: outsourcing affecting innovation outcomes



An alternative situation could exist in which firms undertake an innovation activity ex-ante of an outsourcing decision. Figure 7 portrays a process in which the decision to outsource would come about *after* a realised innovation outcome. Storey suggested that innovation can inform governing structures, particularly the scope of employment contracts (Storey, Quintas, Taylor and Fowle 2002). His study did not look at innovation performance and supplier outsourcing. The linear process of the alternative case follows an internal logic: a correlation may exist statistically but not because there is a cause and effect relationship.

Figure 7. Converse relationship: innovation outcomes affecting outsourcing



This study, however, assumes the first situation is the norm (that is, the decision to outsource may have an impact on innovation performance) but, given that the alternative case may exist, the strength and direction of any relationship indicates an association only. The study would not stand up to the rigour of a hypothesis testing protocol and research propositions and associations are used instead.

13.3 Sequential mixed research methods approach

Scholars in the field of innovation studies have turned their attention to outsourcing and innovation in recent years although this interest is directed at formal innovation outsourcing and technology support outsourcing. Examples of studies looking into formal innovation outsourcing tend to focus on research and development and product development outsourcing (for example, Krause, Scannell and Calantone 2000; Doh 2005). Examples of support service outsourcing are particular to information and communication technology services (for example, McLaren 2000). Empirical studies, which explore the possible effects production outsourcing may have on innovation performance, are mostly inconclusive (Gilley and Rasheed 2000; Leiblein, Reuer and Dalsace 2002; McIvor 2009).

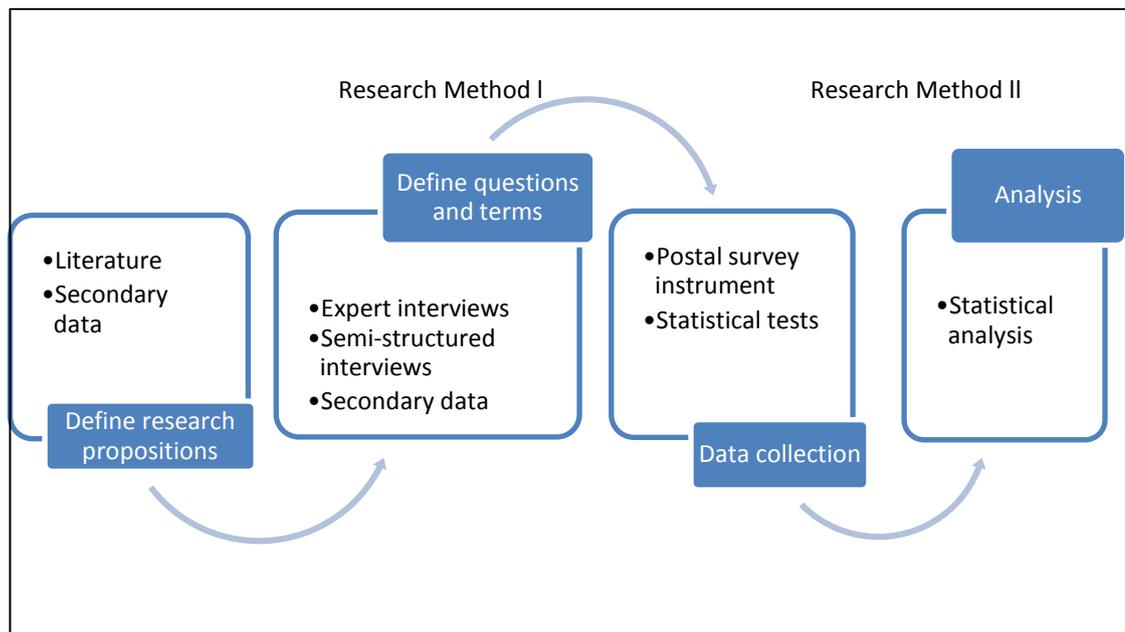
That previous studies have not demonstrated clear relationships between innovation and outsourcing is not surprising. In the first place, outsourcing business functions may not be associated, positively or negatively, with innovation performance. There may be unreported studies, which are deemed inconclusive, but in aggregate may establish a case that no association exists. Negative findings are not reported widely in the academic literature and peer reviewed publications rarely report null hypothesis significance testing (Greenwald 1975). For example, in a study of submitted research abstracts for presentation at the Society for Academic Emergency Medicine (SAEM) meeting, abstract acceptance was strongly related to subjective originality factors and the inclusion of positive test results, regardless of study design or methodology (Callaham, Wears, Weber, Barton and Young 1998).

My contention, however, is that the researched methods employed by these known studies contributed to the unsatisfying results. In the Gilley and Rasheed study, firms from 16 industries were included in their survey and while efforts were made to offer respondents a wide selection of business activities (Gilley and Rasheed 2000 p. 774) industries interpret activities differently. Gilley presented 14 business

activities to respondents but, surprisingly, the authors only offered one production function (assembly) (Gilley and Rasheed 2000). The heterogeneous industry sample may have clouded the responses and, consequently, the results did not reveal any association between activity outsourcing and innovation performance. McIver, on the other hand, followed a qualitative research method. The objective of McIvor's study was to populate a transaction cost and resource-based framework with data collected from three case firms. The rich details arising from this study are informative but not conclusive. In both studies, the applied research methods may not have been appropriate for the purpose of testing outsourcing and innovation performance relationships.

This investigation follows a sequential process, which includes qualitative and quantitative methods. The sequential mixed research methods strategy builds upon the findings from one research method by undertaking another research method (Creswell 2003). Figure 8 portrays the research process used in this study.

Figure 8. Sequential mixed research methods process



The literature review presented in Chapter 2 revealed some inconclusive findings (i.e. gaps in the knowledge base), which contributed to the postulation of the research questions and hypotheses, presented in Chapter 3. The first research mode includes two qualitative method activities: expert interviews and case company

interviews. The objective of the Research Method I stage is to define the questions and terminologies for the second research stage. Research Method II sets out to collect, analyse and test a set of data to support or refute the research propositions presented in Chapter 3. A postal survey is the research instrument of choice for this stage.

13.4 Ethical considerations

Confidentiality was a priority in both research modes. This mainly concerned the data collection exercises and ensuring confidentiality of company information and personal disclosure (Israel and Hay 2006).

For the expert group interview and company case interviews, company names and individual names are not revealed. Organisations are referred to as Company A, Company B and Company C throughout the text. Secondly, the research process was information extractive and interventions were not introduced. Finally, a summary note was sent to the company participants to ensure data and interpretation of the data was correct (a summary report was not sent to participants of the expert group interview).

The names of the company and individuals that participated in the survey are withheld. Also, only aggregate data are used in this paper. The note below note accompanied the survey to ensure confidentiality:

The objective of this survey is to find out how UK furniture companies innovate and your participation would be greatly appreciated. This questionnaire will take 15 minutes to complete. Please return the completed questionnaire using the SAE. If you have any questions or comments please contact:

*Jeff Readman
CENTRIM, The Freeman Centre, University of Brighton,
Falmer, Brighton BN1 9QE
E-mail: j.a.readman@bton.ac.uk/ Tel: (01273) 877 962*

Both sides of the page are used.

ALL INFORMATION THAT YOU PROVIDE WILL BE CONFIDENTIAL. A report detailing the results will be sent to you once the analysis is completed.

14 Research Method I – qualitative interviews and secondary data collections

Qualitative research is defined as, “a means for exploring and understanding the meaning individuals or groups ascribe to a social or human problem”(Creswell 2003 p.4). For this study, it is important to ascertain how firms in the case industry (i.e. wooden furniture manufacturing) define their business activities. The Research Method I stage consists of two research qualitative activities. The first exploratory activity entails informed, open-ended interviews with industry experts.

Complementing the findings from the expert interviews are industry data from secondary sources. The second qualitative research activity makes use of the findings from the expert interviews in order to form a set of terms and questions. These questions are used to interrogate three case businesses.

14.1 Informed industry experts

The objective of the first stage of the Research Method 1 approach is to reveal the appropriate production, administrative and innovation activities performed by furniture manufacturers. The main furniture manufacturing activities and value chain configuration - and the appropriate terminology used in the industry - will inform the survey questionnaire. Multitude of key informants can provide useful insights relevant to case and industry inquiries and can increase the validity of the data (Kumar, Stern and Anderson 1993).

The results of these discussions are reported in Chapter 5. These findings are augmented by secondary data to provide clarification and context. Secondary data sources include industry and trade data collected by UNCTAD and the UK Office for National Statistics. Other secondary sources include market analysis produced by KeyNote, a UK-based business consultancy firm. The findings from this phase informed the case study interviews (Section 14.2) and the survey questions in Research Method II (Section 15).

14.1.1 Expert Group interview

An open interview was held with furniture industry experts on 8 October 2001 in Stevenage, UK. This interview took place in conjunction with a meeting organised by the UK Government (the Department of Trade and Industry) Competitive Steering Group. Additional follow-up interviews took place with several furniture

manufacturers and furniture agents and buyers. The industry experts who participated in the group interview included managers of trade associations, owners/managers from four UK furniture manufactures, managers from four furniture buyers including three multi-chain stores and the Research Director of the UK Furniture Research Technology Organisation (FIRA). This mix of outside informants with industry personnel can improve the accuracy of information (Ming-Jer, Jiing-Lih and Macmillan 1993). The list of Research I interview participants can be found in Appendix 1.

The discussions with the industry experts focused on identifying the main activities performed by furniture manufacturers, suppliers, distributors and agents. The starting framework was Porter's simple value chain (Porter 1985) and discussants elaborated on the different functions particular to furniture manufacturing. The ensuing discussion followed an open-ended template and included the following questions:

1. what manufacturing activities are performed by typical furniture manufacturers?
2. what administrative and supporting activities are performed by typical furniture manufacturers?
3. what are the main inputs supplied to furniture manufacturers?
4. how are furniture product markets classified?
5. what are the distribution links and buyer types for the different product market?

Data attributed to the industry experts are designated in this study as, 'Expert group interview'.

14.1.2 Expert interview

In addition to the group interview with the above personnel, I interviewed the Director of the British Furniture Manufacturers' Association separately and followed the same open questions template used with the group discussants (data attributed to this source is designated 'BFM interview').

14.2 Case company interviews

This study includes three UK furniture case studies to draw out the usefulness of the value chain framework identified by the key informants. The interviews followed a comparative case study design to reveal the relevancy of the activity outsourcing and innovation performance definitions and practices. (Yin 2009). The case companies were not randomly selected. Instead, a selection criteria were applied to identify suitable multiple cases. Multiple cases are used to explore predicted outcomes that can be similar or different (Yin 2009). The predictive outcomes contribute to the study's hypotheses testing and, indirectly, theory building (Eisenhardt 1989b).

The case firms were selected using the following three criterion:

- i. the case firm performs (some) manufacturing activities in the UK;
- ii. the case firm engages in manufacturing outsourcing or receives inputs from suppliers (i.e. there is inter-firm transactions in production or through the chain) and finally
- iii. the case firm has undertaken an innovation endeavour in the past three years such as new product development or designs or process improvement to a manufacturing process

The industry structure revealed by the expert interviews was applicable to the case companies and the outsourcing strategy outcomes were identified. The company names are withheld from this study upon request.

Table 4 notes the interview details. I identified the case firms through a parallel research programme I worked on during this period. The interviews took place between late 2004 and 2005 and follow-up interviews took place with Company A and Company C in 2006. Telephone interviews and company visits took place where convenient and each interview lasted between 30 minutes to 45 minutes.

Table 4. Interview schedule for case companies

	Interview date	Interview location
Company A	November 2002	Telephone interview
	October 2005	Company visit
Company B	January 2003	Telephone interview
Company C	February 2003	Telephone interview
	September 2005	Company visit

A semi-structured interview questionnaire was prepared using the findings from the expert group interview and from secondary data relevant to the furniture industry.

The questions followed three themes: (I) firm background, (II) value chain configuration and outsourcing, and (III) innovation. Information was collected from each case company by the following guiding questions:

I. Firm background

- i. A brief history of company
- ii. Number of employees
- iii. Position of interviewee
- iv. Product lines/ product markets
- v. Firm turnover
- vi. Firm export sales
- vii. Location of the main export locations
- viii. Main buyers (i.e. buyer types)

II. Value chain activities

- i. Which activities provide the company with the greatest value/ or require contribute most cost to the selling price of a product?
- ii. Which value chain activities are performed in the company and which are outsourced?
- iii. Has the company moved into new activities in the past three years?
- iv. Did the company undertake the outsourced activities in the past three years?
- v. Where are the outsourced suppliers located (i.e. country)?

III. Innovation

- i. Explain how your company engages in the development of new products?
- ii. Explain how your company engages in new manufacturing process improvements or innovation?

The findings from the case companies interviews are reported in Chapter 5. The case company results informed the structuring of the survey questions, ensuring the correct industry terminology was used in Research Method II.

15 Research Method II – quantitative survey

Quantitative research is defined as, “a means for testing objective theories by examining the relationship among variables”(Creswell 2003 p. 4). Questionnaires and surveys are quantitative research methods which collect numerical data in order to describe trends or relationships. The Research Method II mode follows a standard survey protocol, including survey sampling, piloting and data analysis procedures. The survey instrument used in this study accommodates three elements for hypotheses testing, namely, (i) following a formal survey protocol, (ii) the questions which contributed to the variables used for testing, and (iii) the industrial organisation of the UK furniture industry to provide context.

15.1 Survey protocol

The preparation of the questionnaire used in this study followed an established protocol prescribed by scholars reporting on research method practices (Creswell 2003; Buckingham and Saunders 2004; Dillman, Smyth, Christian, Dillman and internet 2009). Question and variable formulation is presented in Section 16.1. The questionnaire went through 12 drafts before the final version was accepted. The piloting of the survey, selecting the survey sample and the data collection exercise are reported below.

15.1.1 Pre-test and piloting

The questionnaire was tested with internal support from University of Brighton staff. Several questions were corrected for spelling and grammar errors and the survey layout was improved. The Statistics Department at the University of Brighton provided another pre-test. Issues pertaining to the appropriateness of ordinal scale questions versus closed, categorical questions led to some fine-tuning of several questions.

The survey was piloted with three UK furniture companies (one of which also participated in the case interviews). The respondents of the pilot exercise were not randomly selected. The purpose of the pilot was to review the appropriateness of the questions and to test the data analysis process. Two questionnaires were fully completed and one questionnaire was partially completed. The respondent of the unfinished questionnaire did not answer the financial questions. These questions were modified so that respondents only had to note if their firm had experienced changes to turnover and profit; they were not asked to report an exact figure. Finally, the data from the pilot surveys were analysed to ascertain if any problems could arise when transferring the question into the test variables. This process was successful.

15.1.2 Survey sample

Although the population consists primarily of micro firms, medium and large firms are desirable for this study. In 2004, the ONS (UK Government) identifies 6,680 furniture manufacturers which include wooden furniture manufacturers and firms which manufacture furniture using metal, plastic and other non-wooden materials (ONS 2004b). Many of these firms are micro firms (one to nine employees) and small firms (1- to 49 employees) which constitute 75% and 19%, respectively, of furniture companies based on employee bands (ONS 2004b). Most of these smaller furniture companies are sole proprietors that produce be-spoke items using jobbing processes (source: Expert group interview and BFM interview). The furniture manufacturing category also includes installation, repair and finishing service activities which are not of interest to this study.

According to industry experts, Government industry statistics over-estimate the number of functioning furniture manufacturers in the UK. Industry experts on the other hand suggest that between 1,500 to 2,000 UK companies manufacture furniture for the mass-market – a market segment which I was particularly wanted to investigated (Key Note 2004a and BFM interview). Medium and large firms (and the more established small firms) will have a greater propensity to consider outsourcing decisions.

The study followed a simple stratified random sampling technique to select the sample firms (Buckingham and Saunders 2004). This technique attempts to ensure that specific characteristics are represented in the sample and, by demonstrating

those characteristic, the sample reflects the population (Fowler 2009). Two selection criterion are used:

- i. firms are UK-based wooden furniture manufacturers;
- ii. an employment band was used which biased medium and large firms in order to capture data relating to the mass market selling (smaller firms tend to produce bespoke furniture only). The stratified selection indicated that the sample should include 30% small firms, 40% medium size firms and 30% large firms.

For a list of companies, I turned to Kompass, the marketing and business directory available in the UK and other EU countries. The advantage of using a commercial company directory was the availability of addresses and a contact person and filtering capability (i.e. UK based and employment bands). The disadvantage to using this service is that only those firms which register with the directory are available. This compromise is accepted for this exploratory study.

Kompass offered a list of 1,500 companies based on the selection criteria I provided. A further rudimentary sampling technique was used in which every third company on the alphabetical list was selected. The 500 identified firms were posted a package containing an introductory letter, a questionnaire and self-addressed envelope. Approximately 50 surveys were returned unopened: the companies had either moved, gone out of business or the contact person no longer worked at the firm.

15.1.3 Data collection

Of the 500 packages sent out, 30 were completed within the first week. A reminder letter was posted two weeks after the first mail-out and another 20 completed questionnaires were returned. After a further two weeks, I sent out a final mail-out to the potential participants. This final mailing included another questionnaire and 28 completed surveys were returned.

15.1.4 Survey response rate

From the 500 mail-outs, 78 firms responded to the questionnaire for a return rate of 15.6 per cent. Data were cleaned to ensure compatibility and usability. The data cleaning process considered the type of respondent: for instance, the mail out included furniture buyers with no history of manufacturing and these respondents

were rejected. After this filtering exercise was completed, 66 surveys were deemed useable from the original 500 invitations. The survey response rate is 13.2 per cent which is acceptable for testing the research propositions (Buckingham and Saunders 2004).

15.2 Findings and analysis

The data were inputted into a statistical analysis programme (SPSS) which supports descriptive and significance testing. First, cross-tabulated descriptive statistics of the survey results and the test variables are generated. The results are presented in Chapter 6. Second, the variables, which correspond to the Research Propositions, are analysed using statistical significance tests. The data are non-parametric (not normally distributed), which limited the choice of tests. The non-parametric significance tests were used in this analysis and include Chi Square test, Mann-Whitney test (comparing differences of two independent groups), and Kruskal-Wallis test (ANOVA to test differences between several independent groups). Effect-size calculations, which estimate the strength of the association, are also included when appropriate. The results of the significance tests are reported in Chapter 7.

Two possible errors can occur when performing significance tests. Type 1 errors are one possible miscalculation. These errors occur when the significance tests demonstrate significance when, in fact, there is no association. Type 1 errors may result when working with large sample sizes where even the smallest difference can produce significance. One way to avoid Type 1 errors in large samples is to reject the null hypothesis or research proposition when $p < 0.01$ rather than $p < 0.05$. The sample size in this study is relatively small ($n=66$) and Type 1 errors are not the main concern (although it has to be recognised as a possibility).

The second problem which can occur with significance tests are Type II errors. Type II errors occur when the tests do not demonstrate significance but there may indeed be an association. These errors can occur when the study uses small sample sizes. Type II errors can be alleviated by ensuring that the appropriate statistical techniques are applied according to the type of sample distributions (Field 2005). As stated above, the data in this study are not normally distributed; therefore, non-parametric statistical tests are used throughout.

15.2.1 Missing values and cases

Missing values and cases can be substituted if the missing data is deemed useful (Buckingham and Saunders 2004) . One respondent did not answer the value-adding question (Q.3). The respondent did answer all the other questions however, so the case was included. An average firm profile was generated based on the product types manufactured by the missing case. The average value added scores from respondents showing a similar profile were substituted for the missing values. Details of the procedure are presented in Appendix 3.

15.3 Questions to assess organisation type of and respondent

The legal definitions for UK businesses cover private firms, traded firms and not for profit firms (ONS 2004b). This indicator confirms that the respondent firm is a legal entity and engages in business activities. I was also interested to reveal the ownership structure. Questions 23 and 24 consider the ownership structure and legal status of the respondent firm.

Q. 23. Which of the following best describes your company? Please tick only one.

- *Sole business (not part of any group)*
- *Subsidiary of an UK business*
- *Subsidiary of a foreign business or multinational*
- *Other (please specify)*

Q. 24. Is your company (one of the following):

- *Private company*
- *Public company*
- *Public and traded company*
- *Not for profit company*
- *Other (please specify)*

Self-assessed surveys are viable instrument but it is imperative that the assessor has sufficient knowledge about the survey topics and access to the necessary knowledge about the firm (Buckingham and Saunders 2004; Dillman, Smyth, Christian, Dillman and internet 2009). The categories listed in Question 27 cover the relevant and acceptable managerial and owners positions for self-assessment.

Q. 27. What position(s) in the company do you hold? Please tick all that apply.

- *Owner*
- *Managing Director*
- *Manufacturing/ Operations Manager*
- *Sales or Marketing Director/ Manager*
- *Other Manager*
- *Other (please specify)*

16 Questions and variables used for hypotheses testing

The full questionnaire is reprinted in Appendix 2. The survey questions which supported the research proposition inquiries are discussed below.

16.1 Questions and variables for Hypothesis 1 (H1)

H1a: Firms outsourcing peripheral activities are higher innovation performers than firms performing peripheral activities in-house.

H1b: Firms performing core activities in-house are higher innovation performers than firms outsourcing strategic activities.

The first set of research propositions asserts an association between the location of core and peripheral activities and innovation performance. Variables are constructed to test these two hypotheses. The procedure is described below.

16.1.1 Variable 1: In-house and outsourcing of core and peripheral activities

Variable 1 is a compound variable consisting of two independent variables:

- i. the designation of activities as core or peripheral relative to the average cost of all activities;
- ii. whether firms perform the activities in-house or outsource.

Core and peripheral activities

The findings from the Expert group interview reported later in Chapter 5 identifies the key value chain activities and the supporting activities performed by furniture manufacturers. The activities include pre-production (sawmilling, preparing wood, etc.), product design, inbound logistics, component and parts production, assembly, administration, marketing and sales, after-sales support, and product distribution. Firms were asked to identify the contribution these activities have to the final cost incurred by the buyer of the product (overheads and margins are assumed to be absorbed) in Question 3. Respondents ranked each activity out of a score of 10 (with one indicating a low contribution to cost and 10 indicating a very significant contribution). The average (mean) scores derived from the individual responses are calculated for each activity and normalised so that the total comes to 100.

Q. 3. Furniture production and other activities contribute to the final cost incurred by the end-user or consumer of your product. Please assume that overheads and margins are included in these activities.

In your estimation – and even if it is something your company does not do itself – what is the contribution of the following activities to the final cost? Please rank the following with 10 representing the highest cost and 1 representing the lowest cost.

- | | |
|----------------------------------------|--------------------------------------------------------------|
| • <i>Pre-production</i> | • <i>Administration e.g. finance, HR</i> |
| • <i>Product design</i> | • <i>Marketing and sales</i> |
| • <i>Inbound logistics</i> | • <i>After-sales support</i> |
| • <i>Component and part production</i> | • <i>Product distribution / agent/ import/ export charge</i> |
| • <i>Product assembly</i> | • <i>Retail or selling to end-user</i> |

The notion of value-added costs is used to designate peripheral and core activities.

The analysis uses the costing noted by individual respondents rather than an average cost calculated from the entire sample. The classification of core and peripheral activities for each respondent is formulated by assessing the cost of individual activities as a share of total manufacturing costs. This presents two possibilities:

- i. if the activity cost is above the average cost for the company, then the activity is core;
- ii. if the activity cost is below the average cost for the company, then the activity is peripheral to manufacturing company.

Two further assumption are made to assist this calculation. First, manufacturing costs are normalised to 100 and, second, a general furniture value chain of nine activities is assumed for all respondents. Therefore, the average normalised cost for each firm is 11.11. By extension, core activities are those activities greater than (or equal to) 11.11 and peripheral activities are those activities less than 11.11.

Performing activities in-house or outsource

The second part of the first variables assesses the location of the activity.

Respondents are asked if their firms perform activities fully in-house, fully outsource or partially perform in-house and outsource in Question 4.

Q. 4. Which activities do you perform in-house and which activities do you buy-in or outsource to UK suppliers, other EU and North American suppliers and low-wage country suppliers? Please tick all that apply for each activity.

- | | |
|----------------------------------------|--------------------------------------------------------------|
| • <i>Pre-production</i> | • <i>Administration e.g. finance, HR</i> |
| • <i>Product design</i> | • <i>Marketing and sales</i> |
| • <i>Inbound logistics</i> | • <i>After-sales support</i> |
| • <i>Component and part production</i> | • <i>Product distribution / agent/ import/ export charge</i> |
| • <i>Product assembly</i> | • <i>Retail or selling to end-user</i> |

Variable 1 is an aggregation of two activity classifications. The first classification is 'performing in-house or outsourcing', which is queried in Question 3. The second classification is 'core or peripheral', which is asked in Question 4. Combining the two classifications creates a categorical variable that allocates firm activities into one of the four quadrants of the **outsourcing and innovation-positioning** model discussed in Chapter 3, Figure 1:

Position 1: Peripheral to the firm and performed in-house

Position 2: Core to the firm and performed in-house

Position 3: Core to the firm and outsourced

Position 4: Peripheral to the firm and outsourced

Variable 1 is also transformed into three sub scale measures (Variable 1a , Variable 1b and Variable 1c). The average 'Outsourcing Intensity' index indicates the share of outsourced activities to the total number of activities performed in the value chain. This index measures the level of vertical integration (Harrigan 1985; Gilley and Rasheed 2000). What the index does not account for is the breadth of outsourcing for individual activities.

The algorithm is expressed as:

$$\text{(Variable 1a) Outsourcing intensity (all activities)} = \frac{\text{Number of outsourced activities}}{\text{Total number of activities}}$$

This algorithm is also applied to core and peripheral outsourcing intensity:

$$\text{(Variable 1b) Outsourcing intensity (core activities)} = \frac{\text{Number of outsourced core activities}}{\text{Total number of core activities}}$$

$$\text{(Variable 1c) Outsourcing intensity (peripheral activities)} = \frac{\text{Number of outsourced peripheral activities}}{\text{Total number of peripheral activities}}$$

The index range is 0 (firms that do not outsource) to 1 (firms which outsource 100 per cent of their activities).

16.1.2 Variable 2: Innovation performance

The second variable interrogated is innovation performance. Product innovation and process innovation performance outcomes are captured in Question 10 of the survey. The question is informed by the Community Innovation Survey, particularly the scale of innovativeness (DTI 2005).

Product innovation is defined as product design which reflects the interpretation of product development as reported by the expert interviews during the first research phase. Unlike science or engineering base industries, traditional technology base industries such as furniture manufacturing target incremental product design in their product innovation endeavours (Von Tunzelmann and Acha 2005). Process innovation considers the adoption of new methods in the production of furniture.

Q. 10. Has your company undertaken any new products (new designs) or process initiatives (lean, CI, etc.) related to your most important product or service since 2001? How innovative would you rate these initiatives? Please tick one box for each innovation type.

	NEW TO THE INDUSTRY	NEW TO OUR FIRM	ON-GOING (UNFINISHED)	TRIED BUT FAILED	NO ACTIVITY
Improved products (quality or design enhanced)	<input type="checkbox"/>				
Process innovation (the adoption of new/improved production methods)	<input type="checkbox"/>				

The question lends itself to two categorical analysis. Performance can be measured as either:

- i. are firms innovative active or not active (Variable 2a *product* and Variable 2a *process*)?
- ii. are firms successful or unsuccessful in innovation (Variable 2b *product* and Variable 2b *process*)?

A third set of performance indicators (Variable 2c *product* and Variable 2c *process*) indicates the degree of innovativeness. Respondents were asked to indicate not only if they had undertaken an innovation initiative, but also to rank the innovativeness in terms of novelty, on-going and failure. Innovation performance is measured on a five-point ordinal scale.

16.2 Questions and variables for Hypothesis 2 (H2)

H2a: High innovation performing firms make use of specific innovation capabilities to a greater extent than lower innovation performing firms.

H2b: Firms that outsource peripheral activities make use of specific innovation capabilities to a greater extent than firms that perform activities in-house.

H2c: Firms that perform core activities in-house make use of specific innovation capabilities to a greater extent than firms that outsource core activities.

The second set of research proposition tests the association between outsourcing and innovation performance and the practices, routines and enablers, which may support innovation. The three variables used in this query are:

- i. Variable 1, Variable 1b and Variable 1c: Core or peripheral activity outsourcing Variable 2a and Variable 2b: Innovation performance
- ii. Variable 3: Innovation capabilities

The outsourcing variable and innovation variables are discussed in Section 16.1.

16.2.1 Variable 3: Innovation capabilities

Firms are asked in Question 11 to rank the management, technology and collaboration enablers, which may be used to support product and process innovation, using a five-point ordinal scale. The innovation capabilities are generic and not specific to the furniture industry (for example, Tidd, Bessant and Pavitt 2005). The purpose of the question is to reveal possible trends for the industry, in other words, it is an exploratory investigation.

Q. 11. Which of the following contributed to or constrained your most innovative initiative? Please tick one box for each factor.

	CRITICAL INPUT	LARGE EXTENT	TO SOME EXTENT	MINIMAL INPUT	NO INPUT
YOUR OWN CAPABILITIES					
Skilled employees, problem solving capabilities	<input type="checkbox"/>				
Management, leadership, idea champion	<input type="checkbox"/>				
Technology e.g. CAD, CAM, Information Systems, etc.	<input type="checkbox"/>				
Innovation strategies	<input type="checkbox"/>				
Implementation e.g. project management, team work, etc.	<input type="checkbox"/>				
External scanning e.g. benchmarking, forecasting, etc.	<input type="checkbox"/>				
Reviews, evaluations, measuring, other learning	<input type="checkbox"/>				
OTHER SOURCES					
Parent company/ subsidiary	<input type="checkbox"/>				
Competitors	<input type="checkbox"/>				
Retailers/ buyers	<input type="checkbox"/>				
Consultancy	<input type="checkbox"/>				
Suppliers	<input type="checkbox"/>				
Mergers and acquisitions	<input type="checkbox"/>				
Universities/ technical colleges	<input type="checkbox"/>				
Research institutes (e.g. FIRA)	<input type="checkbox"/>				

The responses to Question 11 reveal the capabilities that support the most innovative initiative. The responses are filtered to Variable 3a (product innovation) and Variable 3b (process innovation).

16.3 Questions and variables for Hypothesis 3 (H3)

H3a: Firm size is associated with innovation performance and outsourcing.

H3b: Buyer preferences/ customer-focus strategies are associated with greater innovation performance.

H3c: Buyer types are associated with innovation performance.

The third set of research propositions test whether alternative positions can explain innovation performance in the furniture industry.

For H3a, three variables are required:

- i. Variable 1 and Variable 1b: Core or peripheral activity outsourcing
- ii. Variable 2a ,Variable 2b and Variable 2c: Innovation performance
- iii. Variable 4: Firm size

For H3b, two variables are required:

- i. Variable 2a and Variable 2b: Innovation performance
- ii. Variable 5: Buyer preferences

For H3c, two variables are required:

- i. Variable 2a ,Variable 2b and Variable 2c: Innovation performance
- ii. Variable 6: Buyer types

The outsourcing variable and innovation performance variable, which are described in Section 16.1.1 and Section 16.1.2, respectively, are used in H3a, H3b and H3c.

The formulation of Variable 4, Variable 5 and Variable 6 are presented below.

16.3.1 Variable 4: Firm size

Firm size is defined by the OECD by grouping the number of employees into three categories: micro and small firms (1 to 49 employees), medium size firms (50 to 249 employees) and large firms (over 250 employees) (OECD 2005). Respondents are asked to locate their firm in one of these firm size categories in Question 25. The micro size and small size firm categories are combined to form one category (a micro and small firm category). Variable 4 is an ordinal ranked categorical variable.

Q. 25. How many employees work at your UK company in 2004 and in 2001?

- 1-9 employees
- 10-49 employees
- 50-249 employees
- 250 employees and above

16.3.2 Variable 5: Buyer preferences

Respondents are asked to rank the customer preferences in terms of winning orders, qualifying orders (or expected minimum requirements) or not important. The different customer-focus strategies are identified and described in Chapter 3. The responses to Question 13 are fed directly in Variable 5. This is an ordinal scale indicator.

Q. 13. Customers want different things when looking for products and services. How important are the following factors to your most important customers (based on share of turnover)? Please tick one box for each factor.

	CRITICAL WILL WIN AN ORDER	VERY IMPORTANT	IMPORTANT QUALIFYING THRESHOLD	IMPORTANT TO SOME EXTENT	NOT IMPORTANT
Lowest price	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
High quality	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Fast delivery	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
On-time delivery	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Innovative designs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Product variety / range of products	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Flexible production volume	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Bringing out new products	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Customisation (build to order)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Services linked with products	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Associated with a brand-name	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Product/ service warranty	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Meeting social/ labour/ environmental standards	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sell directly to end-users	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

16.3.3 Variable 6: Buyer types

From the case study interviews, the focus group discussions held at the DTI forum, and previously published work from this author, it is revealed that four buyer types purchase the bulk of furniture from manufacturers: direct sales to end-users (consumers, businesses, government offices, etc.), agents and distributors, single store retailers and multi-store retailers (Kaplinsky, Morris and Readman 2002a). Respondents are asked to attribute the share of their turnover in 2004 / 2005 to the four buyers types in Question 12. The buyer types variable is constructed as either an ordinal scale indicator or as a categorical indicator.

Q. 12. Companies can sell directly to distributors and import/export agents, to single and multi-store retailers and to end-users (consumers, architects, government offices, etc.). What share of your turnover is attributed to the following customer types? Please tick one box for each type.

	76% -100% TURNOVER	51%-75% TURNOVER	26%-50% TURNOVER	1%-25% TURNOVER	NOT AT ALL
Sell directly to end-users/ consumers	<input type="checkbox"/>				
Multi-store retailers/ large chains	<input type="checkbox"/>				
Single store retailers	<input type="checkbox"/>				
Distributors/ agents / importers/ exporters	<input type="checkbox"/>				

16.4 Variable summary

A summary of the variables used in the study are presented in Table 5. This summary cross-references the hypotheses and the corresponding survey question number(s) to the variables. The table also reports the indicator type and the measures used for each variable.

Table 5. Summary of variable characteristics

Variable No.	Variable	Question No.	Indicator type	Metric	Supporting Hypotheses
1	Core or peripheral activity outsourcing	Q3, Q4	Categorical	Yes/ No	H1a, H1b H2a, H2b H3a
1a	Outsourcing intensity (all activities)	Q3, Q4	Scale	0 to 1	H1a, H1b
1b	Outsourcing intensity (core activities)	Q3, Q4	Scale	0 to 1	H1b, H2c H3a
1c	Outsourcing intensity (peripheral activities)	Q3, Q4	Scale	0 to 1	H1a H2b
2a	Innovation active - product and process	Q10	Categorical	Active/ Not active	H1a, H1b, H2a H3a, H3b, H3c
2b	Innovation success - product and process	Q10	Categorical	Successful/ unsuccessful	H1a, H1b H3a, H3b, H3c
2c	Innovativeness – product and process	Q10	Ordinal	1 to 5	H1a, H1b H3a, H3c
3a	Innovation capabilities – product	Q11	Ordinal	1 to 5	H2a, H2b, H2c
3b	Innovation capabilities - process	Q11	Ordinal	1 to 5	H2a, H2b, H2c
4	Firm size	Q25	Categorical	Small, Medium, Large	H3a
5	Buyer preferences	Q13	Ordinal	1 to 5	H3b
6	Buyer types	Q12	Categorical	Direct, Multi store, One store. Agents	H3c

17 Other survey questions

The external structure of an industry comprises of product and service markets, buyer attributes, rivalry and new entrants (Bain 1968; Grant 2005). The following questions are used in the survey to explore the industrial organisation constituents (except for the buyer attributes which is discussed above) to provide context which may inform the analysis in Chapter 8.

17.1 Market location

Respondents are asked to note the source of their turnover in Question 16. The share of turnover in different market locations indicates market importance and the degree of international exposure. Answers are measured as either an ordinal scale or categorical (IO1).

Q. 16. What share of your turnover is attributed to the following markets?

	76% -100% OF TURNOVER	51%-75% OF TURNOVER	26%-50% OF TURNOVER	1%-25% OF TURNOVER	DO NOT SELL TO THIS MARKET
UK market	<input type="checkbox"/>				
Other EU markets	<input type="checkbox"/>				
N. American markets	<input type="checkbox"/>				
Other international markets	<input type="checkbox"/>				

17.2 Product and service markets

Question 1 asks respondent firms to identify the products and service which they provide or produce. The list of products is derived from the UK Standard Industrial Classification of Economic Activities 2003 and international trade classifications (Harmonized Commodity Description and Coding System and Standard International Trade Classification (ONS 2004b; ONS 2004a). The list of service products is generated from the Expert group interviews in the first research phase. This question supports a categorical indicator (IO2).

Q. 1. What products and services are produced by your company? Please tick one box for each product and service.

- *Wooden office furniture*
- *Wooden kitchen furniture*
- *Wooden bedroom furniture*
- *Wooden furniture for dining / living rooms*
- *Wooden furniture for shops*
- *Other wooden furniture*
- *Wooden furniture parts or components*
- *Other non-wooden furniture*
- *Services to furniture manufacturers*
- *Distribution / agent / importer*
- *Retail or selling direct to end-user*
- *Services to distributors or retailers*

17.3 Rivalry and new entrants

The location of rivals is used to underpin the globalising nature of competition. The intensity and location of new entrants reveals trends of new competition and the ease to which firms can enter the marketplace (IO3). Besides identifying the location of competition for 2005, firms also noted the location of significant competition for 2001 in Question 14. New entrants are defined in this section as the location of competition which has increased since 2001 (IO4). Both the rivalry and new entrant responses are measured as categorical indicators.

Q. 14. Is the rivalry with competitors located in different regions significant today? Was this rivalry significant in 2001? Please tick one box for each year.

	SIGNIFICANT TODAY		SIGNIFICANT In 2001	
	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Competitors within the UK	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Competitors from other EU countries	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Competitors from Central and Eastern Europe	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Competitors from North America	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Competitors from Latin America and the Caribbean	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Competitors from China	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Competitors from other Asian countries (excluding China)	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Yes	<input type="checkbox"/> No

18 Limitations to the research

This mixed methodological approach is exploratory and the intended scope is not ambitious. However, the research programme has some weaknesses which are noted.

18.1 Measurements and indicators

First, the indicators for outsourcing focus on vertical outsourcing and omit any measure of breadth. Firms may outsource only a portion of an activity which would require greater disaggregation of the production value chain. Partial outsourcing could be a factor which would moderate the findings. Even by focusing only on firms located in one industry, the survey method cannot capture data disaggregated to such a fine detail. The survey attempted to measure partial outsourcing but the responses were ambiguous during the trial. The question was retained in the final survey for exploratory reasons.

The second possible drawback is the core and peripheral activity definitions. The share that each activity contributes to the total cost defines core and peripheral: activities are core if they are above the average cost and peripheral if they are below the average cost. This is a crude measure and one that does not account for any intangible contribution these activities may provide. For example, the design function provides important inputs into the innovation process but, for most firms, the cost of design activities is not high compared to production costs. Design entails labour costs and CAD-CAM support while production includes labour inputs, utilities and raw material inputs. Product design is critical for future turnover but the study's cost contribution algorithm places greater emphasis on production activities.

The use of an ordinal scale was used to measure innovation. A more exact indicator could have collected ratio values. For example, product innovation could be measured by the turnover of new products as a share of total turnover. However, the ordinal measure is a recommended indicator by the Oslo Manual (OECD 2005) and was used for convenience.

Another drawback specific to this survey and the statistical techniques used for analysis is the use of non-parametric data. Multivariate significance tests (MANOVA) were also not used. These more sophisticated tests support the exploration of possible relations of more than two variables (Field 2005). However, regression techniques are best used on large time series data and not survey data.

There could be an interval between outsourcing and the innovation outcomes, which could be problematic. The period when firms first started to outsource specific activities and when the innovation occurred could not be exact. The survey had to allow some leeway to the respondent. For example, the respondents were asked to rank innovation activities which had occurred over a three year period. This time frame is also used by the Community Innovation Survey community (DTI 2005).

18.2 Research time lag

The research method has a noticeable process time lag and three factors have contributed to this delay. First, each stage of the information collection exercise and analysis were dependent on the availability of participants. The Expert Group interview and the BFM interview were undertaken early in the program. This activity

was followed by the collection of the supporting secondary data. The formulation of the contextual questions for the case studies was the primary objective of these exercise.

The initial case interviews were conducted over a one-year period with follow-up interviews with two of the three companies taking place to fill in some information gaps. The implementation of the survey followed from the case studies. The sequential method required a fair amount of logistical management. The data collection dates do not diminish the importance of the findings. The objective of the qualitative research method exercise was to reveal patterns of business structures in one industry. The data are illustrative of typical firms and informs the construction of the survey.

While the literature review was managed in parallel during the case interviews and subsequently updated, some activities required the completion of previous stages or activities before work could commence. Company interviews were rescheduled several times. The implementation of the survey took close to 14 months with one person managing the letter and questionnaire printing sampling, proto-type interviews and mail-outs. An additional six months were required for manual data inputting and analysis. This snowballing of knowledge accumulation followed a sequential pathway.

Another obstacle contributed to the time lag. Underpinning the activities were the necessary competences to complete the tasks. The biggest hurdle was the upgrading of statistical skills and mastery of the SPSS software. My previous statistical training occurred in 1987 and did not include software programming. This is not an excuse but refreshing and updating the required statistical knowledge base did slow the advancement of this study.

Finally, the study would have benefited with an additional latter stage. A set of case interviews could verify the findings and explore possible managerial implications. This additional stage could include the same case firms that participated in the Research Method I stage. Future research in this area is recommended.

Chapter 5. Research Method 1 - Mapping the Furniture Value Chain

The theoretical framework introduced in Chapter 3 proposes that innovation performance differs among firms that follow particular outsourcing strategies. To ascertain if innovation and outsourcing are associated, a test case is necessary. The rationale to narrow the inquiry at this point is to concentrate on firms which undertake similar business activities and share a common understanding of innovation and innovation performance. Moreover, for the empirical tests to have practical merit, firms ought to follow similar business functional outsourcing strategies. Outsourcing strategies, of course, will not be the same, but firms should have the potential to pursue similar paths. Outsourcing a particular function is a managerial decision and this decision is assumed to be available to all firms in this study. This assumption supports the outsourcing definition followed by other scholars (for example, Gilley and Rasheed 2000; McIvor 2009). The research propositions test whether the outcome of these outsourcing decisions differ among firms which perform activities in-house to firms which outsource. Therefore, one industry - furniture manufacturing - is selected for this inquiry.

The purpose of the Research Method I mode is to map the value chain of the case industry; this effort uncovers the business activities and innovation definitions of the case industry in order to test the proposed associations. This chapter reports the findings collected from interviews with industry experts, managers of furniture manufacturers and buyers of furniture products and services. Case examples are presented to illustrate the scope of manufacturing outsourcing and innovation. The findings from this research activity constitute the questions used in the Research Method II activity.

19 Background - the UK furniture market and industry

This study covers activities, which occurred between 2003 and 2007. Global and UK market data and consumer expenditure figures reported in this section do not take into account the financial downturn of 2007-2010.

Before I turn to the UK market, it is informative to highlight the reach furniture has globally. In 2003, furniture was the 16th largest of 141 traded manufacturing product groups (SITC 5 to 8 excluding SITC 68), with a total traded value of US\$77.1 billion

(www.unctad.org, last accessed on 24 January 2006). It was the largest traditional, low-technology sector, exceeding trade in the footwear industry (US\$47.9 billion) and the toys and sporting goods industry (US\$53.2 billion). World trade in furniture between 1994 and 2003 grew by 97 per cent, exceeding that of all manufactures (76 per cent), as well as that of toys and sporting goods (47 per cent) and footwear (27 per cent).

Table 6 shows the rapid growth of furniture exports by low-income economies. Between 1994 and 2003, China's exports increased by a factor of 6.1, Czech Republic and Mexico by 4.5, Poland's by 4.4, Malaysia's by 2.1 and Indonesia's by 2. Although to some extent these high growth rates are a result of low export volumes in 1994, they highlight the fact that these countries are now leading global exporters.

Table 6. Value of global furniture trade (SITC 821): the leading 20 exporting countries, 1994 and 2003

(US\$ thousands)

	Gross Exports 1994	Gross Exports 2003	Per cent change	Net Exports 2003
Italy	6,669,315	9,980,698	50%	8,615,808
China	1,494,117	9,062,193	507%	8,501,844
Germany	3,994,526	6,504,550	63%	-1,887,961
Canada	2,158,268	4,963,567	130%	1,585,043
United States	3,449,611	4,614,972	34%	-22,392,883
Poland	893,754	3,896,717	336%	3,269,526
Mexico	840,919	3,747,376	346%	2,612,489
France	1,760,915	2,688,392	53%	-2,314,179
Denmark	1,777,658	2,455,686	38%	1,517,585
Belgium and Luxembourg	1,497,328	2,049,065	37%	-535,797
Spain	721,148	1,750,994	143%	-25,399
Malaysia	767,691	1,617,064	111%	1,414,419
Austria	670,079	1,591,287	137%	-103,335
Indonesia	783,386	1,577,819	101%	1,547,845
United Kingdom	1,096,818	1,528,971	39%	-4,327,479
Sweden	984,576	1,495,409	52%	94,278
Czech Republic	288,510	1,295,412	349%	759,262
China, Taiwan Province of	1,798,164	1,198,213	-33%	937,282
Netherlands	864,469	1,075,613	24%	-1,112,968
Thailand	707,772	1,043,610	47%	951,848
Other countries	5,953,944	12,843,478	16%	
World	39,189,919	77,072,776	97%	

Source: Calculated from UNCTAD, 2005 (www.unctad.org last accessed on 25 January 2006).

The UK was the 15th largest exporter of furniture in 2003. Overall though, the UK imports more furniture than it exports with net exports of (-)US 4.33 billion dollars.

19.1 UK household furniture market

In the UK, households spent £13.3 billion in 2007 on chairs, living and dining room and bedroom suites, new kitchens, gardening furniture and other furnishings (Key Note 2011). Spending increased from £8.16 billion in 2003, an increase of 63 per cent (Key Note 2004a)⁶.

End-users (consumers) purchase household furniture primarily from multiple store chains and department stores. Multiple store retailers control between 35 per cent to 50 per cent of the market, depending on the particular product (Key Note 2004a), Do-It-Yourself (DIY) superstores, which offer low priced, flat-pack furniture, are also important furniture sellers while house-building contractors provide furnishing services to new house buyers. Finally, direct sales through catalogues and the internet are taking root in the UK but at a slower pace than in North America (source: Expert group interview).

The retail market is highly competitive in the UK with product quality, relations with customers and price ranked as the three most important competitive issues facing 20 UK furniture retailers and agents (source: Expert group interview). Rivalry is strong among furniture retailers; moreover, furniture is a consumable product that can be substituted for other durable goods, services and leisure activities. The decision to purchase furniture is often tied to new house purchases. The general state of the economy can also affect consumption behavior: employment security, wages and bonus packages will often be factored into furniture purchasing decisions (Key Note 2004a and Company Interviews)

UK household furniture retailing is concentrated in three large national multi-store retailers and two multi-store furniture specialist stores. These outlets accounted for over 50 per cent of UK household furniture sales in 2004 (Key Note 2004a; Key Note 2011). Competition in the low and medium priced product market niches is intense among the five retailers. Quality products and new designs are important but price remains the critical drawing card that attracts customers. Associated with

⁶ Consumer expenditure on furniture fell to £12.6 billion in 2009 (Key Note, 2011).

competitive pricing is the availability of in-house credit facilities. These facilities include policies that provide customers with interest-free credit. The larger household furniture retailers provide competitive credit rates over longer periods of time than those offered by one shop retailers (Key Note 2004a and Company Interviews).

Table 7. Market concentration of UK furniture retailing, 2004

	Turnover (Million GBP)	Share of UK expenditure*
MFI plc (UK retail only)	1,481.5	18.2%
IKEA* (UK retail only)	882.3	10.8%
Courts plc (UK retail only)	686.3	8.4%
Homestyle Group PLC	588.7	7.2%
DFS Furniture (UK retail and in-house manufacturing)	499.0	6.1%
UK household furniture expenditure	8,160	

*Estimated only

Source: Company reports; ONS, 2001 and Key Note, 2004

19.2 UK office furniture market

The size of the UK office furniture market was worth £860 million in 2007, a decrease from £911 million in 2003 (Key Note 2004b; Key Note 2008; ONS 2011b). The size of the UK office market has slowly declined since reaching a high of £1.16 billion in 2001. Office furniture includes seats, panels and screens, desks and tables, and storage units used for offices and shops (and not households).

Large purchasers of office furniture, which include large corporations and government departments buy direct from the manufacturers. These manufacturers also provide office layout services and customisation furniture designs. SMEs will often buy office furniture through dealers and agents. A recent trend has seen the rise of multi-store retailers such as Office World, Staples and IKEA as sources for office furniture (Key Note 2004b; Key Note 2008).

19.3 UK furniture manufactures

The UK Government identified 6,680 companies in 2004 (ONS 2004b). Micro firms (one to nine employees) and small firms (1- to 49 employees) constitute 75 per cent and 19 per cent, respectively, of furniture companies based on employee bands. Official figure include wooden furniture manufacturers and firms which manufacture furniture using metal, plastic and other non-wooden materials.

Table 8. Number of UK furniture manufactures by employment band, 2004

Number of firms

SIC Class	Description	Employment band				Total
		1-9	10-49	50-249	250+	
3611	Chairs and seats	500	230	95	30	855
3612	Office and shops	650	220	80	15	965
3613	Kitchen	755	200	35	10	1,000
3614	Other furniture	3,135	600	110	15	3,860
	Total	5,040	1,250	320	70	6,680

Source: (ONS 2004b)

The official number of firms in the UK furniture industry is only an estimate. Government industry statistics over-estimate the number of functioning furniture manufacturers in the UK according to industry experts (source: Expert group interview and BFM interview). Most furniture companies are sole proprietors that produce be-spoke items using jobbing processes. Industry experts suggest that between 1,500 to 2,000 UK companies manufacture furniture for the mass-market (Key Note 2011 and BFM interview).

20 Activities in the furniture value chain

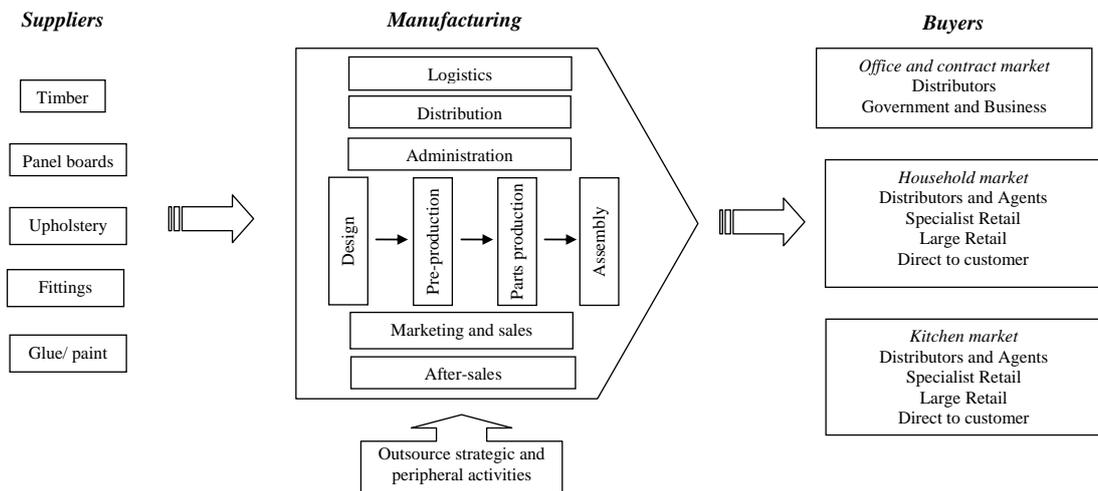
The details of the furniture value chain (Figure 9) are compiled from discussion with industry experts during the DTI Competitive Steering Group meeting (held on 8 October 2001) and additional interviews with furniture manufacturers and furniture buyers (distributors and retailers).

Figure 9 maps a generic wooden furniture value chain. This picture captures the inter-dependency of material inputs, manufacturing and retail. Raw materials, chemical fertilizers and equipment are used to support managed forests. Wood is taken to local sawmills where it is cut into timber. Sawmills are usually located close to these managed forests to elevate transport costs. From there, sawn timber can be sold directly to furniture manufacturers or, alternatively, be used to produce wood panels (although there is an effort by the industry to re-use wood rather virgin timber). Furniture manufacturers obtain other inputs from the machinery, adhesives and paint industries.

The furniture industry also draws on design and branding skills from the service sector. Depending on the market, the furniture then passes through various intermediary buying stages until it reaches the final customer. The furniture product

markets are divided into office and contract furniture, furniture for households (including garden furniture) and kitchen furniture. For historical reasons, the supporting distribution networks tend to be unique for the three product markets.

Figure 9. Furniture manufacturing value chain



Source: Interviews with industry experts at the DTI Competitive Steering Group Forum, 2001

20.1 Supply inputs - solid wood and wood panels

Material inputs for wooden furniture manufacturing include raw wood, wood-based panels, glue, fittings and paint or stain, and furniture components (e.g. table legs, upholstery and backings to chairs) and semi-finished furniture that require stain or painting. The location of the supply base is widening as manufacturers outsource functions formerly performed in-house.

Commercial wood used by furniture manufacturers is divided into softwoods and hardwoods. Commercial softwoods grow primarily in cooler locations and include spruce, pine, and Douglas fir. Softwoods are used in Europe in the building trade although high-quality pine (from Denmark and Sweden) is a popular wood for furniture. Hardwoods grow in southern and northern locations and range from light, Balsawood to durable woods like Ekki from Africa and Balau from Asia.

The first stage in the wooden furniture value chain is the shipment of logs. From logs and sawn timber the wood is dried for furniture and joinery products and to make veneer sheets. Veneers are used for wood-based panels such as plywood, medium-density fibreboard (MDF) and hardboard and for decorative surfaces on furniture and panelling. These intermediate wood products are important inputs into most wood manufactured products. Mass produced furniture increasingly consist of fibreboards and veneer sheets. Types of wood-based panels used by furniture manufacturers include:

- i. veneer sheets are thin sheets of wood bonded together with synthetic glues;
- ii. plywood is used in concrete formwork, sheathing, panelling, floors, furniture and fittings;
- iii. particle board (chipboard) is produced from dried and graded chips mixed with resin and are used in buildings, such as flooring and cladding;
- iv. compressed fibreboards (including hardboard and medium density fibreboard (MDF) are manufactured using a drying process, using a resin adhesive. These products are used for skirting, mouldings, architraves, joinery and furniture and finally
- v. fibreboard (non-compressed) or insulating board.

A report by the European Furniture Federation shows that European furniture manufacturers spend, on average, 28 per cent of total operational costs on the wood panels, followed by furniture components (16 per cent) (UEA 2004). Other inputs such as paint, stain and glue are not high cost material.

Table 9. Share of materials used in furniture production

<i>Materials</i>	<i>Average share of material costs used in a typical product</i>
Wood panels including: Veneers Plywood Particleboards MDF	27.8%
Parts of furniture	15.8%
Metal	11.7%
Hardware	9.3%
Plastics	8.9%
Textile	6.2%
Coatings	3.1%
Energy	2.8%
Leather	2.8%
Glass	1.7%
Glues	1.6%
Rubber	0.6%
Marble & stones	0.5%
Others	7.2%

Source: UEA. (2004). "Federation of European Furniture." Retrieved 10 June 2004, from www.ueanet.com.

20.2 Logistics and inward distribution

Figure 9 does not reveal the complex interaction between buyers, agents, commissioners and company representatives which mediate every stage of the value chain⁷. Although large furniture manufacturers may have in-house purchasing responsibilities (dedicated to buying wood directly from saw mills from around the world) many small and medium size furniture manufacturers purchase wood and panel boards from independent agents and wood importers. The link between sawmills and SME furniture manufacturers is the agent, broker or importer (if wood from overseas is sought). Most brokers are based in the home country of the manufacturer and will be equipped with detail knowledge of the supplier country. The agent may have a network of overseas agents (who are commissioners or

⁷ Information for this section comes from interviews with UK furniture manufacturers and from the Forests Forever initiative of the UK Timber Trade Federation (source: <http://www.forestsforever.org.uk>, accessed 1 June 2006).

representatives of sawmills) or have ties to the overseas sawmills directly. The broker acts as an information conduit and negotiates prices between suppliers or the suppliers' agent and end-users, sets delivery dates and ensures product quality. The broker can also provide export services such as preparing letters of credit, export insurance and organising shipping and distribution transport.

Larger wood buyers combine the role of agent and overseas purchaser. These larger buyers hold timber inventories for other intermediate users. The large buyer sells to smaller timber merchants, meeting the demands for the entire wholesale and retail wood market. In this way buyers not only mediate transactions but, acting collectively, also moderate prices by stabilising short-term imbalances in demand or supply. As with other commodity markets, the supply and demand of wood and timber are sensitive to price, quality and delivery scheduling. Most OECD countries will have an indigenous wood-based panel industry to meet local demand. However, other than large forest-rich countries such as Canada and the USA, most European furniture manufacturers import raw solid wood, especially hard woods from Asia and Africa. There is a small but growing sustainable forestry industry in European many countries but this tends to be for soft woods. Solid wood increasingly requires country of origin certification to curtail illegal logging activities, particularly in countries with large hardwood forests (e.g. Indonesia, Ghana and Brazil).

20.3 Product design

Product development in the furniture industry is not a science-based or technological endeavour. As a traditional manufacturing industry, furniture producers are more inclined to be design-led than engaging in science-based research and development (Von Tunzelmann and Acha 2005). New materials have had an impact on product development activities but such developments have originated from supplier manufacturers and not furniture manufacturers. For example, wood panel boards, particularly MDF, are replacing the use of solid wood in mass produced furniture. Panel board developments include the technologies from resins, glue and panel board manufacturers. Furniture producers have focused on design endeavours instead. New designs are usually incremental changes from previous incarnations and are influenced by design for manufacturing considerations (at least for products slated

for the mass product market niche). Furniture design and innovation is discussed in Section 22.1 (below).

20.4 Immediate furniture production

Furniture production consists of three sequential stages: pre-production, parts production and assembly. According to industry sources, manufacturing costs (including materials) accounts for 45 per cent of total production costs while manufacturing services (primarily product development and distribution) account for 15 per cent of total costs. Firms on average can charge 40 per cent to 80 per cent on top of total production costs to their immediate buyers (UEA 2004). This cost breakdown indicates that immediate production activities are core activities. The cost composition further suggests that the share of costs can be an indicator to distinguish between core and peripheral activities.

20.4.1 Pre-production

Pre-production consists of the planning and operation analysis applied to specific product designs. The functions of planning, specifying, and coordinating the application of required factory resources including: performing analyses of production operations, processes, and systems; applying new manufacturing methods, tooling, and equipment; controlling the introduction of engineering changes, and employing cost control and quality techniques from the factory viewpoint.

20.4.2 Parts production and assembly

Central to the furniture manufacturing are parts production and assembly. Wood is transformed into components and assembled into semi-finished or finished products. Wood-based panels is used low to medium priced furniture while, increasingly, manufactures of high valued items are using MDF. Assembling is a key stage in mass produced furniture and includes the work performed to modify components for customised items. Assembly work requires significant effort to organise and schedule parts inventory and labour.

Immediate production activities include lamination and production finishing activities including spraying, drying, waxing, staining, and polishing. The labour skills involved in the production of wooden furniture include (i) craft skills such as

wood carving, (ii) operational skills which entail sanding and machine operating, assembly, and spray finishing, and (iii) low-skilled activities such as packaging.

20.5 Outbound distribution, marketing, sales and after-services

After the immediate production stages, firms undertake a series of outbound activities to deliver products to buyers and end-users. Increasingly, services are being offered and include export services, marketing and sales and after-sales services. Distribution is becoming an important function for most large manufacturers and companies are taking advantage of FMS (flexible manufacturing systems) to provide made-to-order and just-in-time delivery services. Many firms, particularly SMEs, out-source distribution to companies, which specialise in shipping, packaging and land-transport. These one-stop distribution service providers allow small and medium furniture manufacturers to concentrate on other core competences such as product development and production.

21 Product markets and buyers

The organisation of retail and distribution activities differs in every country. In the UK, the furniture market is divided into three broad product markets: household, kitchen and office furniture. Manufacturers tend to focus on one of these product markets. This product market focus is not tied necessarily to a firm's rigidities to technological paths (and to lesser extent design) (Dosi 1982) but rather, a reliance on marketing relationship assets (Sheth and Parvatiyar 1995; Srivastava, Fahey and Christensen 2001).

UK household furniture is sold through retail outlets, specialising in a market niche. For example, high-value, craft built furniture will be sold by specialised furniture shops usually dedicated to a brand name or a particular style of furniture. Low to medium priced furniture, which is usually mass-produced, is sold through large multi-chain stores. These chains may sell children's furniture, bedroom and living room furniture under one roof. These larger buyers buy products directly from local and overseas manufacturers and avoid going through a middleman.

Kitchen furniture is closely linked to the construction industry. Units are often sold to building contractors rather than to the final user. The "Do-It-Yourself" or refurbishing outlets cater to house owners seeking furniture for kitchen upgrading.

However, most kitchen furniture requires some input from manufacturers or installers. Mass produced completed kitchen furniture often require tradesmen to install the units.

Retail outlets dedicated to office supplies sell office furniture for home use. Larger furniture department stores (for example, IKEA) sell a limited range of office furniture. Office furniture for business or government procurement comes under the category of 'contract' furniture. In the contract furniture market, buyers or end-users place large orders directly with manufacturers; this furniture tends to be more durable than the office furniture sold for residential use.

Manufactures have made inroads to reach customers directly. Catalogue shopping, furniture manufacturer's showrooms and specialised ordering are outlets available to most European and North American customers. The common strand in these buying mechanisms is to circumvent one of the chain links – in this case, the retailer – that stands in the way of the manufacturer and the final end user.

Furniture distribution is increasingly more efficient with the use of electronic data interchange (EDI) and web-based logistical systems (Sapling, 2001). EDI systems, for example, electronically link retailers to the account receivables of their manufacturers. This enables made-to-order and just in time delivery processes. Most manufacturers contact suppliers using some form of electronic communication: orders are sent by e-mail, design work by facsimile or, if companies are using advanced CAD systems, CAD designs are fed directly from the designer to the manufacturer electronically.

Furniture companies from developing countries do not have a direct link to the final user living in developed countries. Agents representing the retail firm, buyers located in both developing and developed countries and wholesalers in both countries will purchase furniture from manufacturers located in developing countries. Large retailers take on the role of the governor of the supply chain and are involved in the design and quality control function. Every buyer or middle person will add his or her own commission to the product before the product continues onto the next buyer (and these charges will be added until it finally reaches the end-user).

Despite this market complexity, it is possible to identify three major buying agents facilitating the entry of wood furniture producers into final markets (Source: Expert Company Interview):

- i. large multi-chain retailers, with both retail outlets and suppliers in many countries;
- ii. small scale retailers, purchasing directly from a limited number of suppliers in a limited number of countries; and finally
- iii. specialised medium-sized buyers sourcing from many countries and on-selling to retail outlets, predominantly in a single country or region. It is not atypical for these buyers to have more than 1,500 suppliers, located in many countries; even the smaller specialised buyers will typically source from more than 100 suppliers (source: Expert group interview).

22 Innovation in furniture manufacturing

The data reported in this section comes from interviews with the Director of the BFM, senior managers from three manufacturers (the case companies) and four large furniture buyers (retail and distribution agents). The interview template made use of open-ended questions which focused on two threads:

- i. what criteria do firms consider when developing new products?;
- ii. what factors are important for firms when production processes (or other processes) are improved?

Secondary data sources are also used.

22.1 Product innovation (design)

Product innovation is defined as the introduction of new products to the market (Tidd, Bessant and Pavitt 2005). In the furniture industry, product development takes the form of new designs rather than technological change. Furniture designs make use of existing materials and product architecture and follow design for manufacturing practices (Whitney 1988). Furniture design often follow a pre-determined launch cycle which are entail annual or seasonal design changes (although some designs will last for years). Small and medium size manufacturing firms often out-source product design for high-value items, taking advantage of the brand name of the designer. For low to medium priced products, design is not so

important and the manufacturer often alters an existing design or ‘copies’ a competitor’s design (copyright protection is not a factor in the industry).

Furniture design is closely associated with the brand name of the manufacturer or the retailer. For instance, large retailers in the UK such as IKEA, Courts Plc and MFI Plc market furniture under their own banner rather than the name of the manufacturer. The country of origin can also contribute to a brand: Danish pine furniture or Italian designed furniture are examples where product quality is perceived through a national identity.

The one recent technological development, which had an important impact on furniture products, was the introduction of flat-pack furniture. This development made use of component modularity and material advances in wood panel boards such as MDF (multi-density fibreboard) which reduced costs and improved production quality (furniture producers view panel boards to be more reliable than solid wood) (Spalding 2001). Advances in flat-pack technology also contributed to production moving from labour-intensive solid furniture, to capital-intensive production.

22.2 Process innovation

Process innovation entails increasing the efficiency of internal processes, usually associated with production (OECD 2005; Tidd, Bessant and Pavitt 2005). Process innovation is measured by productivity measures, which reflect reducing the costs per worker, improving the quality output or accelerating the process. Furniture manufacturers have undertaken several technological and process improvement initiatives since the early 1990s. Examples of process innovation initiatives include the following (Spalding 2001 and Company Interviews):

- i. modular, computer-numerically-controlled (CNC) wood-working machinery allowed firms to input complex, sequential commands to a computer, which control the production machinery. Capital-intensive production process facilitated firms to engage with mass markets;
- ii. computer-aided design and manufacturing (CAD/CAM) allowed the dis-integration of design with manufacturing. Designers can now send CAD designs

- to manufacturing plants located anywhere. Productivity and quality improved dramatically when CAD designs are integrated with CNC machinery;
- iii. the advent of flat-pack or RTA (ready-to-assemble) furniture led to an important change to furniture production methods. RTA designed furniture, with standard shapes and sizes and high volume demand, led factories to take advantage of *design for manufacturing* processes;
 - iv. production plans introduced flexible manufacturing system (FMS) layouts which improved the flow of furniture parts efficiently without unneeded retooling and finally
 - v. made-to order and just-in-time distribution systems reduce inventory levels of raw material inputs and finished but-not-sold items.

For example IKEA is focusing on designing and distributing furniture rather than manufacturing, although the company has opened a manufacturing subsidiary in order to 'learn' about product and process innovation (Source: Company Interview). Moreover, firms have shifted production away from labour-intensive solid furniture, to the capital-intensive production of flat-pack furniture. Automation and the corresponding organisational changes in furniture manufacturing have reduced the share of wage to company sales from 50 per cent in the 1960s to 28 per cent in the mid-1990s (EU, 1997).

In attempt to improve operational productivity, the UK furniture industry association launched a national supplier and operational awareness campaign to introduce lean and Kaizen production techniques in 2002 (BFM 2011). Short-term success was super ceded however by unprecedented overseas competition, primarily from China, and many medium and large UK furniture manufacturers have gone out of business since 2005.

23 Outsourcing and innovation in the furniture industry - case studies

Wood furniture manufacturing is a large and rapidly-globalising sector. It provides for a range of technical choices in production and strategy. The introduction of new technology and the fact that it is a discrete-products industry assembling products from components also allows for an extended inter-firm division of labour, with producers able to specialize in numerous links in the value chain. In other words, there is scope for widening business outsourcing primarily based on capabilities and cost factors.

To delve deeper into the issues pertaining to business activity outsourcing, three case studies are presented. The examples illustrate outsourcing strategies of production activities including parts production and assembly, design and, to a lesser extent, distribution.

23.1 Company A – design and parts production outsourcing

This SME is located in southeast England and specialises in high-value English reproduction furniture. Turnover in 2000 was £12.5 million and the company employed 350 workers. In the mid-1980s, Company A employed 700 staff and turnover averaged £20 million per annum. The company downsized when overseas demand for reproduction furniture diminished. However, UK demand remains strong and the company expects steady, but not spectacular, growth for the next five years.

Company A manufactures dining room and living room suites. The firm previously had a significant in-house design team but by the late 1990s, increasingly the company relied on designs produced by UK design houses. The products are marketed under Company A's brand name and sold in specialist furniture shops in the UK and northern Europe (and on orders to the USA). The company provides retail services in order to reduce older inventory

Material inputs are supplied from several locations. Solid wood is purchased from West Africa while wood-based panels are purchased from UK and other European suppliers. Agents based in the UK are used to procure material inputs: the company requires high quality solid wood and the agents have an established network in West

Africa. Company A is certified for ISO 9002 and ensures all wood meets FSC certification.

In 2002, the company outsourced approximately 15 per cent to 20 per cent of parts production to manufacturers located in the UK, Eastern and Central Europe and Asia. Lower costs and high quality are mitigating factors why Company A does not produce all the furniture components in-house. Two examples of parts production outsourcing include:

- i. engraved chair backing components are manufactured in the Philippines. These parts are shipped to Company A and are added to in-house manufactured components to produce a high value dining room chair for dining room suites. The engravings are hand crafted and the Asian workmanship is very high. Company A could not undertake the craft process in-house without incurring prohibitive costs.
- ii. semi-finished dining room furniture made of high quality teak is produced in Indonesia. Teak is a heavy wood and it is cheaper to purchase a semi-finished product than to ship the raw material and manufacture the product in the UK. The semi-finished components are assembled, varnished and finished by Company A. Reproduction furniture is a unique market niche: value is added through a finishing process that makes the furniture look and feel old. The finished furniture is sold under Company A's brand name.

The company sends technical personnel directly to non-UK factories to inspect product quality and production processes. The production manager of Company A ranked furniture suppliers from the Philippines and Indonesia in terms of price and quality and to contrast the two Asian suppliers with another supplier country (in this case, the manager identified a firm from Romania which supplies finished hard wood components).

The Romanian firm was ranked very high on price and quality criteria. Indonesian firms ranked lower in quality and price factors than firms from the Philippines and Romania. The Company A production manager suggested that it was the price of Indonesian products that concerned the company (although consistently high price

quotes may have long term ramifications); it was price fluctuations. Cost certainty is a critical factor for long term production planning.

23.2 Company B – parts production outsourcing

Company B employs 120 workers in the UK and specialises in the manufacture of upholstery for wooden furniture. Company B's products are sold to the low to medium priced household and outdoor/ garden markets. The company combines manufacturing with direct selling through furniture catalogues and mail orders.

The company outsources all their wooden furniture parts requirements; in-house manufacturing includes upholstery backing and cushion manufacturing and final furniture assembly. Wooden furniture components are supplied by local UK manufacturers and Asian manufactures particularly:

- UK parts production include wood based panels (about 25 per cent of parts);
- suppliers from China account for 75 per cent of all household furniture parts and 25 per cent of all wooden garden furniture parts;
- 75 per cent of garden furniture parts come from Thailand and Vietnamese suppliers and finally
- cane furniture parts are purchased from Malaysia and Indonesia suppliers.

Company B uses agents to purchase all overseas parts. UK-based agents are used for Malaysian and Indonesian orders. Agents located in Hong Kong are used for orders to Chinese suppliers and the company uses a Thailand-based agent for Vietnamese orders. The company uses catalogues and information and communication technology for product selection. The company does not, however, use CAD-generated files for submitting product designs. Designs are hand drawn and scanned.

When the company began to source supplies from Asia in the 1990s, all design work came from Company A. Since 2000, Asian manufactures have deepened their design capabilities and (as of 2004) 50 per cent of all wooden furniture parts and semi-finished products are designed by Asian firms with the remaining components designed by Company A.

Importing agents can often maintain a buffer between the overseas manufacturer and the buyer (Kaplinsky, Morris and Readman 2002a). Managing the transaction between purchasers (in this case, UK manufacturers) and parts manufacturers is a

transaction cost. Small firms cannot afford the expertise to source suppliers, particularly if low cost preferences require overseas suppliers. If buyers and sellers knew each other, then there would be no need for an intermediary. Even though the company depends on agents to facilitate orders with Asian suppliers, Company B has direct access to all their suppliers. Frequent visits to China and Thailand to local suppliers occur. Company B cited their buying power as the chief reason why agents do not withhold information about suppliers: orders are large and no agent wants to lose Company B as a client.

Asian agents occasionally perform more than a commissioner function. Agents (especially agents representing Chinese manufacturers) often have a financial stake in the local manufacturer or represent a network of companies that are inter-dependent (Source: Company Interview). Agents may not be worried about losing a commissioner's fee since they would still benefit if the supplier they are associated with receives an order. UK-based agents, however, may not be closely associated with Asian manufacturers and will rely on the traditional commissioner role as the only source of income in any transaction.

The company manager indicated that the market is price driven and that was the prime reason why the company purchased from Asian suppliers. Even non-Chinese Asian firms have difficulty meeting the prices offered by Chinese manufacturers. Product quality from Thailand and Indonesia remains very high which can compensate for higher prices.

23.3 Company C - parts production and assembly outsourcing⁸

This example investigates an UK manufacturer which supplies high value-added garden furniture. The furniture is made overseas and includes Iroko furniture from Ghana, teak furniture manufactured in Vietnam and China and small volumes of contemporary furniture (a hybrid wood and metal) from Eastern Europe. Furniture was also purchased from South Africa until 2002. Furniture manufacturers perform production activities and source wood materials and other inputs. Producers are also

⁸ This case study is adapted from previous work published by the author in Kaplinsky, R., J. Readman and O. Memedovic (2008). *Upgrading Strategies in Global Furniture Value Chains*. Vienna, UNIDO. **WORKING PAPER 09/2008.**

responsible for outbound distribution to the UK. Activities performed by Company C include supplier sourcing, product design, European wholesale/ distribution and after-sales services. Products are distributed to garden centres in the UK (multi-store and single store retailers) and to department stores and general furniture stores in other EU countries.

Although Company C is the linchpin of the value chain, it is appropriate to start this story from the viewpoint of the furniture producer in Ghana. This local furniture producer started their foray in the UK market in the 1980s as a contract manufacturer for several large UK household furniture manufacturers. An UK office was established to facilitate European product distribution soon afterwards. In 1992, this producer introduced its own product line of garden furniture which was also sold under its own brand name. The UK affiliate quickly added marketing and distribution responsibilities for these garden furniture items. During this period, the Ghana discontinued their contract manufacturing activities and concentrated on supplying the UK affiliate.

The UK buying associate and the Ghana producer separated into two companies in the mid-1990s. The split allowed each business to develop and pursue their own strategic objectives. The Ghana producer was seeking new distribution outlets outside the UK and the UK buyer wanted to source furniture from other locations. These former affiliates remained closely linked in business and personnel matters however. For example, Company C has continued to purchase the bulk of the Ghana firm's production output, about 70 per cent in 2005 (the remaining output is sold in the local market). The current Managing Director of Company C was also the production manager of the Ghana factory until the late 1990s. Business pressures however are putting a strain on this relationship.

Despite this long history, Company C has steadily increased orders from Asia (notably Vietnam and China) and away from Ghana. The share of furniture parts supplied by the Ghana manufacturer dropped from 56 per cent in 2001 to 35 per cent in 2005. It is expected any future order increases will go to Asia.

Of the three operational factors which were graded very important, the Ghana supplier out-performed suppliers from South Africa, China and Vietnam on quality and delivery measures. The finished product quality of Ghana furniture was rated

superior to that of the other suppliers, but not by a significant margin. The wood type used by Asian suppliers is preferred however. The Ghana furniture is made from Iroko which was introduced as a teak substitute. Until recently, teak was too expensive to be used for garden furniture and Iroko, which is widely available in West Africa, is cheaper to harvest and provides teak-like quality properties, was an ideal substitute. The emergence of Asian furniture producers though has coincided with the availability of inexpensive teak, which consumers favour over the lesser known Iroko. Teak garden furniture is controversial for two reasons. China, and to a lesser extent Vietnam, are net importers of raw wood used in wood product production and the illegal trade of hard woods concerns buyers and end-user (The Financial Times 2005). Furthermore, and despite using imported wood inputs, the price of furniture sold by China and Vietnam to the export markets is low, perhaps even lower than what is sold in the local Chinese and Vietnamese domestic markets (The Financial Times 2006). Ghana furniture producers cannot match the prices being offered by Asian rivals.

Whilst the Ghana supplier marginally out-performed suppliers from China and Vietnam in the quality and delivery measures, the Asian suppliers were clear winners on the price criteria. Table 10 reveals the prices (price index) charged by different producers for a similar type of furniture. The price of furniture from China and Vietnam is, respectively, 40 per cent and 24 per cent lower than similar products produced in Ghana while the price of South African furniture is 20 per cent higher than the Ghana product. Company C discontinued purchases from South Africa in 2002 when suppliers could not offer competitively priced products. The lower prices offered by suppliers from China and Vietnam is the foremost reason why this buyer has moved away from their African supply base.

Table 10. Prices offered by suppliers for a similar item of garden furniture

	Price index
Ghana supplier	100
China supplier	60
Vietnam supplier	76
South Africa supplier	120

Source: Company C Interview

The company designs its own furniture for other suppliers while it has on-site designers in Ghana. According to company sources, the brand name took several years to establish and it has only been in the past five years which the name has become synonymous with high quality garden furniture in the UK. Product variety is sold on design features, the type of wood and the location of the manufacturer. Company C introduces several new products design every year. The company also makes use of UK design houses.

Company C did not regard innovative criteria to be as important as the operational criteria. The company creates product concepts and manages the design process internally. It does not purchase any furniture which has been designed by furniture manufacturers. Nonetheless, the company does acknowledge that it has benefited from its supplier capabilities. Product design concepts, which have been developed in the UK do not always easily transfer to an off-shore manufacturing site. Chinese suppliers have improved the design for manufacturing specifications.

The Managing Director noted how his firm has benefited particularly from innovative Chinese manufacturers:

On more than one occasion, our Chinese suppliers have offered an improvement on one of our designs and did not charge me for it. Other suppliers (i.e. from Ghana) would probably not be able to make this change. And if they could, they would send me a bill.

Source: Managing Director, Company C Interview

Company C employs local and expatriate staff to manage its supply base. In addition, the Managing Director visits several key suppliers annually. These visits consist of factory tours and meetings with managers and workers. This gives the buyer a unique perspective in which to evaluate qualitative factors such as labour capabilities and practices. Company C considers the labour capabilities of China manufacturers to be superior to that of suppliers in Vietnam, Ghana and South Africa.

Although the furniture industry is a labour-intensive industry, it is advantageous for suppliers to use advanced production process technology. For instance, the use of CNC machinery is essential to produce high quality, mass produced furniture. Small firms are at a disadvantage: these firms do not have the capacity to produce large volumes and the investment to upgrade is usually beyond their reach. Small firms

are best suited for batch volume production or bespoke furniture. Company C retorted that Vietnam furniture producers were utilising superior process technologies in their factories and that both Vietnam and China were investing more in technology than producers in Ghana and South Africa.

24 Cluster of production activities – exploratory research proposition

The case companies present several outsourcing patterns which are summaries in Figure 10. Specific interest is in design activities and immediate production (pre-production, part production and assembly). A dark shade in the figure represents the outsourcing fully of a function; a greyish shade represents partial outsourcing and a clear/ white shade indicates the activity is performed wholly in-house.

Figure 10. Outsourcing strategies followed by Case Firms

	Design	Immediate production		
		Pre-production	Parts production	Assembly
Company A				
Company B				
Company C				

Outsource	
Partial outsource	
In-house	

First, design specialists have been used by UK furniture manufacturers off and on for many years (source: BFM interview). The three case companies are recognised for innovative product designs and continue to launch new products. However, these companies outsource partially or fully the design function to UK design houses. From a strategic perspective, do firms which have embedded design capability demonstrate higher product innovation performance than firms which do not perform design in-house? This query is tested in the second Hypothesis (H1b): *firms performing core activities in-house are higher innovation performers than firms outsourcing strategic activities.*

The second outsourcing pattern suggests that furniture manufacturers follow a combination of immediate production outsourcing strategies. Outsourcing different production functions can reduce costs or achieve other competitive advantages such as developing technical competences, avoiding non-tariff barriers or targeting long-term market presence. For example, production sharing among firms in developed and developing countries tends to follow a pattern where the controlling firm holds onto R&D, product development and design, capital-intensive manufacturing, and marketing activities while shifting labour-intensive operations to countries with lower labour costs (Drucker 1977; Feenstra and Hanson 1996). Production sharing occurs if goods are produced in two or more sequential value-adding stages by two or more firms. Yeats estimates that production sharing within the machinery and transportation equipment sector (which covers 50 per cent of world trade in manufactured goods) accounted for 30 per cent of all shipments of OECD exports of parts and components in this group (Yeats, 1998).

These findings raise an interesting question: are there specific combinations of production activities which are associated with higher innovation performance? From the observations of the three case studies, an exploratory research proposition is posed:

RP_e: Is there an optimal combination of immediate production sharing associated with innovation performance?

25 Summary of Research Method 1 findings

The Research Method 1 mode consisted of open-ended and semi-structured questions with industry experts, manufacturers and buyers. The UK furniture industry is a buyer-driven value chain with few scale- or technology-entry barriers in production (Gereffi, Humphrey and Sturgeon 2005). The key findings consider the manufacturing value chain activities and those activities which can be outsourced.

The furniture manufacturing value chain includes material inputs, manufacturing, distribution and retail. The case company interviews suggest that core activities can be outsourced and these could include immediate production activities: pre-production (organising and preparing raw materials, wood panels, etc.), component and part production and product assembly. Other core activities include product design and product distribution. The case interviews did not reveal a preference for

the outsourcing of peripheral activities except for inbound logistics. Other peripheral activities include administration, marketing and sales and after-sales support.

Product innovation is primarily defined through new product designs. Design capability can exist not only with the manufacturer but also with large buyers and specialised design houses. Not having an embedded design capability does not prevent manufacturers from launching new products: design outsourcing is practiced throughout the industry. Process innovation occurs in production and, to a lesser extent, distribution and logistics. Process innovation amounts to incremental improvements through continuous improvement and through the introduction of new production technologies.

Three buyers types were identified: large-multi store retailers, specialized buyers or agents and small independent stores. The biggest and most dynamic of these buyers are multi-store retailers, which generally purchase on a large scale and, except for a few minor items, tend to source directly from the producers. For these buyers, cost and volume are the key critical success factors determining their purchasing decisions. The second major type of buyer is the specialized import agents. They, too, tend to deal directly with the furniture producers, but buy in smaller volumes and sell to less price-sensitive and more design-conscious retailers. The third buyer type is retailers with a limited number of outlets. These buyers tend to purchase in small quantities, generally from import-agents or from wholesalers in producing countries, and sell into design-conscious markets. Finally, manufacturers can also sell directly to end-users.

The next chapter explores the exploratory research question proposed in Section 24 and the three sets of research propositions set out in Chapter Three. The activity, outsourcing and innovation tendencies revealed in the Research Method I mode are used to construct a questionnaire which is applied to a sample of furniture manufactures. The outsourcing strategies of business activities and the innovation performance are tested for possible association.

The first research stage (Research Method 1) identified the value chain activities specific to firms in the UK furniture industry. The qualitative mode also defined the industry's innovation performance. These industry and firm attributes contributed to the construction of the Research Method II questionnaire. Secondary sources have also informed the survey questions referring to strategy and industrial organisation. The purpose of the second research stage was to test the research propositions in those firms that display similar – or potentially similar - organisational structures and industrial organisation.

The first-level survey results are reported in this chapter with particular attention given to the questions and variables that are relevant to the testing of the research propositions. Frequency tables and histograms are intersperse throughout this chapter to highlight notable findings. The findings report on firm activities from 2004 to 2005 unless stated otherwise. The first section report on the descriptive findings that are relevant to the three sets of hypotheses drawn from Chapter 3 and the one exploratory research proposition suggested in Chapter 5 (Research Method 1). Reported in this section are the outsourcing profile ,innovation performance, firm size, buyer preferences and buyer types. This data set is used to measure the test variables in the next chapter. The second section summarises the profiles of the respondents and include the legal status of the firms and respondents' position(s) in the firms. The respondent profile justifies the use of the self-assessment questionnaire. The third section provides an overview of the industrial organisation of the sample firms while the last section raises issues arising from the findings.

26 Variables and descriptive results for Hypothesis 1 (H1)

The procedures and calculations used to measure the variables for Hypothesis 1 (H1) are presented in this section. The first level results are reported.

26.1 Variable 1: Core or peripheral activity outsourcing

26.1.1 Core and peripheral activities

Firms were asked to rank activities by the contribution these activities make towards total costs. Activities may contribute directly to revenue but the contribution to turnover is not often clear and not adequately measured. Moreover, most companies,

particularly SMEs, do not calculate the contributions of activities towards turnover. Costing activities is more prevalent in firms and cost contributions was used as an indicator of core activities.

Respondents ranked each business activity out of a score of 10 (with one indicating a low contribution to cost and 10 indicating a very significant contribution). The average (mean) scores, derived from the individual responses, are calculated for each activity and normalised so that the total arrives at 100. The results of this calculation are illustrated in Table 11. As a share of the total cost base, product assembly, parts production and pre-production activities contribute the greatest value while inbound logistics and after-sales support add the least value.

This average value added cost structure should be viewed with some caution. The variances of the individual responses are high in some cases: Table 11 contrasts the average costs (mean scores) and the standard deviations of the scores. The normalised standard deviation ranges from 3.79 for inbound logistics to 6.98 for pre-production. This wide variation indicates that respondents hold (vastly) different perspectives about their cost base.

Table 11. Average value-added manufacturing costs

	Normalised Mean	Normalised StD
Pre-production	14.39	6.98
Product design	9.32	4.05
Inbound logistics	6.36	3.79
Parts production	15.32	6.13
Product assembly	15.73	5.64
Administration	9.91	4.10
Marketing and sales	11.82	4.33
After-sales support	7.87	4.06
Product distribution	9.27	5.94

N=66

The breakdown of core and peripheral activities for the sample is presented in Table 12. Chapter 4, Section 5.1.1 describes the definition of core and peripheral activities are the algorithm. Parts production and assembly are core to over 80 per cent of the respondents, followed by preproduction (67 per cent of firms) and marketing and sales (56 per cent).

Table 12. Core and peripheral activities – based on above average costs

Per cent of respondents

	Core	Peripheral
Pre-production activities	67%	33%
Product design	36.4%	63.6%
Inbound logistics	10.6%	89.4%
Components / parts production	80.3%	19.7%
Product assembly	80.3%	19.7%
Administration	43.9%	56.1%
Marketing and sales	56.1%	43.9%
After-sales support	22.7%	77.3%
Product distribution	34.8%	65.2%

N=66

There is a danger in using value-added costs as an indicator for value. Activities which do not incur above average costs are by definition not core. For example, design and after-sales services, two activities, which contribute positively to turnover, are core to only 36 per cent and 23 per cent, respectively, of the respondents. The emphasis on value-added costs rather than value-added to turnover may favour high cost activities while negating revenue-contributing activities (that have a lower cost base).

26.1.2 Performing activities in-house or outsource

Firms were asked if they perform activities fully in-house, fully outsource or partially perform in-house and outsource. Supporting services such as administration, after-sales support and marketing and sales are predominately performed in-house (95 per cent, 91 per cent and 82 per cent of respondents respectively). Activities, which are partially or completely outsourced include component production (48 per cent of respondents), inbound logistics (44 per cent of respondents) and pre-production (34 per cent).

Table 13. Activities performed in-house or outsourced

Per cent of responses

	Perform fully in-house	Outsource fully	Partially in-house and partially outsource
Pre-production activities	67%	32%	2%
Product design	79%	14%	8%
Inbound logistics	56%	38%	6%
Components / parts production	52%	31%	18%
Product assembly	82%	11%	8%
Administration	95%	3%	2%
Marketing and sales	82%	12%	6%
After-sales support	91%	6%	3%
Product distribution	62%	23%	15%

N=66

UK furniture manufacturers contract work to local suppliers and from suppliers non UK suppliers, mainly located in other EU countries. Firms make use of non-UK low cost suppliers and suppliers with unique capabilities for parts production (31 per cent of firms) and product design (13 per cent of firms). Pre-production activities and support services are undertaken, for the most part, by local suppliers rather than outsourced outside the country. Product assembly is outsourced equally to local and foreign suppliers: (9 per cent and 10 per cent of firms, respectively, outsource to UK firms and non-UK firms. Inbound logistics which entails organising and transporting inputs for production is managed by UK firms (35 per cent) while distribution - transporting finished products to buyers – includes a large share of UK suppliers (23 per cent) and non-UK firms (15 per cent). For all activities however, a greater share of firms rely on in-house capabilities than outsourcing.

Table 14. Local and international production networks

Per cent of responses

	Perform in-house	Outsource to UK firms	Outsource outside the UK
Pre-production activities	67.0%	24.2%	9.8%
Product design	79.0%	9.1%	12.9%
Inbound logistics	56.0%	34.8%	9.2%
Components / parts production	52.0%	18.2%	30.8%
Product assembly	82.0%	9.1%	9.9%
Administration	95.0%	3.0%	2.0%
Marketing and sales	82.0%	12.1%	5.9%
After-sales support	91.0%	6.1%	2.9%
Product distribution	62.0%	22.7%	15.3%

N=66

To proceed with the variable formulation, I collapse the different outsourcing categories. First, I assigned those activities, which firms perform, ‘partially in-house and outsource’, to the ‘outsource fully category’. By undertaking this transformation, the data set loses an unique classification, which could dilute the results especially if the capabilities to perform ‘in-house and outsource’ are different from the capabilities ‘outsource fully category’. Also, the depth of activity outsourcing is an important factor which can affect performance (Gilley and Rasheed 2000). However, other than component/ parts production and product distribution, the number of firms, which are affected by this procedure, is not large. Shedding the ‘partially outsource’ category allows the testing of two groups of firms, i.e. comparing the results of firms which perform activities in-house to firms which outsource.

Second, the test variables do not distinguish between the different locations of the outsourced activities. The sample firms from this study indicate the location of suppliers outside the UK are mostly located in other EU countries. While costs differentials may explain outsourcing decisions, the location of activities may be particularly relevant as to whether local production networks differ from global production networks in performance. The outsourcing location is introduced to support the analysis of the test finding in the chapter on implications (Chapter 8).

26.1.3 Descriptive results of Variable 1

This indicator places firm activities into four in-house-outsourcing positions as discussed in Chapter 3, Figure 1:

Position 1: Peripheral and performed in-house

Position 2: Core and performed in-house

Position 3: Core and outsourced

Position 4: Peripheral and outsourced

Figure 11 presents the in-house- outsourcing positions for the different activities performed by the survey respondents. Each quadrant presents the share of the total number of respondents (N=66). For this study, the comparison is between the outsourcing positions of (a) core activities and (b) peripheral activities. Therefore, firms in Position 1 (in-house peripheral activities) are compared to firms in Position 4 (outsourcing peripheral activities); firms in Position 2 (in-house core activities) are compared to firms in Position 3 (outsource core activities).

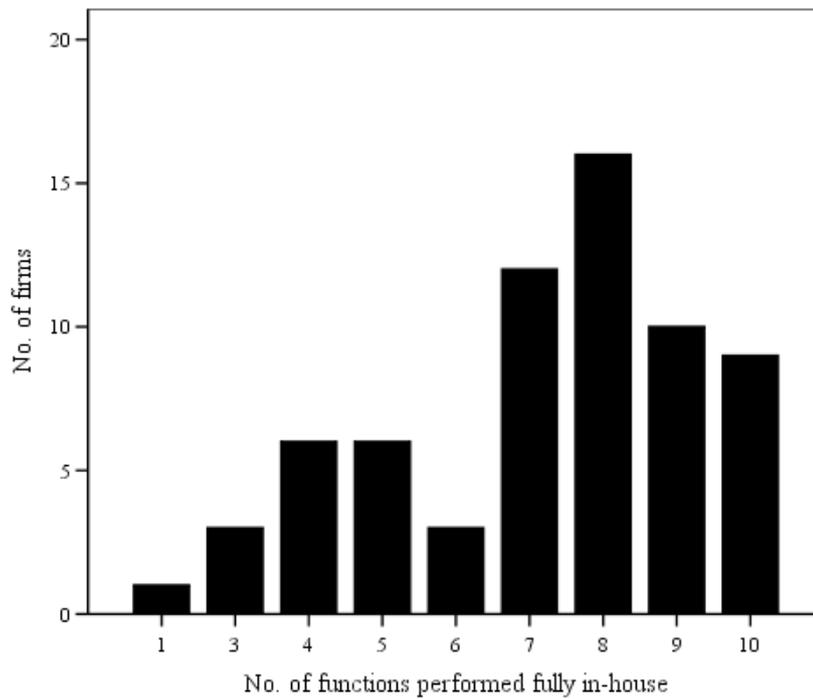
Figure 11. In-house- outsourcing positions of activities, per cent of respondents

	1		2	
<i>In-house</i>	Pre-production	19.7%	Pre-production	47.0%
	Product design	53.0%	Product design	25.8%
	Inbound logistics	53.0%	Inbound logistics	3.0%
	Parts production	4.5%	Parts production	47.0%
	Product assembly	16.7%	Product assembly	65.2%
	Administration	56.1%	Administration	40.9%
	Marketing and sales	37.9%	Marketing and sales	43.9%
	After-sales support	69.7%	After-sales support	21.2%
	Product distribution	43.9%	Product distribution	19.7%
<i>Outsource</i>	Pre-production	13.6%	Pre-production	19.7%
	Product design	10.6%	Product design	10.6%
	Inbound logistics	36.4%	Inbound logistics	7.6%
	Parts production	15.2%	Parts production	33.3%
	Product assembly	3.0%	Product assembly	15.2%
	Administration	0.0%	Administration	3.0%
	Marketing and sales	6.1%	Marketing and sales	12.1%
	After-sales support	7.6%	After-sales support	1.5%
	Product distribution	21.2%	Product distribution	15.2%
	4		3	
	<i>Peripheral activities</i>		<i>Core activities</i>	

26.2 Variables 1a, 1b and 1c: Outsourcing intensity

The number of activities, which firms outsource, is of interest as any variance may be affect firm performance. The median number of functions performed fully in-house by the respondents is eight (out of nine operational activities and one direct selling activity). Most firms, in fact, perform the lion share of the manufacturing operations in-house. As illustrated in Figure 12, 14 per cent of firms perform all nine operational activities (including direct sales/ retail) while 18 per cent perform all nine operational activities (excluding direct sales/ retail).

Figure 12. Number of functions performed fully by respondents



N=66

The results of the three outsourcing intensity index calculation are presented in Table 15. The index range is 0 (firms that do not outsource) to 1 (firms which outsource 100 per cent of their activities). On average, firms outsource 28 per cent of their core activities (mean = 0.2774) and outsource 24 per cent of their peripheral activities (mean =0.2440). Firms outsource slightly more than one quarter of all business activities.

Table 15. Outsourcing intensity results

Variable Number	Variable Name	Mean	Std. Deviation
1a	Outsource intensity - core activities	.2774	.30020
1b	Outsource intensity - peripheral activities	.2440	.25536
1c	Total outsource intensity	.2576	.22656

N=66

26.3 Variable 2a: Innovative active

The UK Government's definition of innovation active includes all firms which have engaged in an innovative activity during a specified time (DTI 2006). This definitions includes projects which are successful (new to the industry or to the firm), on-going or incomplete and those which have failed. Firms were asked if they had engaged in product and process innovation since 2001. Over 92 per cent of all respondents are innovative active in new product development and 86 per cent of these firms are also successful product innovators.

Table 16. Innovation active firms

No. of firms

	Not active	Active
Product innovation active	7.6%	92.4%
Process innovation active	34.8%	65.2%

N=66

26.4 Variable 2b: Successful innovators

The innovation attribute(s) of the furniture industry are captured by two measures: 'innovative active' and 'successful innovators'. The term 'successful innovators', on the other hand, encompasses only initiatives which have been successful but excludes on-going initiatives. What is telling is that of the 65 per cent of firms which are active in process innovation, just over half are successful. This low outcome reflects the high number of projects which were on-going at the time of the survey (see Table 19 below).

Table 17. Successful innovators

No. of firms

	No	Yes
Successful product innovators	21.2%	78.8%
Successful process innovators	62.1%	37.9%

N=66

26.5 Variable 2c: Innovativeness performance

26.5.1 Product innovativeness

Product innovation is defined as:

- i. new products which are different from previous designed and produced products;
- ii. improvement of existing products such as better quality or enhance design.

The furniture industry is a labour intensive and low technology sector (albeit the utilisation of production technology can be advanced). From discussion with case firms and drawing from the literature, formal R&D expenditures by furniture manufacturers is insignificant (although significant R&D activity does occur in machinery technology sectors and material sectors) (Kaplinsky, Morris and Readman 2002a). The type of product innovation which occurs in the furniture industry is mainly of the second type noted above (i.e. improvement of existing products) particularly innovations which have a new design dimension.

Reported in Table 16 and Table 17 are the categorical results for product innovative active and successful product innovator respondents. Respondents also ranked their product innovation initiatives by the degree of innovativeness. These scores range from ‘new to the industry’, ‘new to the firm but rivals have it’, ‘on-going initiative (not completed)’ and ‘a failed initiative’. Respondents could also indicate if they did not engage in any product innovation activity since 2001.

The innovativeness of the respondents’ product development endeavours is reported in Table 18. Again, I must note that innovation performance is self-assessed. The findings show that firms see their designs as either being new to the firm (62 per cent of respondents) or new to the wider industry (17 per cent of respondents). Finally, 8 per cent of the respondents reported that they did not engage in any product innovation activity from 2001 to 2005.

Table 18. Type of product innovation performed since 2001

	No activity	Failed	On-going	New to the firm rivals have it	New to the industry
Product innovation	7.6%	4.5%	9.1%	62.1%	16.7%

N=66

26.5.2 Process innovativeness

Process innovation is defined as the adoption of new or improved production methods. This innovation type includes changes in techniques, equipment and/or software (OECD 2005). Respondents were asked if they had completed a process innovation initiative since 2001 (Q10). They were also asked to grade their initiatives with similar innovation categories used in the product innovation ranking exercise (i.e. ‘new to the industry’, ‘new to the firm but rivals have it’, ‘on-going initiative (not completed)’, ‘a failed initiative’ and ‘no activity’).

The results of Q10 are presented in Table 19. Besides the 38 per cent of respondents which completed a process innovation activity, at the time of survey, a further 21 per cent of the respondents indicated that they were engaged in an on-going process improvement initiative and a further 6 per cent of respondents claimed that their process initiative was unsuccessful. The remaining firms (35 per cent) are inactive in process innovation activities.

Table 19. Type of process innovation undertaken by respondents since 2001

	No activity	Failed	On-going	New to the firm rivals have it	New to the industry
Process innovation	34.8%	6.1%	21.2%	34.8%	3.0%

N=66

27 Variables and descriptive results for Hypothesis 2 (H2)

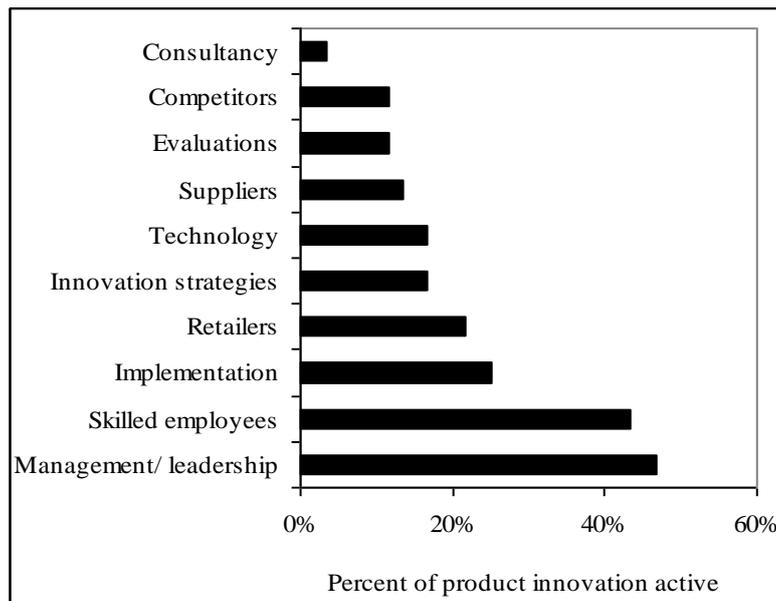
The procedures and calculations used to measure the variables for Hypothesis 2 (H2) are presented in this section. The first level results are reported. The calculations for the outsourcing variable and innovation performance variable are referred to in the previous section.

27.1 Variable 3a: Practices supporting product innovation

Of the total respondents, 92 per cent are product innovation active (Table 16). Moreover, 90 per cent of firms indicated that their product development initiatives were equal or more innovative than their process innovation activity. This filtering is necessary because Question 11 asks respondents to identify the enablers for their most innovative initiative, which can be either a product or process innovation endeavour.

Respondents were asked to rank a predefined list of enablers. The scaling range is as follows: one equal to no input and five equal to critical. Enablers which are to a large extent and critically significant (i.e. scores of four and five out of a maximum score of five) to the product development process include management and leadership (47 per cent of respondents) closely followed by skilled employees (43 per cent of respondents). The least important enablers relate to the use of external networks: only 12 per cent, 12 per cent and 3 per cent of respondents stated that suppliers, competitors and consultants, respectively, were important to the developmental process.

Figure 13. Significant practices for product innovation active firms⁹



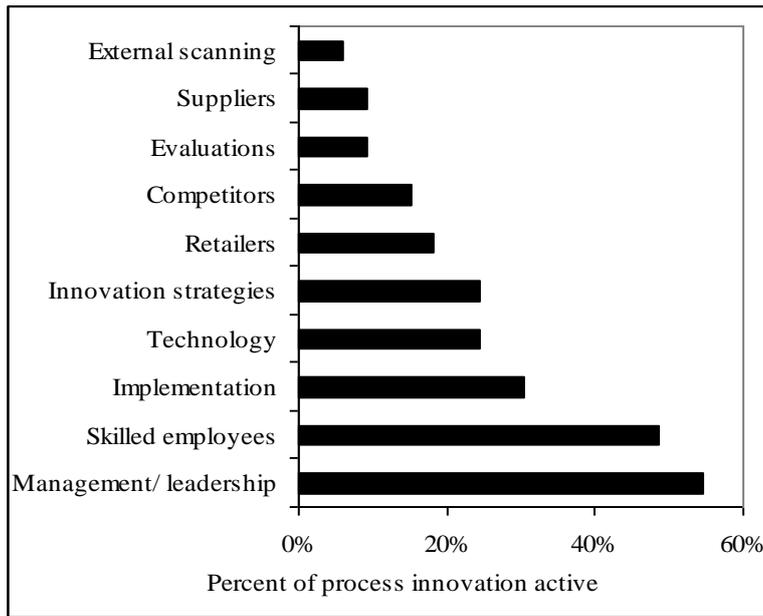
N=66; Product innovation active firms = 61; Product innovation active firms priority = 60

27.2 Variable 3b: Practices supporting process innovation

Respondents, which are process innovation, active ranked the management, technology and networking enablers which support process innovation activities (Q11). Of the total respondents, 65 percent are process innovation active firms (Table 16). A filter process reveal that 50 percent of firms indicated that their process innovation initiatives are equal to or more innovative than their product development initiative. This filtering exercise was undertaken to account for the ambiguity of Question 11. The scale is defined from one equal to no input to five equal to critical. Figure 14 presents those enablers, which are very important or critical to a process innovation activity. The two most important enablers contributing to process innovation are management and leadership (55 per cent of respondents) and skilled employees (48 per cent of respondents). These scores are similar to the results of the ranking of the product development enablers (Figure 13) except that management and leadership is more important for process innovation than it is for product development (55 per cent versus 47 per cent of respondents).

⁹ Of the total number of respondents (N=66), five firms are not product innovation active and one firm indicated that process innovation was the more innovative endeavour.

Figure 14. Significant practices which enable process innovation¹⁰



N=66; Process innovation active firms = 43; Process innovation active firms priority = 33

28 Variables and descriptive results for Hypothesis 3 (H3)

28.1 Variable 4: Firm Size (H3a)

The OECD employee band is used to group the survey respondents. Results point out that 67 per cent (of respondents) are small firms, 24 per cent are medium size firms and 9 per cent are large firms. The survey sample is biased towards medium and large firms when compared to the actual constituency of the UK furniture industry. In 2004, there were 6,680 firms manufacturing furniture of which 94 per cent were micro and small firms, 5 per cent were medium size firms and 1 per cent large firms (ONS 2004b)¹¹.

¹⁰ Of the total number of respondents (N=66), 23 firms are not process innovation active and seven firms indicated that their product innovation endeavours were more innovative than process innovation endeavours.

¹¹ The SIC categories for furniture include items made of wood, metal, plastic and other materials.

Table 20. Firm size (employee band) of respondents and UK furniture industry, 2004

Employee band	Survey respondents	UK furniture industry
1 to 49	66.7%	94%
50 to 249	24.2%	5%
Above 250	9.1%	1%

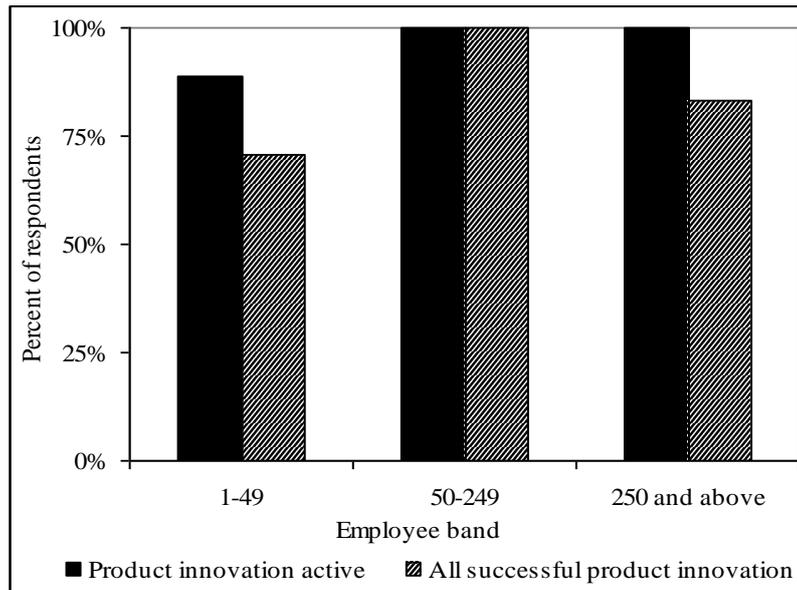
N=66

Variables for H3a are drawn from Question 25 (number of employees working in the firm) and Question 10 (innovation performance); the details of both questions have already been reproduced. Differentiating innovation activities by firm size reveals that medium size firms are, on the whole, more successful in their innovation endeavours than small and large firms. A cross tabulation of successful innovators (among active innovators) shows the following:

- i. 97 per cent of the innovation active medium size firms are successful innovators;
- ii. 69 per cent of the innovation active large firms are successful innovators;
- iii. 66 per cent of the innovation active small firms are successful innovators.

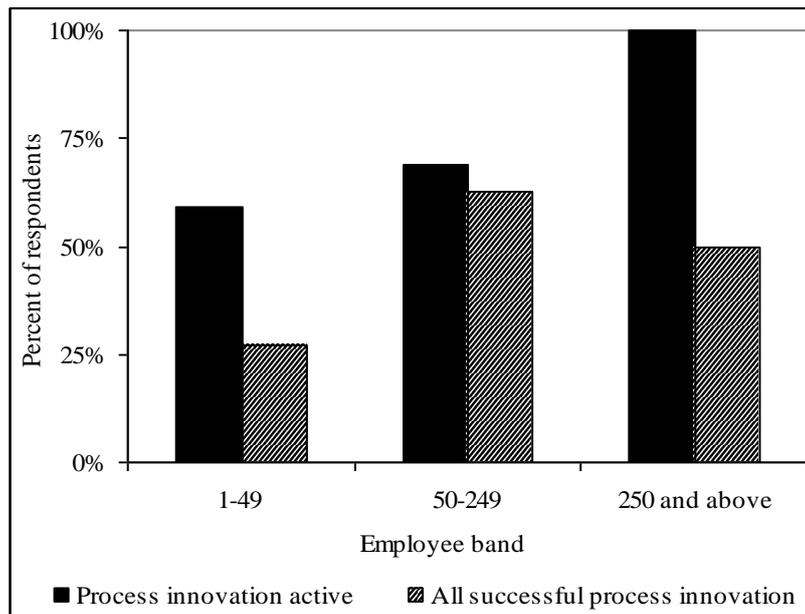
Figure 15 and Figure 16 pictorially contrast innovation active firms with successful innovators for product and process innovation performance among the different firm size categories. These disaggregate findings illustrate that medium size firms are more successful than small and large firms are in product and process innovation activities.

Figure 15. Product innovation active and successful innovators, by firm size



N=66

Figure 16. Process innovation active and successful innovators, by firm size



N=66

28.2 Variable 5: Buyer preferences (H3b)

Table 21 indicates that 78 per cent of respondents consider high product quality to be the most important buyer preference followed by on-time delivery (71 per cent of respondents) and product customisation (58 per cent of respondents). The least important customer preference criteria are offering products associated with the

manufacturer's brand-name (33 per cent of respondents) and meeting CSP (corporate social responsibilities) and environment standards (36 per cent of respondents).

Table 21 also reports the median scores for each customer preference. The median scores take into account any variation to the average. The four highest preference correspondent to the critical order winner appraisal and emphasis non-price factors such as quality, delivery and customisation.

Table 21. Buyers' preferences for furniture

Per cent of respondents

	CRITICAL and VERY IMPORTANT (WILL WIN AN ORDER)	NOT IMPORTANT	MEDIAN
High quality	78.7%	0%	4
On-time delivery	71.2%	0%	4
Customisation (build to order)	59.1%	10.6%	4
Fast delivery	50.0%	4.5%	3.5
Innovative designs	48.5%	6.1%	3
Product variety	48.5%	1.5%	3
Sell directly to end-users	43.9%	27.3%	2.5
Lowest price	40.9%	7.6%	3
Flexible production volume	36.4%	10.6%	3
Bringing out new products	30.3%	13.6%	3
Services linked with products	24.2%	21.2%	2.5
Product/ service warranty	18.2%	18.2%	2
Associated with a brand-name	10.6%	33.3%	2
Corporate social responsibility policies	10.6%	36.4%	2

N=66

Customer preferences can also be a proxy for a value strategy, particularly if firms are embedded in a competitive market structure. These customer-focus strategies are integral to medium-term success and it is the alignment of these preferences with operations which (ought to be) is the focus of a successful manufacturing strategy (Skinner 1974; Berry, Hill and Klompmaker 1995). Significance difference tests are applied to customer preferences against the industrial organisation and resource based variables in the next chapter.

28.3 Variable 6: Buyer types (H3c)

Direct sales to end-users accounted for over 51 per cent to 100 per cent of turnover for 53 per cent of the respondents. Direct sales are a common practice particularly for the contract furniture sector which includes office furniture made for government and business use. Multi-store retailers were the least common buyer type as 74 per

cent of respondents indicated that they do not sell to this type at all. Retail chains tend to place large volume orders and this finding supports the noted trend reported in earlier chapters that lower price imports of mass produced items have supplanted UK made products.

Table 22. Significant buyer types, by share of turnover

Per cent of respondents

	DO NOT SELL	1%-25% OF TURNOVER	26%-50% OF TURNOVER	51%-75% OF TURNOVER	76% -100% OF TURNOVER
Sell directly to end-users	15.2%	24.2%	7.6%	7.6%	45.5%
Single store retailers	57.6%	18.2%	12.1%		12.1%
Distributors/ agents	47.0%	28.8%	7.6%	6.1%	10.6%
Multi-store retailers/ large chains	74.2%	16.7%	6.1%	3.0%	

N=66

I have introduced five categories of buyer types for this study. The buyer type is classified as a dominant buyer if one buyer type accounts for over 50 per cent of all purchases from a respondent. If no buyer type accounts for more than 50 per cent of purchases then there is no dominant buyer type for that firm. Of course, there may be more than one buyer making up a predominant buyer type (that is, the category only highlights the type of buyer and not the number of buyers). Direct sales is the dominant buyer type with 53 per cent of respondents indicating they sell directly to end users. However, as noted in Table 21, while 44 per cent of respondents saw direct selling as an important customer preference, 27 per cent of respondents did not indicate that this was an important criterion. Direct selling is a divergent issue for this sample of manufacturers. Finally, 15 per cent of respondents indicated that they have no dominant buyer type.

Table 23. Buyer types

	Per cent of respondents
No dominant buyer	15.2%
Direct sales	53.0%
Multi chain stores	3.0%
Single stores	12.1%
Distributors	16.7%

N=66

29 Variables for the exploratory research proposition (RP_e)

The exploratory research question emerged from the Research Method I findings:

RP_e: Is there an optimal combination of immediate production sharing associated with innovation performance?

The activity variable (V1 - core or peripheral activity outsourcing), is suspended for this analysis. In the test case industry, immediate production is made-up of three business functions, namely pre-production, parts production and assembly. There are eight possible combinations for production sharing in furniture manufacturing:

Number of production sharing (PS) combinations = 2^n

with $n = 3$ business activities (pre-production, parts production and assembly)

Table 24 reports the immediate production sharing strategies found in the sample firms. Firms registered five unique immediate production sharing strategies with 41 per cent of firms maintaining all three activities in-house (PS₁). The next largest immediate production strategy saw 23 per cent of firms performing pre-production and assembly in-house and outsourcing parts production (PS₃) while 14 per cent of firms outsource all three activities (PS₈). There are three strategies which are inconsequential with 1.5 per cent of the sample (or one firm) applying each strategy (PS₂, PS₄ and PS₆).

Table 24. Immediate production sharing strategies in the furniture industry

Label	Pre-production	Parts production	Assembly	Firms in the sample	Per cent of sample
PS ₁	In-house	In-house	In-house	27	40.9%
PS ₂	In-house	In-house	Outsource	1	1.5%
PS ₃	In-house	Outsource	In-house	15	22.7%
PS ₄	In-house	Outsource	Outsource	1	1.5%
PS ₅	Outsource	In-house	In-house	5	7.6%
PS ₆	Outsource	In-house	Outsource	1	1.5%
PS ₇	Outsource	Outsource	In-house	7	10.6%
PS ₈	Outsource	Outsource	Outsource	9	13.6%

N=66

The test statistics for RP_e compare the innovation performance outcomes of firms which apply the five viable immediate production strategies (with outliers omitted).

30 Profiles of respondents

This section summarises the profiles of the survey respondents. The legal and institutional status of the respondent firm and the managerial position of the persons who completed the questionnaire are reported. This information authenticates the responses by, (a) recognising the responding firms as legal entities, which can be validated with secondary information, and (b) confirming that the persons replying to the questions are knowledgeable about the activities undertaken by their respective firms as well as wider industry issues. The industrial organisation attributes reported in the latter part this section include the market location, products and services offered and rivalry and new entrants.

As noted in the methodology chapter, the survey response rate is 13.2 per cent.

30.1 Status of the organisation

Questions 23 and Question 24 categorise the organisational status of the respondents. Of the 66 respondents, 83 per cent are sole businesses, (79 per cent are private firms, 3 per cent are publicly traded and 1 per cent is a not for profit company). 11 per cent of the respondents are subsidiaries of an UK business (all of which are private companies), 3 per cent are subsidiaries of a foreign group or multi-national (all of which are private companies) and 3 per cent are the parent company (again, private).

Table 25. Legal and institutional status of respondent firms

No. of firms as per cent of total

	Sole business (not part of a group)	Subsidiary of an UK business	Subsidiary of a foreign group or multinational	Parent company	Total
Private company	79%	11%	3%	3%	95%
Publicly traded company	3%	0%	0%	0%	3%
Not for profit company	2%	0%	0%	0%	2%
Total	83%	11%	3%	3%	100%

N=66

30.2 Informed self-assessment

Individuals completing the questionnaire, on behalf of the respondent company, were asked to select their area of responsibility or the position(s) they held. Without exception, respondents are versed in their company's operational, marketing and innovation activities. Of the 66 completed surveys, 38 per cent are firm owners while 47 per cent are managing directors (this includes eight respondents holding both

titles). In total, 15 per cent of the respondents (10 managers) hold more than one position.

Table 26. Positions of firms' representatives

	Per cent of total
Owner	38%
Managing Director	47%
Sales or Marketing Director/ Manager	14%
Manufacturing/ Operations Manager	3%
Other Manager	9%
Other	8%

N=66

Responses are over-whelming from company owners or senior managers. These high-level informants provide conducive evidence that the information provided in the survey instrument is reliable (Buckingham and Saunders 2004; Dillman, Smyth, Christian, Dillman and internet 2009).

30.3 Market location

The UK is the most important market location for the survey respondents based on turnover. Over 83 per cent of the respondents indicated that the UK market accounted for 76 per cent to 100 per cent of turnover in 2004 and 2005. Other EU country markets are the second most important location; this is a secondary market as 32 per cent of respondents indicated that only 1 per cent to 25 per cent of turnover comes from this region. Finally, the North American market is the least important market location with only 12 per cent of respondents selling products in this location.

Table 27. Location of sales

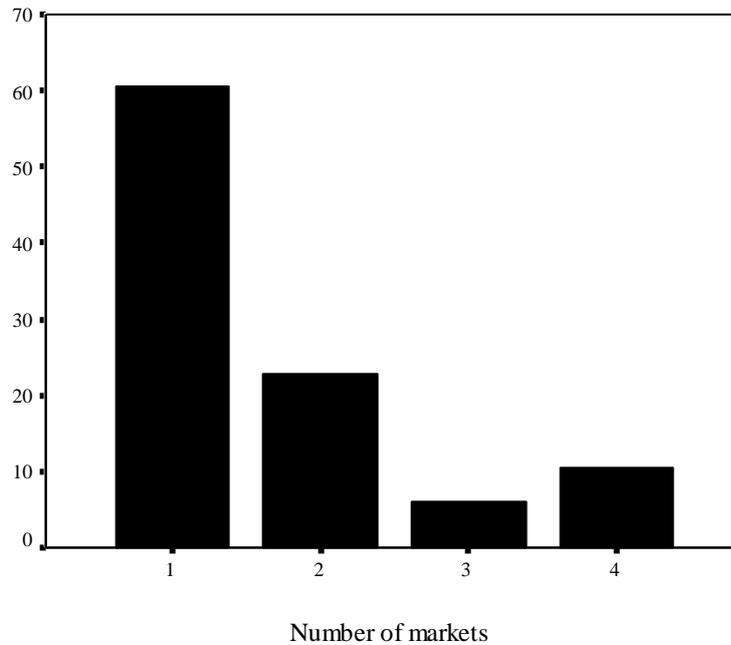
Per cent of respondents

	DO NOT SELL	1%-25% OF TURNOVER	26%-50% OF TURNOVER	51%-75% OF TURNOVER	76% -100% OF TURNOVER
UK market		6.1%	3.0%	7.6%	83.3%
Other EU markets	63.6%	31.8%	4.5%		
Other international markets	81.8%	16.7%	1.5%		
N. American markets	87.9%	6.1%	4.5%		1.5%

N=66

UK firms are not averse to selling to more than one market. While over half (61 per cent) of the respondents sell to only one market, 11 per cent of the respondents (including five SMEs or 8 per cent of all respondents) sell products in all four market locations (UK, Other EU, North America, and other international markets) .

Figure 17. Number of markets respondents sell to, 2005



N=66

30.4 Products and services

Respondents are primarily wooden furniture manufacturers. Table 28 reports the most significant furniture products manufactured by respondents (based on the contribution to turnover) are dining and living room furniture (32 per cent of respondents) and bedroom furniture and kitchen furniture (29 per cent of respondents for each product type).

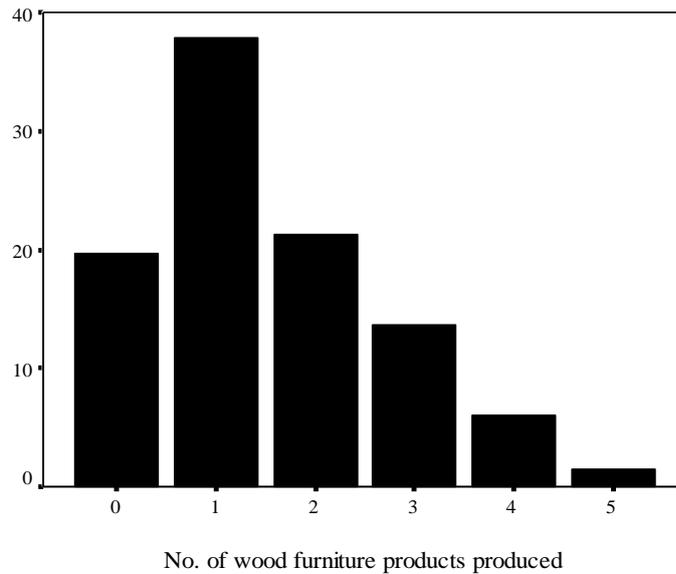
Table 28. Products and services produced by respondents

	Per cent of total
Wooden furniture for dining / living rooms	31.8%
Wooden bedroom furniture	28.8%
Wooden kitchen furniture	28.8%
Wooden office furniture	25.8%
Other wooden furniture	19.7%
Wooden furniture parts or components	12.2%
Wooden furniture for shops	6.0%

N=66

The median number of furniture products manufactured by the survey respondents is one while the maximum number is seven products. Although 38 per cent only produce one furniture product type, a substantial number of firms produce more than one type. Figure 18 illustrates that 21 per cent of firms produce two furniture product types and 21 per cent of firms produce three or more wooden furniture product types.

Figure 18. Number of wooden furniture product types manufactured by respondents



N=66

Besides wooden furniture production, respondents also engage in non-wooden furniture production and value-added services. Table 29 lists the significant services and non-wooden furniture offered by the survey respondents. These outputs are cross tabulated with the number of wooden furniture products which respondents manufacture. 47 per cent of respondents either sell directly to customers or provide retail services while over 21 per cent offer services to distributors. Non-wooden furniture products are manufactured by 26 per cent of respondents.

Table 29. Other goods and services provided by wooden furniture producers

Per cent of respondents

Other service and products	Number of wood product categories				Group Total
	No wood furniture	1 wood furniture type	2 wood furniture types	3 or more wood furniture types	
Retail or direct sales	9.1%	18.2%	10.6%	9.1%	47.0%
Services to distributors	4.5%	6.1%	3.0%	7.6%	21.2%
Services to manufacturers	1.5%	1.5%			3.0%
Manufacture non-wood furniture	13.6%	6.1%	3.0%	3.0%	25.8%

N=66

Table 29 also shows that 12 per cent of furniture producers (8 out of 66 respondents) produce non-wooden furniture. This low turnout is to be expected. The technological capabilities of firms which manufacture wood products are different than the capabilities required to work with plastics and metals (Bell and Pavitt 1993; Dosi 1993). These differences include technical skills and the associated tacit knowledge, the capital equipment requirements and supply chains, i.e. unique networks for wood suppliers and metal suppliers. The marketing relationships and buyer networks may be similar, however: the same buyers will often purchase metal, plastic and wooden furniture.

30.5 Rivalry in 2004-2005

The indicator, location of rivals, reveals the globalising nature of competition. While over 83 per cent of firms face competition from other UK firms, competition from international rivals is high with 56 per cent of respondents indicating that other EU countries are significant competitors. Competition from Eastern and Central Europe and China are significant competitors for 49 per cent of respondents. Rivals from Latin America and the Caribbean are the least important.

Table 30. Location of significant competition in 2004-05

Per cent of respondents

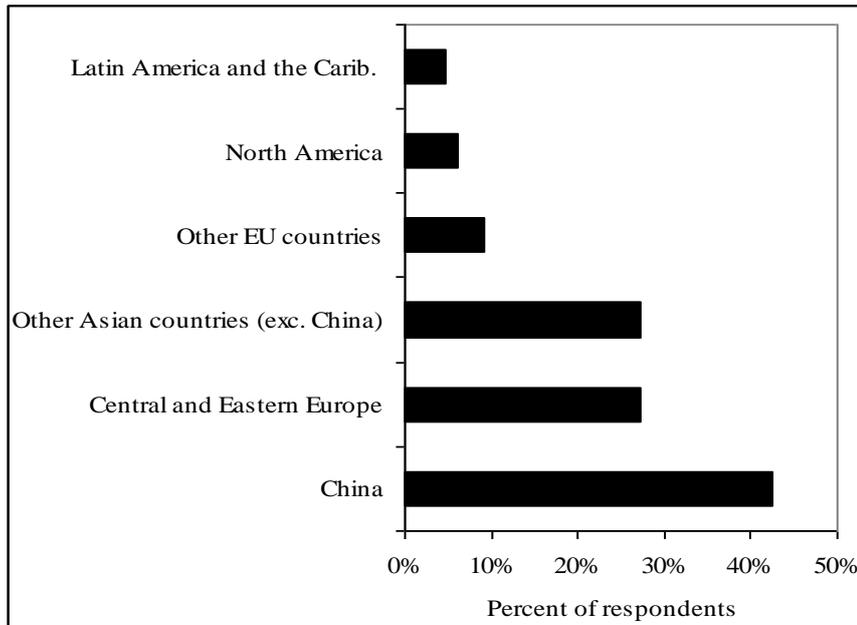
	2005
Competitors within the UK	83.3%
Competitors from other EU countries	56.1%
Competitors from Central and Eastern Europe	48.5%
Competitors from China	48.5%
Competitors from other Asian countries (exc. China)	42.4%
Competitors from North America	24.2%
Competitors from Latin America and the Carib.	6.1%

N=66

30.6 New entrants

New entrants (entering the market in last three years) from China provide significant competition for 42 per cent of respondents while new entrants from Central and Eastern Europe and other Asian countries are significant rivals to 27 per cent of respondents. New entrants from the UK were not significant competitors.

Figure 19. Location of significant new entrants since 2001



N=66

31 Issues arising from the first-level results

31.1 Outsourcing profile

For the most part, UK furniture manufacturers perform core business activities in-house. Support services such as administration and marketing and sales, are predominating managed internally. When outsourcing does occur, mainly UK firms supply core and peripheral functions. The predominant core outsourcing activities include immediate production (pre-production, parts production and assembly) and outbound distribution. The main peripheral outsourcing activities include inbound logistics and outbound distribution.

31.2 Innovation profile

The survey results reveal that UK firms are product innovators (product designers). Of the 61 firms (92.4 per cent) which are product innovation active, 52 firms are successful (an innovation success ratio of 85.2). The degree of novelty of these

initiatives is primarily ‘new to the firm’ which reflects the emphasis placed by furniture manufacturers on new designs and incremental improvements rather than the introduction of new technology. Process innovation is not undertaken to the same extent as new product development innovation with only 65 per cent of firms active in process innovation efforts.

The management practices and enablers, which support innovation, are predominately intra-firm oriented: management and leadership and skilled employees are the most important enablers for both product and process innovation. External collaborations are not as important as internal capabilities.

31.3 Market performance

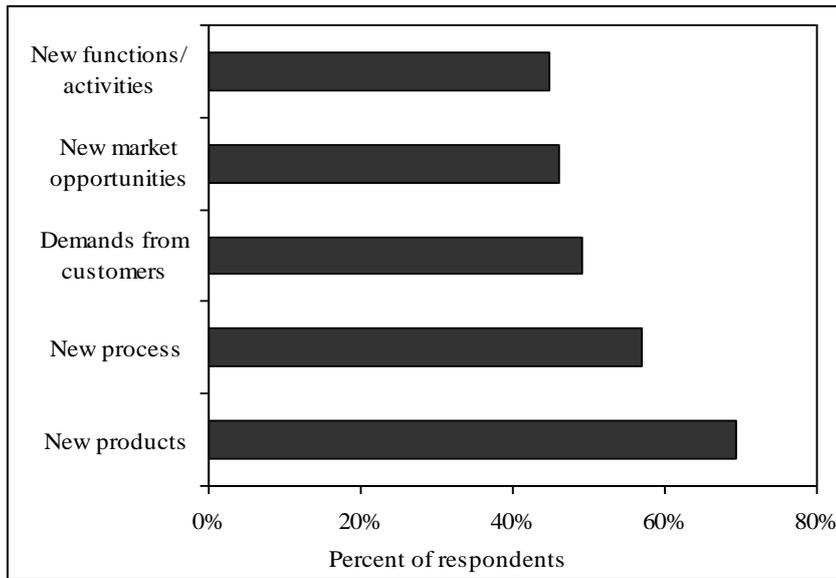
A number of questions in the survey were not applicable to the formal research propositions. These questions refer to market performance and the results are reported below.

First, firms identified several external factors and endogenous factors (internally driven including innovation initiatives) that have positively or negatively affected prices and market share of their most important product or service since 2001 (Q. 20)¹². These influencing factors are ranked as having a large positive impact, no impact or large negative impact on economic performance. The results presented in Figure 20 refer to those factors which have had a large positive impact on performance while Figure 21 refers to those factors which have had a significant negative impact on performance.

Activities related to innovation and upgrading have had a positive impact on economic performance. New product development (69 per cent of respondents), new process development (57 per cent of respondents) and functional upgrading (45 per cent of respondents) were in the top five of the most highly cited factors.

¹² Factors which could affect profits were not included in this section. Besides exogenous and endogenous factors, profits can also be influenced by accountancy rules and activities not directly tied to the sale of furniture.

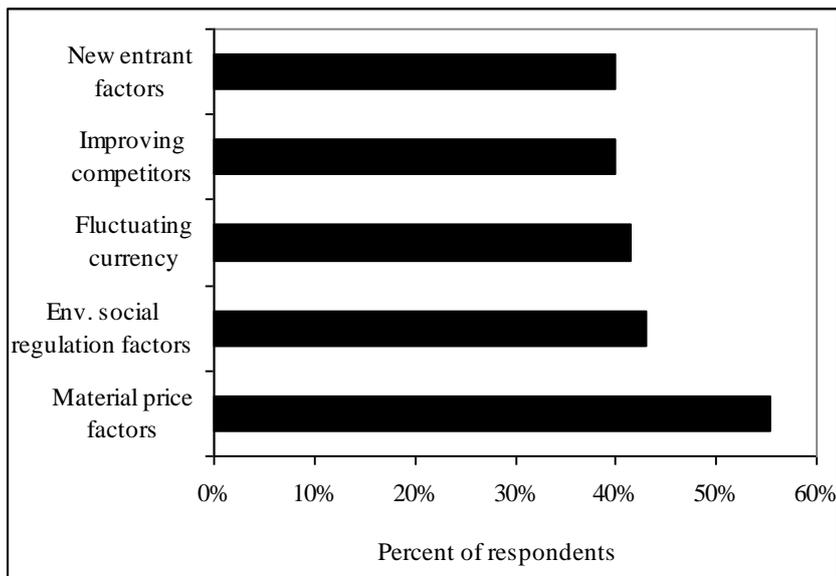
Figure 20. Positive factors contributing to market performance since 2001



N=66

Factors, which have had a negative impact on price and market share performance include the price of materials (55 per cent of respondents), social and environmental regulations (43 per cent of respondents) and currency fluctuations (42 per cent of respondents). Competition has also had a negative effect on UK firms; new competitive entrants and competitors who can now offer quality products are of a concern to 40 per cent of respondents.

Figure 21. Negative factors contributing to market performance since 2001



N=66

This first pass at the survey results provides an insight into the internal organisational structure and industry organisation of the sample firms. The sample size, while acceptable, can pose problems with any generalisation. Nonetheless, the findings indicate that manufacturers in the UK furniture industry are constantly introducing new products through the application of internal resources while facing local and international competitive challenges. The research framework discussed earlier focuses on the relationship between outsourcing and innovation performance. The model entertains an exploratory purpose of revealing possible associations. The next chapter continues this analysis and tests for any association between innovation performance and outsourcing.

The hypotheses are tested in this chapter. For each research inquiry, the descriptive statistics are presented followed by the test statistics and analysis. The test results are used to accept or reject the research propositions.

32 Hypothesis 1 (H1) test results: outsourcing and innovation performance

The first set of hypotheses investigates the possible association between outsourcing business functions and innovation performance. There are two parts to the first research proposition. The hypothesis (H1a) sets out to explore whether firms that outsource peripheral activities have higher innovation performance than firms which perform these activities in-house. The hypothesis (H1b) inquires whether firms which perform core activities in-house have greater innovation performance than firms that outsource core activities.

The variables used to interrogate the two hypothesis are formulated from the survey questions. First, outsourcing activities are defined along two operational dimensions (i) outsourcing or in-house and (ii) peripheral or core. The case studies and interviews identified nine business activities performed by furniture manufacturing. Respondents identified which of these nine activities are internally managed or outsourced; they also ranked business activities as either peripheral or core. In addition, an outsourcing intensity algorithm measures the share of both outsourced peripheral activities and outsourced core activities: a high intensity score indicates higher share of (core or peripheral) activities outsourced (0 = no outsource and 1 =all activities are outsourced).

The innovation variables include product innovation and process innovation types. These innovation outcomes are measured by categorical scores (active or inactive; successful or unsuccessful) and by ordinal scales (no activity, failed, new to the firm but rivals have it and new to the industry).

32.1 Test results for H1a

H1a: Firms outsourcing peripheral activities are higher innovation performers than firms performing peripheral activities in-house.

The objective of this inquiry is to ascertain if the intensity of outsourcing is associated with innovation performance. For this test, firms are segmented by the totality of their outsourcing strategies of peripheral functions (activities that are below the average cost contribution for all activities). The outsourcing strategies of specific peripheral functions are not investigated in this study.

H1a states that firms with a higher number of outsourced peripheral activities should have higher levels of innovation performance. Specifically, the tests investigate the following:

- i. firms which are product or process innovation active will have a higher outsourcing intensity of peripheral activities than firms which are innovation inactive;
- ii. firms which are successful product or process innovators will have a higher outsourcing intensity of peripheral activities than firms which were unsuccessful in their innovation endeavours.

The outsourcing variable is constructed using two measures: (i) the value firms give to each business function which designates the functions as either core or peripheral and (ii) the decision to perform the functions in-house or outsource. Both product innovation and process innovation are considered. Innovation performance is measured as active or not active, successful and not successful and the level of innovativeness based on a gradient scale.

The descriptive statistics for outsourcing intensity of peripheral activities and innovation active performance are presented in Table 31. On average, product innovation inactive firms marginally outsource a greater proportion of peripheral activities than active innovative firms do (outsourcing intensity mean scores of 0.25 and 0.244, respectively). The outsource intensity scores for inactive process innovators are also higher than the score of active firms (outsourcing intensity mean scores of 0.253 and 0.239, respectively). The difference between the two mean scores is not great however.

Table 31. Outsource intensity of peripheral activities and innovation active performance, descriptive statistics

	N	Median	Mean	Std. Deviation
	(outsourcing intensity - peripheral)			
Product innovation Inactive	5	.0000	.2500	.43301
Product innovation Active	61	.2000	.2435	.24112
Process innovation Inactive	23	.2000	.2536	.27798
Process innovation Active	43	.2000	.2389	.24569

N=66

The results of the Mann-Whitney test reveals no significant differences in the intensity of peripheral activity outsourcing among product active innovators (median score = 0.2) and inactive product innovators (median score = 0.0): U = 130.5 and no significance. Also, process active innovators (median score = 0.2) did not differ in the intensity peripheral activity outsourcing from process inactive firms (median 0.2): U=14355 and no significance.

Table 32. Outsource intensity of peripheral activities and innovation active performance, Mann-Whitney test results

	Product innovation Active vs. Inactive	Process innovation Active vs. Inactive
Mann-Whitney U	130.5	489.0
Wilcoxon W	145.5	14355.0
Z	-.550	-.076
Exact Sig. [2*(1-tailed Sig.)]	.604a	.
Exact Sig. (2-tailed)	.602	.942
Exact Sig. (1-tailed)	.304	.470
Point Probability	.009	.003

^aNot corrected for ties; p<0.05

Table 33 reports the cross tabulation descriptive statistics for outsourcing intensity of peripheral activities and successful innovation performance. Firms, which are unsuccessful product innovators, outsource a greater share of their peripheral activities than successful innovators (outsourcing intensity scores of 0.296 and 0.234 respectively). Moreover, firms which are unsuccessful process innovators (outsourcing intensity score of 0.250) outsourced more peripheral activities than successful process innovators (outsourcing intensity score of 0.183).

Table 33. Outsourcing intensity of peripheral activities and successful innovation performance, descriptive statistics

	N	Median	Mean (outsourcing intensity - peripheral)	Std. Deviation
Product innovation Unsuccessful	9	.4000	.2963	.25191
Product innovation Successful	52	.2000	.2344	.24055
Process innovation Unsuccessful	18	.2500	.3167	.26935
Process innovation Successful	25	.0000	.1829	.21549

N=66; Product innovation N=61; Process innovation N=43

The test results are reported in Table 34. The intensity of peripheral activity outsourcing among successful product innovators (mean = 0.234) and unsuccessful product innovators (mean = 0.296) did not show any difference: U = 200 and no significance. The test statistics did produce a significant finding for the process innovation and peripheral outsourcing intensity however. Unsuccessful process innovators have a significantly higher peripheral activity outsourcing intensity (mean = .3167) than successful process innovators (mean = 0.1829): U= 158 and p<.05. However, since the inquiry predicted that successful firms would be more successful (i.e. the opposite outcome), this hypothesis is rejected.

Table 34. Outsource intensity of peripheral activities and successful innovation performance, Mann-Whitney test results

	Product innovation Successful vs. Failed	Process innovation Successful vs. Failed
Mann-Whitney U	200	158.000
Wilcoxon W	1578.500	483.000
Z	-.710	-1.709
Exact Sig. (2-tailed)	.487	.089
Exact Sig. (1-tailed)	.243	.045
Point Probability	.003	.001

N=66; *p<0.05

The significance tests did not reveal any association between the outsourcing of (i) peripheral activities and innovation active performance (Table 32) and (ii) outsourcing of peripheral activities successful innovation performance (Table 34). The research proposition H1a is rejected.

32.2 Test results for H1b:

H1b: Firms performing core activities in-house are higher innovation performers than firms outsourcing strategic activities

H1b asserts that firms performing core activities in-house are associated with high innovation performance. The first set of tests considers the share of outsourcing core activities (as measured by an outsourcing intensity index) and two innovation performance measures

- i. firms which are product or process innovation active will have a lower outsourcing intensity of core activities than firms which are innovation inactive;
- ii. firms which are successful product or process innovators will have a lower outsourcing intensity of core activities than firms which were unsuccessful in their innovation endeavours.

H1b also explores the relationship between specific core activities and innovation performance. The purpose of this inquiry is to assess if there are activities that stand-out in their association with innovation. This possible relationship includes two suppositions:

- i. firms which perform specific core activities in-house are more product or process innovation active than firms that outsource these activities;
- ii. firms which perform specific core activities in-house are more successful product or process innovators than firms that outsource these activities.

32.2.1 Outsourcing intensity of core activities and innovation performance

Table 35 presents the descriptive statistics measuring the association between product innovation performance and outsourcing intensity of core activities. Firms, which are product innovation active, have a higher outsourcing intensity than non-active firms do (mean outsourcing intensity scores of 0.279 and 0.26, respectively). The outsourcing scores for process innovators and outsourcing intensity of core activities show greater disparity. Non-active process innovation firms have a higher outsourcing intensity score than active innovators (0.366 and 0.23, respectively).

Table 35. Outsource intensity of core activities and innovation active performance, descriptive statistics

	N	Median	Mean (outsourcing intensity - core)	Std. Deviation
Product innovation Inactive	5	.2500	.2600	.32673
Product innovation Active	61	.2000	.2788	.30081
Process innovation Inactive	23	.3333	.3659	.31863
Process innovation Active	43	.1667	.2300	.28231

N=66

The results of association testing between outsourcing intensity of core activities and innovation active performance are presented in

Table 36. Product innovation active firms (mean score = 0.279) show no difference in their outsourcing intensity from product innovation inactive firms (mean score = 0.26): U=147.5 and no significance.

Process innovation active firms indicate a significantly lower outsourcing intensity score (mean score = 0.23) than inactive firms (mean score 0.366): U =364 and p<.05 (0.036). Effect size ($r = \frac{Z}{\sqrt{N}}$) is -0.28, which represents a medium effect on performance. The positive significance test result is highlighted (Table 36).

Table 36. Outsource intensity of core activities and product innovation, Mann-Whitney test results

	Product innovation Active vs. Inactive	Process innovation Active vs. Inactive
Mann-Whitney U	147.500	364.000
Wilcoxon W	162.500	1310.000
Z	-.125	-1.809
Exact Sig. [2*(1-tailed Sig.)]	.907 ^a	
Exact Sig. (2-tailed)	.910	.071
Exact Sig. (1-tailed)	.461	.036*
Point Probability	.009	.001

^aNot corrected for ties; *p<0.05

The outsourcing intensity scores for successful and unsuccessful innovation firms are presented in Table 37. The average outsourcing intensity score for successful product innovators is 0.275 while the intensity score for unsuccessful firms is 0.30. The average scores for successful process innovators and unsuccessful process innovators are 0.195 and 0.279, respectively. While the average ranks support the association

assertions proposed in H1b, the difference between both sets of mean scores do not appear to be significant.

Table 37. Outsource intensity of core activities and innovation successful, descriptive statistics

	N	Median	Mean (outsourcing intensity - core)	Std. Deviation
Product innovation Unsuccessful	9	.0000	.3000	.39370
Product innovation Successful	52	.2250	.2752	.28644
Process innovation Unsuccessful	18	.2250	.2787	.31074
Process innovation Successful	25	.1250	.1950	.26081

N=66; Product innovation N=61; Process innovation N=43

Successful innovating firms did not differ significantly from unsuccessful firms in their core activities outsourcing intensity scores. Test results show successful product innovators (mean =0.275) and unsuccessful firms (mean = 0.3): U= 226.5 and no significance and successful process innovators (median =0.1950) and unsuccessful process innovators (median =0.279), U= 189 and no significance.

Table 38. Outsource intensity of core activities and successful innovation performance, Mann-Whitney test results

	Product innovation Successful vs. Failed	Process innovation Successful vs. Failed
Mann-Whitney U	226.500	189.000
Wilcoxon W	271.500	514.000
Z	-.157	-.928
Exact Sig. (2-tailed)	.882	.360
Exact Sig. (1-tailed)	.446	.180
Point Probability	.005	.003

p<0.05

32.2.2 Outsourcing of specific core activities and innovation performance

The second part of the H1b proposition investigates the association between outsourcing specific core activities and innovation performance. Business functions, which respondents categorised as ‘core’ (equal to or above the average cost contribution for all activities), are analysed in this section. Product and process innovation performance is measured as active (or inactive) and successful (or unsuccessful). The purpose of this investigation is to ascertain if undertaking core activities in-house is associated with higher innovation performance. If the share of firms following an outsourcing strategy for each activity demonstrates a similar or

equal innovation performance, then further tests are not required. However, if the difference is large, then further testing could reveal if this difference is significant.

Table 39 reports the cross tabulation results for specific core activities and product and process innovation active performance. The table is structured as follows:

- i. the number of firms (n) that identified the activity as core (equal to or above the average costs) differs for each activity;
- ii. the share of firms (as a percentage) which perform the activity in-house or and are innovation active and not active (product and process are interrogated separately).
- iii. the share of firms (as a percentage) which outsource the activity and are innovation active and not active (product and process are interrogated separately).

As a rule of thumb, I consider a difference of 20 per cent or greater between outsourcing strategies for each activity and innovation active performance to be of interest (given the low sample size). The data in Table 39 suggest that the product innovation active performance varies greatly in firms pursuing different administration outsourcing strategies. The table also shows that process innovation active performance varies in firms following different outsourcing strategies for design, parts production and distribution. The sample sizes for core activities logistics (n=7) and after-sales support (n=15), are not sufficient to run the Chi Square tests. The results, which are tested for significance, are shaded.

Table 39. Core activities and innovation active performance, cross tabulations results

Share of firms undertaking outsourcing strategy

n	Core activity		Product innovation		Process innovation	
			Not active	Active	Not active	Active
44	Preproduction	In-house	6.5%	93.5%	32.3%	67.7%
		Outsource	7.7%	92.3%	46.2%	53.8%
24	Design	In-house	11.8%	88.2%	17.6%	82.4%
		Outsource	0.0%	100.0%	57.1%	42.9%
7	Logistics	In-house	0.0%	100.0%	50.0%	50.0%
		Outsource	20.0%	80.0%	60.0%	40.0%
53	Parts production	In-house	6.5%	93.5%	25.8%	74.2%
		Outsource	4.5%	95.5%	50.0%	50.0%
53	Assembly	In-house	4.7%	95.3%	32.6%	67.4%
		Outsource	10.0%	90.0%	50.0%	50.0%
29	Admin	In-house	7.4%	92.6%	22.2%	77.8%
		Outsource	50.0%	50.0%	100.0%	0.0%
37	Marketing	In-house	6.9%	93.1%	37.9%	62.1%
		Outsource	0.0%	100.0%	37.5%	62.5%
15	After-sales	In-house	14.3%	85.7%	35.7%	64.3%
		Outsource	0.0%	100.0%	0.0%	100.0%
23	Distribution	In-house	15.4%	84.6%	46.2%	53.8%
		Outsource	10.0%	90.0%	30.0%	70.0%

N=66

The results of the Chi Square significance test are presented for core administration and product innovation active performance (Table 40). The small sample size requires the application of a Fisher's Exact test as there are cells containing less than five respondents. No significance results are found.

Table 40. Core administration and product innovation active, Chi Square test results

	Value	Df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Prob.
Pearson Chi-Square	3.642 ^a	1	.056	.200	.200	
Continuity Correction ^b	.497	1	.481			
Likelihood Ratio	2.259	1	.133	.200	.200	
Fisher's Exact Test				.200	.200	
Linear-by-Linear Assoc.	3.517 ^c	1	.061	.200	.200	.192

n=29

a. 3 cells (75.0%) have expected count less than 5. The minimum expected count is .21.

b. Computed only for a 2x2 table; c. The standardized statistic is -1.875.

The results of the Chi Square significance tests are presented for process innovation active performance and core design, core parts production, core administration and core distribution in Table 41, Table 42, Table 43 and Table 44, respectively. The four tests did not reveal any significant differences between active and inactive firms. The test results for parts production and administration does suggest a weak association ($p < 0.1$ for both tests) however. A larger sample size may have avoided the possibility of a Type II false negative error (i.e. test indicate no significance when, in fact, a significance difference could exist).

Table 41. Core design and process innovation active, Chi Square test results

	Value	Df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Prob
Pearson Chi-Square	.619 ^a	1	.431	.669	.363	
Continuity Correction ^b	.127	1	.722			
Likelihood Ratio	.627	1	.428	.669	.363	
Fisher's Exact Test				.669	.363	
Linear-by-Linear Assoc.	.592 ^c	1	.442	.669	.363	.252

n=23

a. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 3.91.

b. Computed only for a 2x2 table; c. The standardized statistic is .770.

Table 42. Core parts production and process innovation active, Chi Square test results

	Value	Df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Prob
Pearson Chi-Square	3.275 ^a	1	.070	.088	.065	
Continuity Correction ^b	2.308	1	.129			
Likelihood Ratio	3.268	1	.071	.088	.065	
Fisher's Exact Test				.088	.065	
Linear-by-Linear Assoc.	3.213 ^c	1	.073	.088	.065	.047

n=53

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 7.89.

b. Computed only for a 2x2 table; c. The standardized statistic is -1.793.

Table 43. Core administration and process innovation active, Chi Square test results

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Prob.
Pearson Chi-Square	5.639 ^a	1	.018	.069	.069	
Continuity Correction ^b	2.417	1	.120			
Likelihood Ratio	5.558	1	.018	.069	.069	
Fisher's Exact Test				.069	.069	
Linear-by-Linear Assoc.	5.444 ^c	1	.020	.069	.069	.069

n=29

a. 2 cells (50.0%) have expected count less than 5. The minimum expected count is .55.

b. Computed only for a 2x2 table; c. The standardized statistic is -2.333.

Table 44. Core distribution and process innovation active, Chi Square test results

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Prob
Pearson Chi-Square	.619 ^a	1	.431	.669	.363	
Continuity Correction ^b	.127	1	.722			
Likelihood Ratio	.627	1	.428	.669	.363	
Fisher's Exact Test				.669	.363	
Linear-by-Linear Assoc.	.592 ^c	1	.442	.669	.363	.252
N of Valid Cases	23					

n=23

a. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 3.91.

b. Computed only for a 2x2 table; c. The standardized statistic is .770.

Table 45 reports on the cross tabulations of the share of firms undertaking core activities (in-house and outsourcing) and successful innovation. Note that not only are the number of firms (n) for each core activity different, the number of firms differs for each innovation type as well. This is due to the exclusion of not active innovation firms in this analysis, which differs for each innovation type.

Following the rule of thumb to highlight any difference of 20 per cent or greater between outsourcing strategies, the ensuing patterns emerge. Successful product innovators indicated that only the outsourcing strategy for assembly activity appears to be different substantively (the core administrative activity has an empty cell and is not included). Successful process innovators revealed that design, assembly and marketing activities vary largely. These results, which suggest further significance tests, are shaded in the table.

Table 45. Specific core activities and successful innovation performance, cross tabulations

		Product innovation			Process innovation		
		N	Unsuccessful	Successful	N	Unsuccessful	Successful
Preproduction	In-house	41	10.3%	89.7%	28	28.6%	71.4%
	Outsource		8.3%	91.7%		28.6%	71.4%
Design	In-house	22	20.0%	80.0%	17	42.9%	57.1%
	Outsource		14.3%	85.7%		66.7%	33.3%
Logistics	In-house	6	0.0%	100.0%	3	0.0%	100.0%
	Outsource		0.0%	100.0%		0.0%	100.0%
Parts production	In-house	50	13.8%	86.2%	34	39.1%	60.9%
	Outsource		9.5%	90.5%		45.5%	54.5%
Assembly	In-house	50	7.3%	92.7%	34	41.4%	58.6%
	Outsource		44.4%	55.6%		80.0%	20.0%
Admin	In-house	26	20.0%	80.0%	21	38.1%	61.9%
	Outsource		0.0%	100.0%		0%	0%
Marketing	In-house	35	18.5%	81.5%	23	38.9%	61.1%
	Outsource		25.0%	75.0%		60.0%	40.0%
After-sales	In-house	13	16.7%	83.3%	10	22.2%	77.8%
	Outsource		100.0%	0.0%		100.0%	0.0%
Distribution	In-house	20	18.2%	81.8%	14	71.4%	28.6%
	Outsource		11.1%	88.9%		57.1%	42.9%

N=66

The Chi Square tests reveal that firms performing core assembly activities in-house are significantly more successful product innovators than firms that outsource (Table 46): Pearson Chi Square =8.45 and $p < .05$ (0.015).

Table 46. Core assembly and successful product innovation, Chi Square test results

	Value	Df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Prob.
Pearson Chi-Square	8.449 ^a	1	.004	.015	.015	
Continuity Correction	5.647	1	.017			
Likelihood Ratio	6.666	1	.010	.015	.015	
Fisher's Exact Test				.015	.015*	
Linear-by-Linear Association	8.280 ^c	1	.004	.015	.015	.013

n=50; *p<0.05

a. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 1.26.

c. The standardized statistic is -2.878.

The effect size is calculated using the following odds ratio formula:

$$= \frac{\text{Number of cf firms that perform core assembly in-house and successful}}{\text{Number of firms that perform core assembly in-house and unsuccessful}} \div \frac{\text{Number of firms that outsource core assembly and successful}}{\text{Number of firms that outsource core assembly and unsuccessful}}$$

$$= \frac{38}{3} \div \frac{5}{4}$$

$$= \frac{12.67}{1.25} = 10.13$$

Therefore, those firms, which perform core assembly activities in-house, are 10.13 times more likely to be successful product innovators than firms that outsource.

The results of the Chi Square significance tests for successful process innovation and core design, core assembly and core marketing are presented in Table 47, Table 48 and Table 49, respectively. No significant differences of process innovation performance were revealed between in-house and outsourcing firms of the three activities.

Table 47. Core design and successful process innovation, Chi Square test results

	Value	Df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Prob.
Pearson Chi-Square	.562 ^a	1	.453	.576	.453	
Continuity Correction	.013	1	.910			
Likelihood Ratio	.568	1	.451	.576	.453	
Fisher's Exact Test				.576	.453	
Linear-by-Linear Association	.529 ^c	1	.467	.576	.453	.371

n=17; p<0.05

a. 2 cells (50.0%) have expected count less than 5. The minimum expected count is 1.41.

c. The standardized statistic is -.727.

Table 48. Core assembly and successful process innovation, Chi Square test results

	Value	Df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Prob.
Pearson Chi-Square	2.553 ^a	1	.110	.164	.133	
Continuity Correction	1.238	1	.266			
Likelihood Ratio	2.676	1	.102	.164	.133	
Fisher's Exact Test				.164	.133	
Linear-by-Linear Association	2.478 ^c	1	.115	.164	.133	.118

n=34; p<0.05

a. 2 cells (50.0%) have expected count less than 5. The minimum expected count is 2.35.

c. The standardized statistic is -1.574.

Table 49. Core marketing and successful process innovation, Chi Square test results

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Prob.
Pearson Chi-Square	.710 ^a	1	.400	.618	.367	
Continuity Correction	.111	1	.739			
Likelihood Ratio	.705	1	.401	.618	.367	
Fisher's Exact Test				.618	.367	
Linear-by-Linear Association	.679 ^c	1	.410	.618	.367	.278

n=23; p<0.05

a. 2 cells (50.0%) have expected count less than 5. The minimum expected count is 2.17.

c. The standardized statistic is -.824.

33 Hypothesis 2 (H2) test results: outsourcing, innovation performance and innovation capabilities

The second set of hypotheses suggests possible associations between innovation performance and supportive capabilities. Do high innovation performers make use of capabilities more effectively than less-endowed firms do? Furthermore, high innovation performers may even make use of capabilities which are not available to other firms. These two ascertains are explored in the first part of Hypothesis 2 (H2a).

The innovation capabilities considered in this exercise include intra-firm management routines and practices and collaborations with external organisations. Internal capabilities include skilled employees directed towards problem finding and solving, leadership and strategy, technology, external scanning, use of project management to support implementation and evaluations and reviews. External collaborators, which can support innovation, include suppliers, customers, competitors, universities and research and technology organisations. An importance scale is introduced which respondents ranked each capability. Innovation performance is segmented into success product innovation (and not successful) and successful process innovation (and not successful). It is not relevant to compare active and inactive innovation firms as the proposition assumes that only active innovators will make use of innovation capabilities.

The possibility that outsourcing and innovation capabilities are also associated is investigated in two further queries, H2b and H2c. H2b suggests that firms, which outsource peripheral activities, should have resources to deploy innovation capabilities more effectively. H2c explores whether performing core activities in-

house should also be associated with higher levels of capabilities. Moreover, outsourcing specific core activities, which are associated to high innovation performance (H1b), are associated with a unique set of innovation capabilities

33.1 Test results for H2a

H2a: High innovation performing firms make use of specific innovation capabilities to a greater extent than lower innovation performing firms.

H2a compares the importance placed on innovation capabilities by high and low innovation performing firms. The descriptive results for successful product innovation and innovation capabilities are presented in Table 50. Successful product innovators, on average, ranked internal capabilities higher than unsuccessful innovators. On the other hand, the mean scores for unsuccessful innovators are higher for two external collaborators (competitors and buyers) than the scores for unsuccessful innovators.

Table 50. Successful product innovators and innovation capabilities, descriptive results

	Unsuccessful			Successful		
	Mean	Median	Std. Deviation	Mean	Median	Std. Deviation
Skilled employees	2.62	2.50	1.685	3.15	3.00	1.552
Management	2.88	3.00	1.727	3.29	3.00	1.304
Technology use	1.38	1.00	1.061	2.42	3.00	1.226
Innovation strategies	1.12	1.00	.835	2.42	3.00	1.177
Implementation	1.75	1.00	1.035	2.67	3.00	1.309
External scanning	1.38	1.00	.744	1.73	2.00	.795
Evaluations	1.50	1.00	.756	2.19	2.00	1.103
Competitors	2.00	1.00	1.604	1.94	1.00	1.162
Buyers	2.62	2.50	1.598	2.21	2.00	1.333
Consultancy	1.25	1.00	.463	1.48	1.00	.896
Suppliers	1.62	1.00	1.061	1.94	1.00	1.178
Universities	1.00	1.00	.000	1.13	1.00	.486
Research institutes	1.12	1.00	.354	1.19	1.00	.561

n=60¹³

¹³ Includes firms that indicated product innovation performance was equal to or more important than process innovation performance.

Successful product innovators assessed three intra-firm capabilities to be significantly more important than unsuccessful innovators (Table 51). The significance test results are reported as follows:

- i. successful product innovators (median = 3.0) hold supportive technologies to be significantly more important than unsuccessful innovators (median = 1.0): U = 111.0 and p<0.05 (0.015). Technology has a medium effect on performance (effect of size is 0.29);
- ii. successful product innovators (median =3.0) indicated that innovation strategies are significantly more important than unsuccessful innovators (media = 1.0): U= 84 and p<0.05 (0.002). Innovation strategies have a medium effect on performance (r=0.37);
- iii. successful product innovators (median =3.0) assessed implementation of projects to be significantly more important than unsuccessful innovators (media = 1.0): U = 124.5 and p<0.05 (0.028). Implementation has a small to medium effect on performance (r=0.25).

Table 51. Successful product innovators and innovation capabilities, Mann-Whitney test results

	Mann-Whitney U	Wilcoxon W	Z	Exact Sig. (2-tailed)	Exact Sig. (1-tailed)	Point Prob.
Skilled employees	167.500	203.500	-.899	.382	.194	.004
Management	179.500	215.500	-.638	.521	.265	.009
Technology use	111.000	147.000	-2.219	.028	.015*	.002
Innovation strategies	84.000	120.000	-2.831	.004	.002**	.001
Implementation	124.500	160.500	-1.889	.058	.028*	.006
External scanning	152.500	188.500	-1.321	.212	.112	.042
Evaluations	133.500	169.500	-1.697	.098	.055	.022
Competitors	198.000	234.000	-.238	.813	.413	.009
Retailers	174.500	1552.500	-.776	.453	.224	.013
Consultancy	193.000	229.000	-.412	.738	.378	.107
Suppliers	181.000	217.000	-.647	.513	.264	.023
Universities	188.000	224.000	-.781	.568	.407	.346
Research institutes	204.000	240.000	-.134	.856	.539	.234

n=60¹⁴; *p<0.05' **p<0.01

¹⁴ Includes firms that indicated product innovation performance was equal to or more important than process innovation performance.

Table 52 reports the descriptive statistics for successful process innovators and innovation performance. The mean scores for successful innovators are higher than unsuccessful innovators for all the internal capabilities and all but one external collaborations. The lone exception is unsuccessful product innovators score the importance of buyers (mean = 2.88) higher than successful product innovators (mean = 2.28).

Table 52. Successful process innovators and innovation capabilities, descriptive results

	Unsuccessful			Successful		
	Mean	Median	Std. Deviation	Mean	Median	Std. Deviation
Skilled employees	2.62	2.50	1.685	3.32	4.00	1.773
Management	2.88	3.00	1.727	3.56	4.00	1.387
Technology use	1.25	1.00	.886	2.80	3.00	1.291
Innovation strategies	1.50	1.00	1.309	2.84	3.00	1.179
Implementation	1.75	1.00	1.035	3.08	3.00	1.187
External scanning	1.62	1.00	.916	2.24	2.00	.879
Evaluations	1.75	1.50	.886	2.36	3.00	1.036
Competitors	2.00	1.00	1.604	2.08	2.00	1.222
Buyers	2.88	3.00	1.458	2.28	3.00	1.208
Consultancy	1.50	1.00	.756	1.64	1.00	.810
Suppliers	1.88	1.50	1.126	1.96	1.00	1.172
Universities	1.00	1.00	.000	1.28	1.00	.614
Research institutes	1.12	1.00	.354	1.32	1.00	.627

n=33¹⁵

The test results for process innovation active and innovation capabilities are presented in Table 53. The key findings include:

- i. successful process innovators (median = 3.0) ranked supportive technology higher than unsuccessful process innovators (median = 1.0): U=35.5, p<0.05 (0.003). The association has a high strength (r=-0.49);
- ii. successful process firms (median = 3.0) ranked innovation strategies higher than unsuccessful firms (median = 1.0): U=44, p<0.05 (0.008). This is a medium strong association (r=-0.42);

¹⁵ Includes firms that indicated process innovation performance was equal to or more important than product innovation performance.

- iii. successful process firms (median = 3.0) ranked project management implementation higher than unsuccessful innovation firms (median = 1.0): U = 41.5, p<0.05 (0.005). The size effect is medium to large (r=-0.45); and
- iv. successful process firms (median = 2.0) ranked external scanning higher than unsuccessful process innovators (median = 1.0): U=62, p<0.05 (0.037). The size effect of this association is low (-0.29).

Table 53. Successful process innovators and innovation capabilities, Mann-Whitney test results

	Mann-Whitney U	Wilcoxon W	Z	Exact Sig. (2-tailed)	Exact Sig. (1-tailed)	Point Prob.
Skilled employees	77.500	113.500	-.975	.342	.175	.015
Management	76.000	112.000	-1.037	.337	.168	.028
Technology use	35.500	71.500	-2.801	.004	.003**	.001
Innovation strategies	44.000	80.000	-2.423	.016	.008**	.001
Implementation	41.500	77.500	-2.565	.010	.005**	.002
External scanning	62.000	98.000	-1.679	.086	.037*	.008
Evaluations	67.000	103.000	-1.457	.161	.095	.033
Competitors	91.000	127.000	-.410	.701	.355	.012
Buyers	74.500	399.500	-1.128	.248	.128	.011
Consultancy	91.500	127.500	-.402	.769	.422	.141
Suppliers	98.000	134.000	-.091	.928	.467	.027
Universities	80.000	116.000	-1.348	.302	.224	.224
Research institutes	87.500	123.500	-.737	.557	.349	.237

n=33¹⁶; *p<0.05; **p<0.01

a. Not corrected for ties

33.2 Test results for H2b

H2b: Firms that outsource peripheral activities make use of specific innovation capabilities to a greater extent than firms that perform activities in-house

The rationale for undertaking this exploration is to ascertain if firms, which outsource more peripheral activities, will assess their innovation capabilities higher than firms which undertake peripheral activities in-house. The assumption is that outsourcing peripheral outsourcing releases resources which can be directed towards innovation.

¹⁶ Includes firms that indicated process innovation performance was equal to or more important than product innovation performance.

The variable ‘outsourcing intensity – peripheral activities’ is modified from a scale variable to a categorical number. Firms that do not outsource any peripheral activities are classified as ‘Outsource inactive – peripheral (n=25)’. All other firms which outsource at least one peripheral activity or more are categorised as, ‘Outsource active – peripheral (n=41)’. This new variable is applied as a grouping variable for significance testing.

Table 54 reports the descriptive statistics for the cross tabulation of outsourcing active and innovation capabilities rankings. Outsource peripheral inactive firms ranked more important than outsource active firms, on average, six of seven intra-firm innovation capabilities (the exception is skilled employees). In contrast, active firms ranked higher five of six external collaborations than inactive firms (with university links equally ranked).

Table 54. Outsource active (peripheral) and innovation capabilities, descriptive statistics

	Outsource inactive – peripheral			Outsource active – peripheral		
	Mean	Median	Std. Deviation	Mean	Median	Std. Deviation
Skilled employees	2.92	3.00	1.730	3.07	3.00	1.490
Management	3.40	4.00	1.414	3.05	3.00	1.413
Technology use	2.64	3.00	1.319	1.98	2.00	1.151
Innovation strategies	2.40	3.00	1.190	2.17	2.00	1.302
Implementation	2.60	3.00	1.291	2.44	3.00	1.305
External scanning	1.76	1.00	.970	1.71	2.00	.782
Evaluations	2.20	2.00	1.118	1.98	2.00	1.060
Competitors	1.68	1.00	1.145	2.02	2.00	1.214
Retailers	1.96	1.00	1.369	2.37	3.00	1.318
Consultancy	1.32	1.00	.627	1.56	1.00	.976
Suppliers	1.60	1.00	1.041	2.05	2.00	1.182
Universities	1.12	1.00	.332	1.12	1.00	.510
Research institutes	1.20	1.00	.408	1.17	1.00	.587

N=66

A mixed picture is reported by the test statistic (Table 55). First, outsource inactive (peripheral) firms (median = 3.0) ranked supportive technology significantly higher than outsource active firms (median = 2.0): U=372.0 and p<0.05 (0.025). I was expecting active firms to report higher performance. Second, outsource active (peripheral) firms (median = 2.0) ranked suppliers significantly higher than inactive

firms (median = 1.0): $U = 400.0$ and $p < 0.05$. The size effect for both technology and outsource inactive and supplier and outsource active is small with $r = -0.24$ and -0.20 , respectively. The findings are not conclusive.

Table 55. Outsource active (peripheral) and innovation capabilities, Mann-Whitney test results

	Mann-Whitney U	Wilcoxon W	Z	Exact Sig. (2-tailed)	Exact Sig. (1-tailed)	Point Prob.
Skilled employees	491.000	816.000	-.290	.777	.387	.003
Management	434.500	1295.500	-1.060	.294	.147	.003
Technology use	372.000	1233.000	-1.958	.049	.025*	.000
Innovation strategies	459.000	1320.000	-.741	.465	.230	.004
Implementation	470.500	1331.500	-.580	.567	.284	.004
External scanning	508.500	833.500	-.058	.970	.486	.007
Evaluations	452.500	1313.500	-.835	.406	.206	.006
Competitors	420.500	745.500	-1.348	.181	.092	.009
Retailers	419.500	744.500	-1.319	.193	.096	.002
Consultancy	463.000	788.000	-.822	.429	.216	.029
Suppliers	400.000	725.000	-1.648	.103	.050*	.001
Universities	493.000	1354.000	-.455	.712	.427	.054
Research institutes	470.000	1331.000	-.867	.491	.235	.010

N=66; * $p < 0.05$

33.3 Test results for H2c

H2c: Firms that perform core activities in-house make use of specific innovation capabilities to a greater extent than firms that outsource core activities.

H2c builds on the findings from H1b (core activities and innovation performance). The findings reveal that significant differences arise in (i) the intensity of outsourcing core activities and innovation performance and (ii) outsourcing strategy of specific activities (assembly) and innovation performance. H2c extends these results by inquiring whether there are associations between the intensity of core activities and innovation capabilities and core assembly outsourcing and innovation capabilities.

33.3.1 Outsourcing intensity of core activities and innovation capabilities

In Section 32.2.1, the study reported a positive association between the number of core activities and innovation performance. Specifically, the analysis showed that firms, which performed a greater number of core activities in-house, are associated

with higher innovation performance. In this complementary investigation, I explore whether the number of outsourced core activities are associated with the application of innovation capabilities. The assumption is that the greater the number of activities performed in-house will be associated with highly regarded innovation capabilities.

The analysis modified the variable ‘outsourcing intensity – core activities’ from a scale to a categorical variable. Firms with an outsource intensity score = 0 (that is, firms do not outsource their core activities) are classified as ‘Outsource inactive – core’ (N=25). All other firms are categorised as, ‘Outsource active – core’ (N=41). This new variable is introduced as a grouping variable for the significance testing.

The descriptive statistics for outsource intensity (two categories) and innovation capabilities are presented in Table 56. Firms, which are core activity outsource inactive, score all their internal innovation capabilities (except technology) higher than outsource active firms.

Table 56. Outsource active (core) and innovation capabilities, descriptive statistics

	Outsource inactive – core			Outsource active – core		
	Mean	Median	Std. Deviation	Mean	Median	Std. Deviation
Skilled employees	3.04	3.00	1.814	3.00	3.00	1.432
Management	3.48	4.00	1.447	3.00	3.00	1.378
Technology use	2.20	2.00	1.354	2.24	2.00	1.200
Innovation strategies	2.56	3.00	1.356	2.07	2.00	1.170
Implementation	2.92	3.00	1.256	2.24	2.00	1.261
External scanning	1.92	2.00	.862	1.61	1.00	.833
Evaluations	2.48	2.00	1.046	1.80	1.00	1.030
Competitors	1.80	1.00	1.155	1.95	1.00	1.224
Retailers	2.28	2.00	1.400	2.17	2.00	1.321
Consultancy	1.56	1.00	1.003	1.41	1.00	.774
Suppliers	1.64	1.00	.952	2.02	1.00	1.235
Universities	1.12	1.00	.332	1.12	1.00	.510
Research institutes	1.12	1.00	.332	1.22	1.00	.613

N=66

The results of the outsourcing core intensity and innovation capabilities test statistics are presented in Table 57. Firms, which are outsource inactive of core activities, ranked two innovation capabilities significantly higher in importance than firms which are outsource active (the shaded area indicates significant findings).

The findings show that:

- i. core outsource active firms (median 3.0) ranked project management (implementation) significantly higher than core outsource inactive firms (median =1.0): U= 358.5 and $p < 0.05$ (0.017). Effect of size is small to medium ($r = -0.27$);
- ii. core outsource active firms (median 2.0) ranked project evaluations significantly higher than core outsource inactive firms (median =1.0): U = 323.0, $p < 0.05$ (.004). This accounts for a medium degree of performance ($r = 0.33$).

Furthermore, outsource inactive firms ranked innovation strategies and external scanning higher than outsource active firms. While the Mann-Whitney tests did not reveal significance results ($p < 0.05$), the test scores could be consider an almost result if a higher confidence level (e.g. $p < 0.1$) is considered. These semi-strategic capabilities are flagged.

Table 57. Outsource active (core) and innovation capabilities, Mann-Whitney test results

	Mann-Whitney U	Wilcoxon W	Z	Exact Sig. (2-tailed)	Exact Sig. (1-tailed)	Point Prob.
Skilled employees	491.500	1352.500	-.284	.782	.391	.001
Management	406.500	1267.500	-1.440	.152	.076	.002
Technology use	500.500	825.500	-.167	.883	.443	.003
Innovation strategies	397.500	1258.500	-1.594	.113	.056**	.000
Implementation	358.500	1219.500	-2.128	.033	.017*	.000
External scanning	401.500	1262.500	-1.598	.115	.059**	.007
Evaluations	323.000	1184.000	-2.637	.008	.004*	.000
Competitors	477.500	802.500	-.513	.614	.316	.017
Retailers	495.500	1356.500	-.241	.814	.408	.007
Consultancy	483.000	1344.000	-.490	.635	.312	.019
Suppliers	429.500	754.500	-1.216	.231	.119	.008
Universities	493.000	1354.000	-.455	.712	.427	.054
Research institutes	493.000	818.000	-.398	.676	.322	.043

N=66; * $p < 0.05$; ** $p < 0.1$

33.3.2 Outsourcing of specific core activities and innovation capabilities

The findings in Section 32.2.2 indicated that firms performing core assembly activities in-house were more successful product innovators than firms that outsourced. No other activity outsourcing strategy produced a significant difference

in innovation performance. This section explores the assertion that firms that perform core assembly activities in-house are also associated with higher innovation capabilities than firms that outsource.

Table 58 reports the descriptive statistics of the innovation capability importance scores for firms performing core assembly activities in-house and firms outsourcing. The average scores indicate that the use of innovation capabilities does not vary greatly among firms within the two groups. Of the seven internal innovation capabilities, firms performing core assembly in-house scored five capabilities higher than firms that outsource. The importance scores for external collaborators are evenly split (with the same score applied to suppliers). However, the differences between the rankings of intra-firm capabilities and external collaborations are not great.

Table 58. Core assembly and innovation capabilities, descriptive statistics

	Core Assembly In-house			Core Assembly Outsource		
	Mean	Median	Std. Deviation	Mean	Median	Std. Deviation
Skilled employees	3.07	3.00	1.668	2.70	3.00	1.418
Management	3.12	3.00	1.366	3.30	3.50	1.418
Technology use	2.37	2.00	1.346	2.10	2.50	.994
Innovation strategies	2.14	2.00	1.226	2.30	3.00	1.160
Implementation	2.47	3.00	1.297	2.00	1.50	1.155
External scanning	1.70	1.00	.860	1.60	1.00	.843
Evaluations	2.09	2.00	1.171	1.80	1.50	.919
Competitors	1.81	1.00	1.160	2.40	2.00	1.506
Retailers	2.07	1.00	1.334	2.50	2.50	1.509
Consultancy	1.47	1.00	.909	1.30	1.00	.483
Suppliers	1.81	1.00	1.160	1.80	1.50	1.033
Universities	1.12	1.00	.448	1.10	1.00	.316
Research institutes	1.14	1.00	.467	1.40	1.00	.699

n=53

The second part of the proposition H2c is rejected. No significant differences in innovation capability rankings were found between firms, which perform core assembly activities in-house, and firm that outsource.

Table 59. Core assembly and innovation capabilities, Mann-Whitney test results

	Mann-Whitney U	Wilcoxon W	Z	Exact Sig. (2-tailed)	Exact Sig. (1-tailed)	Point Prob.
Skilled employees	182.500	237.500	-.755	.462	.231	.007
Management	198.000	1144.000	-.398	.709	.361	.022
Technology use	191.000	246.000	-.575	.559	.281	.006
Innovation strategies	195.500	1141.500	-.470	.638	.329	.010
Implementation	173.000	228.000	-1.001	.335	.169	.023
External scanning	201.000	256.000	-.351	.747	.400	.049
Evaluations	189.500	244.500	-.613	.562	.290	.021
Competitors	164.000	1110.000	-1.290	.219	.110	.004
Retailers	178.500	1124.500	-.897	.374	.191	.015
Consultancy	212.000	267.000	-.086	1.000	.491	.078
Suppliers	205.000	1151.000	-.255	.789	.403	.020
Universities	214.500	1160.500	-.019	1.000	.654	.283
Research institutes	175.500	1121.500	-1.319	.260	.132	.069

n=53; p<0.05

34 Hypothesis 3 (H3) test results: alternative explanations for innovation performance

The main tenant of this study is the establish possible patterns between outsourcing and innovation performance. Nonetheless, alternative explanations for variances in performance are considered. In this section, innovation performance is paired with firm size, customer focus strategies and buyer types.

34.1 Test results for H3a

H3a: Firm size is associated with innovation performance and outsourcing.

For this study, firm size is defined by employee number bands. Small firms have one to 49 employees, medium size firms have 50 to 249 employees and large firms have over 250 employees. The cross tabulation counts for firm size and innovation active and successful innovation performances are reported in Table 60 and Table 61, respectively. Most firms in all three size categories are product innovation active. Greater shares of large firms are process innovation active compared to small and medium size firms (in fact, there are no process inactive large firms). As for successful innovation performance, a greater share of medium size firms (91%) is more successful in process innovation than small firms (46%) or large firms (50%). The share of firms which are successful product innovators range from 80% (small and large firms) and 100% (medium size firms).

Table 60. Firm size and innovation active, descriptive statistics

Share of performance indicator for each firm size category

Firm size	Product innovation		Process innovation	
	Not active	Active	Not active	Active
Small	11.4%	88.6%	40.9%	59.1%
Medium	.0%	100.0%	31.2%	68.8%
Large	.0%	100.0%	.0%	100.0%

N=66

Table 61. Firm size and successful innovation, descriptive statistics

Share of performance indicator for each firm size category

Firm size	Product innovation		Process innovation	
	Unsuccessful	Successful	Unsuccessful	Successful
Small	20.5%	79.5%	53.8%	46.2%
Medium	.0%	100.0%	9.1%	90.9%
Large	16.7%	83.3%	50.0%	50.0%

N=66

This dispersion, while illuminating, poses a problem for the significance testing. The Chi Square tests - including the Fisher's Exact tests - are invalid if one or more cells are empty (i.e. equal to zero). Cross tabulations between innovation active and firm size produce three cells empty (Table 60) while one cell is empty in the successful innovation and firm size cross tabs (Table 61). Chi Square tests are therefore not available for this analysis.

The Kruskal Wallis test is an alternative significance test method. The innovation performance variables are transformed from a categorical variables into ordinal variables. The variable transformation requires the merging of the 'innovation active' and 'innovation successful' variables into an ordinal scale : successful = 3; abandoned or failed = 2; and not active (or ongoing) = 1. The grouping variable is firm size.

Table 62 presents the descriptive test result for innovation performance and firm size. On average, product innovation performance scores higher than process innovation performance for each firm size category. This finding is not surprising given the high number of product active firms (93% of firms) compared to process active firms (65% of firms). Product design is central to most furniture manufacturers.

Table 62. Firm size and innovation performance, descriptive statistics

Firm size	Product innovation			Process innovation		
	Mean	Median	Standard Deviation	Mean	Median	Standard Deviation
Small	2.45	3.00	0.87	1.61	1.00	0.89
Medium	3.00	3.00	0.00	2.25	3.00	1.00
Large	2.83	3.00	0.41	2.17	2.50	0.98

N=66

Table 63 reports the significance test results for firm size and product and process innovation performance. Product innovation performance is significantly associated with firm size ($H = 6.34, p < 0.05 (0.037)$). Process innovation performance is also significantly associated with firm size ($H = 5.90, p < 0.05 (0.047)$).

Table 63. Firm size and innovation performance, Kruskal Wallis test results

	Product innovation	Process innovation
Chi-Square	6.339	5.904
Df	2	2
Asymp. Sig.	.042	.052
Exact Sig.	.037*	.047*
Point Probability	.001	.000

N=66; * $p < 0.05$

Post hoc tests are required to identify which of the firm size categories are significantly different from the others and to measure the size effect. Three further tests on two independent group comparisons are applied (Mann-Whitney tests). The significance level is adjusted as per the Bonferonni correction in which the critical significance level is divided by the number of tests (Field 2005 p. 550). In this case, three tests are required:

$$p < \frac{0.05}{3} = p < 0.017.$$

The post hoc test results are presented in Table 64 (small and medium size firms and innovation performance), Table 65 (small and large size firms and innovation performance) and

Table 66 (medium and large size firms and innovation performance). Significant variances are measured between small firms and medium size firms for product innovation performance and process innovation performance.

The findings show that:

- i. medium size firms (median =3.0) have significantly higher product innovation performance than small firms (median =3.0): $U= 248, p<0.017$ (0.010). Size accounts for a medium effect on innovation performance (-0.313).
- ii. medium size firms (median =3.0) have a significantly higher process innovation performance than small firms (median = 1.0): $U= 237, p<0.017$ (0.018). The size effect is low to medium (-0.286).

No significance results are found for the other firm size comparisons.

Table 64. Small and medium size firms and innovation performance, Mann-Whitney test results

	Product innovation	Process innovation
Mann-Whitney U	248.000	237.000
Wilcoxon W	1238.000	1227.000
Z	-2.427	-2.216
Asymp. Sig. (2-tailed)	.015	.027
Exact Sig. (2-tailed)	.024	.031
Exact Sig. (1-tailed)	.010*	.018*
Point Probability	.010	.007

n=60; $p<0.017$

Table 65. Small and large firms and innovation performance, Mann-Whitney test results

	Product innovation	Process innovation
Mann-Whitney U	109.500	90.500
Wilcoxon W	1099.500	1080.500
Z	-.856	-1.446
Asymp. Sig. (2-tailed)	.392	.148
Exact Sig. [2*(1-tailed Sig.)]	.511 ^a	.222 ^a
Exact Sig. (2-tailed)	.401	.164
Exact Sig. (1-tailed)	.194	.118
Point Probability	.071	.053

a. Not corrected for ties.

n=50; $p<0.017$

Table 66. Medium size and large firms and innovation performance, Mann-Whitney test results

	Product innovation	Process innovation
Mann-Whitney U	40.000	45.000
Wilcoxon W	61.000	66.000
Z	-1.633	-.256
Asymp. Sig. (2-tailed)	.102	.798
Exact Sig. [2*(1-tailed Sig.)]	.590 ^a	.858 ^a
Exact Sig. (2-tailed)	.273	1.000
Exact Sig. (1-tailed)	.273	.477
Point Probability	.273	.107

a. Not corrected for ties.
n=22; p<0.017

Firm size is associated with innovation performance for this sample of UK furniture manufactures. Specifically, innovation performance is significantly higher in medium size firms than in small firms.

34.2 Test results for H3b

H3b: Buyer preferences/ customer-focus strategies are associated with greater innovation performance

The influence of business strategy on the activities of a company can include the breadth and direction of innovation. At a high-level perspective, strategy can direct resources towards cost reduction or market penetration initiatives; process innovation can support the former initiative while product innovation activities can foster the latter. Decisions about incremental design can also be steered by managers, particularly when directed to customer demands.

Customer-focus strategies as noted in Chapter 3 are driven by explicit buyer preferences. These preferences are translated into strategic and operational intent and deployment. UK furniture manufacturing is a highly competitive traditional industry and identifiable customer-focus strategies are guides to why firms follow certain paths. These paths include innovation, specifically demands by customers for new product designs.

The tests for of customer-focus strategies and innovation performance associations compliments the previous analysis. The scale which respondents scored customer preferences is an ordinal scale modified and adapted from importance qualifier-winner scale (Berry, Hill and Klompmaker 1995). Only product and process innovation active innovation performance metrics are used .

Table 67 report on the descriptive test results for customer preferences and product innovation active firms. The three most important customer preferences for product active firms are high quality, on-time delivery and customisation. For product inactive firms, the three most important customer preferences are on-time delivery, lowest price and high quality. Other than customers looking for the lowest price, the average customer preferences scores are higher for product active firms than product inactive firms.

Table 67. Customer preferences and product innovation active, descriptive statistics

	Not active			Active		
	Mean	Median	Std. Deviation	Mean	Median	Std. Deviation
Lowest price	3.40	3.00	.894	3.15	3.00	1.181
High quality	3.40	4.00	1.342	4.16	4.00	.734
Fast delivery	2.80	3.00	1.304	3.34	4.00	1.047
On-time delivery	3.60	4.00	.894	3.85	4.00	.792
Innovative designs	2.40	2.00	1.517	3.31	4.00	1.148
Product variety	2.60	3.00	1.140	3.49	4.00	.906
Flexible production	2.20	2.00	.837	3.03	3.00	1.169
Bringing out new products	1.60	2.00	.548	2.89	3.00	1.097
Customisation	2.80	2.00	1.643	3.54	4.00	1.409
Services linked with products	2.40	2.00	1.140	2.59	3.00	1.174
Associated with a brand-name	2.00	2.00	1.225	2.13	2.00	.991
Product/ service warranty	2.00	2.00	.707	2.56	3.00	1.073
CSR	2.00	2.00	1.000	2.20	2.00	1.123
Sell directly to end-users	2.40	2.00	1.673	2.90	3.00	1.535

N=66

The significance tests results for product innovation active and customer preferences associations are presented in Table 68. Not surprisingly, product- centre customer preferences tested significantly higher for product active innovators: The results show that:

- i. the customer preference, product variety, scored significantly higher for product innovation active firms (median = 4.0) than inactive firms (median = 3.0): $U = 85$ and $p < 0.05$ (.046). This preference only has a small effect ($r = -0.212$) on innovation performance;
- ii. the customer preference, launching new products, ranked significantly higher for product innovation active firms (median = 3.0) than inactive firms (median = 2.0): $U = 52$ and $p < 0.01$ (0.006). This preference has a medium effect on innovation performance ($r = -0.310$).

Table 68. Customer preferences and product innovation active, Mann-Whitney test results

	Mann-Whitney U	Wilcoxon W	Z	Exact Sig. (2-tailed)	Exact Sig. (1-tailed)	Point Prob.
Lowest price	138.000	2029.000	-.362	.781	.391	.004
High quality	101.000	116.000	-1.340	.215	.088	.001
Fast delivery	116.000	131.000	-.925	.387	.184	.024
On-time delivery	135.500	150.500	-.451	.614	.337	.023
Innovative designs	89.500	104.500	-1.580	.116	.070	.004
Product variety	85.000	100.000	-1.720	.090	.046*	.007
Flexible production	90.000	105.000	-1.562	.137	.076	.028
Bringing out new products	52.000	67.000	-2.517	.009	.006**	.004
Customisation	110.500	125.500	-1.054	.308	.168	.036
Services linked with products	139.500	154.500	-.325	.769	.394	.059
Brand-name	137.000	152.000	-.393	.705	.372	.038
Product/ service warranty	106.500	121.500	-1.158	.289	.147	.041
CSR	141.000	156.000	-.292	.805	.438	.088
Sell directly to end-users	125.500	140.500	-.673	.527	.268	.013

^aNot corrected for ties.
N=66; * $p < 0.05$; ** $p < 0.01$

For process innovation active firms, the three most important customer preferences are high quality, on-time delivery, and customisation and product variety (tied). Process innovation inactive firms identified high quality, on-time delivery and customisation as priority buyer preferences. Process inactive firms ranked lowest

price, product/ service warranty and sell directly to end-users higher than active firms; process active firms ranked all other preference categories higher.

Table 69. Customer preferences and process innovation active, descriptive statistics

	Not active			Active		
	Mean	Median	Std. Deviation	Mean	Median	Std. Deviation
Lowest price	3.17	3.00	1.029	3.16	3.00	1.233
High quality	3.96	4.00	.825	4.19	4.00	.794
Fast delivery	3.22	3.00	1.043	3.35	4.00	1.089
On-time delivery	3.78	4.00	.902	3.86	4.00	.743
Innovative designs	3.00	3.00	1.168	3.37	4.00	1.196
Product variety	3.22	3.00	.951	3.53	4.00	.935
Flexible production	2.91	3.00	1.240	3.00	3.00	1.134
Bringing out new products	2.57	2.00	1.273	2.91	3.00	1.019
Customisation	3.39	4.00	1.373	3.53	4.00	1.470
Services linked with products	2.30	2.00	1.105	2.72	3.00	1.182
Associated with a brand-name	2.00	2.00	1.000	2.19	2.00	1.006
Product/ service warranty	2.57	2.00	1.121	2.49	2.00	1.032
CSR	2.04	2.00	1.022	2.26	2.00	1.157
Sell directly to end-users	3.09	4.00	1.474	2.74	2.00	1.575

N=66

The test results for customer preferences and process innovative active did not reveal any significant difference (Table 70).

Table 70. Customer preferences and process innovation active, Mann-Whitney test results

	Mann-Whitney U	Wilcoxon W	Z	Exact Sig. (2-tailed)	Exact Sig. (1-tailed)	Point Prob.
Lowest price	483.500	759.500	-.153	.888	.444	.007
High quality	417.000	693.000	-1.120	.265	.139	.016
Fast delivery	455.000	731.000	-.556	.587	.294	.007
On-time delivery	473.500	749.500	-.310	.756	.377	.013
Innovative designs	405.500	681.500	-1.240	.215	.108	.002
Product variety	397.500	673.500	-1.373	.167	.085	.003
Flexible production	475.000	751.000	-.271	.795	.398	.013
Bringing out new products	401.000	677.000	-1.300	.198	.098	.001
Customisation	457.000	733.000	-.523	.615	.313	.009
Services linked with products	400.500	676.500	-1.303	.198	.099	.004
Brand-name	442.000	718.000	-.738	.467	.239	.015
Product/ service warranty	480.500	1426.500	-.196	.861	.433	.015
CSR	449.500	725.500	-.634	.535	.267	.009
Sell directly to end-users	438.500	1384.500	-.775	.445	.223	.006

N=66

Finally, are customer preferences associated with outsourcing specific business activities? The previous analysis revealed that firms, which perform core assembly activities in-house are more successful product innovators than outsourcing firms and customer preferences could influence outsourcing. Table 71 reports on the cross tabulated descriptive statistics between core assembly outsourcing and customer preferences.

Other than lowest price preferences and sales to end users, firms performing assembly activities in-house considered customer preferences higher than outsourcing firms. This finding suggests that in-house assembly firms are more customer focus oriented.

Table 71. Core assemble strategy and customer preferences, descriptive statistics

	Core Assembly In-house				Core Assembly Outsource			
	N	Mean	Median	Std. Deviation	N	Mean	Median	Std. Deviation
Lowest price	43	3.14	3.00	1.207	10	3.40	3.00	1.075
High quality	43	4.30	4.00	.773	10	3.70	4.00	.675
Fast delivery	43	3.26	3.00	1.049	10	3.20	3.00	1.135
On-time delivery	43	3.79	4.00	.742	10	3.40	3.50	.966
Innovative designs	43	3.49	4.00	1.142	10	2.70	3.00	.823
Product variety	43	3.42	3.00	.932	10	3.30	3.00	.823
Flexible production	43	3.05	3.00	1.154	10	2.40	2.00	.843
Bringing out new products	43	3.00	3.00	1.155	10	2.20	2.00	.789
Customisation	43	4.02	4.00	1.185	10	2.60	2.00	1.174
Services linked with products	43	2.65	3.00	1.131	10	2.20	2.00	1.135
Brand-name	43	2.21	2.00	.965	10	1.70	1.50	.949
Product/ service warranty	43	2.67	3.00	1.169	10	2.00	2.00	.816
CSR	43	2.16	2.00	1.132	10	2.20	2.50	.919
Sell directly to end-users	43	2.91	2.00	1.571	10	3.30	4.00	1.494

n=53

Table 72 presents the results of the Mann-Whitney tests for customer preferences and core assembly (in-house and outsource). Interestingly, the results show that in-

house performers of core assembly activities ranked the following customer preferences higher than outsource firms:

- i. high quality: $U=119.5$ and $p<0.05$ (.004). This is a medium strength of association ($r=-0.321$);
- ii. innovative designs: $U=125.5$ and $p<0.05$ (0.001). This is a medium strength of association ($r=0.287$);
- iii. flexible production: $U= 143.5$ and $p<0.006$. $r=-0.231$ which is a low association ;
- iv. launching new products: $U=127$ and $p<0.05$ (0.005). The association is of medium strength ($r=-0.284$); and
- v. customisation: $U=90.5$ and $p<0.05$ (0.0). This represents a medium to high association with $r=-0.408$.

Table 72. Core assembly strategy and customer preferences, Mann-Whitney tests

	Mann-Whitney U	Wilcoxon W	Z	Exact Sig. (2-tailed)	Exact Sig. (1-tailed)	Point Prob.
Lowest price	192.000	1138.000	-.538	.621	.311	.012
High quality	119.500	174.500	-2.339	.026	.011*	.004
Fast delivery	209.500	264.500	-.130	.917	.458	.014
On-time delivery	164.500	219.500	-1.259	.210	.110	.016
Innovative designs	126.500	181.500	-2.090	.038	.019*	.001
Product variety	194.500	249.500	-.491	.620	.314	.016
Flexible production	143.500	198.500	-1.681	.098	.049*	.006
Bringing out new products	127.000	182.000	-2.065	.038	.021*	.005
Customisation	90.500	145.500	-2.971	.003	.001**	.000
Services linked with products	166.000	221.000	-1.149	.252	.117	.008
Brand-name	147.000	202.000	-1.618	.110	.055	.005
Product/ service warranty	144.500	199.500	-1.654	.110	.058	.007
CSR	203.000	1149.000	-.285	.779	.389	.014
Sell directly to end-users	189.500	1135.500	-.596	.581	.287	.012

n=53; * $p<0.05$; ** $p<0.001$

The positive association between customer preferences and core assembly activities does not reveal any hierarchy. For instance, strong customer preferences could influence firms to focus on and maintain in-house activities. On the other hand, firms with in-house capabilities (in assembly activities) could be predisposed to take on buyers with specific preferences. While the interpretation of the results from this test

requires more study, what is certain, however, are the very strong links between the immediate function (assembly) and customer preferences. H3b is supported.

34.3 Test results for H3c

H3c: Buyer types are associated with innovation performance.

The global value chain perspective holds that, for some traditional manufacturing industries, buyers govern the supply chains by setting quality and price performance criteria (Gereffi, Humphrey and Sturgeon 2005). Furniture manufacturers tend to be dependent on distributors, agents and retailers to access final markets. While some producers have explored direct selling strategies, most buyers dominate the activities of producers, usually through governance structures. These buyers also play a predominant role in establishing innovation performance criteria including design specifications and cost reduction targets (Kaplinsky, Morris and Readman 2002a).

As an alternative rationale for understanding difference in innovation performance, this study tests if the proposition that buyers of furniture products are associated with innovation performance. To determine a predominant buyer, firms segmented their different buyer types by the share of purchases: 50% or more of total revenue define the predominant buyer type for each firm in a given year. Table 73 shows that the most common buyer type is direct selling to end-users (53% of firms) while the least common buyer type are multi-chain stores (3% of firms). A further 15% of firms have no dominant buyer.

To ensure a safe significance test and avoid any empty cells, the innovation performance ordinal scale, introduced in Section 34.1, is used. The average product innovation performance scores and process innovation performance scores do not vary greatly by different buyer types (Table 73). Product innovation performance ranks higher than process innovation performance across all buyer types (with firms with multi-chain buyers indicating the same rank for both performances).

Table 73. Predominant buyers and innovation performance, descriptive statistics

Predominant buyer	Percent of total Respondents	Product innovation			Process innovation		
		Mean	Median	Standard Deviation	Mean	Median	Standard Deviation
Direct sales	53.0%	2.51	3.00	0.82	1.89	1.00	0.96
Distributors	16.7%	2.82	3.00	0.60	1.55	1.00	0.93
No dominant buyer	15.2%	3.00	3.00	0.00	1.50	1.00	0.85

Single stores	12.1%	2.50	3.00	0.93	2.25	3.00	1.04
Multi-chain stores	3.0%	2.00	2.00	1.41	2.00	2.00	1.41

N=66

The test results do not reveal any significant difference among buyers and innovation performance (Table 44).

Table 74. Predominant buyers and innovation performance, Kruskal Wallis test results

	Process innovation	Product innovation
Chi-Square	3.793	5.702
Df	4	4
Asymp. Sig.	.435	.223
Exact Sig.	.457	.200
Point Probability	.000	.000

N=66

35 Test results for the exploratory research proposition (RP_e)

RP_e: Is there an optimal combination of immediate production sharing associated with innovation performance?

The final research question explores the possible association between different combinations of immediate production activities and innovation performance. Immediate production comprises of three operational activities: pre-production, parts production and assembly. There are five immediate production strategies (out of a possible eight combinations) which are pursued by firms. The tests consider the five strategies and ignores the outlier strategies (thereby omitting 4.5 per cent of the sample).

Table 75 reports the cross tabulation results for firms engaging in the five immediate production strategies and their respective innovation performances. The average scores (both the mean and median) for process innovation performance does not vary considerably among the five strategy groups with a mean range of 1.44 to 1.96. The average scores for product innovation performance however, does show greater variance with firms following PS₈ (outsourcing all three activities) showing lower performance scores than the other four strategic paths.

Table 75. Immediate production strategies and innovation performance, descriptive statistics

Strategy	N	Percent of total respondents	Process innovation			Product innovation		
			Mean	Median	Std. Deviation	Mean	Median	Std. Deviation
PS1	27	40.9%	1.96	2.00	.980	2.52	3.00	.849
PS3	15	22.7%	1.93	1.00	1.033	2.87	3.00	.516
PS5	5	7.6%	1.80	1.00	1.095	3.00	3.00	.000
PS7	7	10.6%	1.57	1.00	.976	3.00	3.00	.000
PS8	9	13.6%	1.44	1.00	.726	2.11	2.00	.928
Outliers PS2,PS4,PS6	3	4.5%	1.67	1.00	1.155	2.33	3.00	1.155

N=66

Kruskal Wallis non-parametric tests are applied to the innovation performance scores of firms grouped by the five immediate production strategies; the outliers are not included in this test (Table 76). The test results show that product innovation performance is significantly associated with immediate production strategies, $H=11.066$, $p<0.05$ ((0.022)). No significance was found for process innovation and immediate production strategies associations.

Table 76. Immediate production strategy and innovation performance, Kruskal Wallis test results

	Process innovation	Product innovation
Chi-Square	2.479	11.066
Df	4	4
Asymp. Sig.	.648	.026
Exact Sig.	.659	.022
Point Probability	.000	.000

n=63

Post hoc tests reveal which of the immediate production strategies is significantly associated with product innovation performance. The mean scores of the five strategies noted in Table 75 suggest that firms following PS₈ have the lowest innovation performance score; therefore, this grouping of firms will be compared to

the high innovation performing firms following three immediate production strategies (PS₃, PS₅ and PS₇) using paired independent group comparisons tests (Mann-Whitney tests). The significance level is adjusted as per the Bonferonni correction, requiring three tests:

$$p < \frac{0.05}{3} = p < 0.0167$$

The post hoc test results are reported below. Of the three paired tests, firms following PS₃ are associated with significantly higher product innovation scores than firms following PS₈: U = 35.5, p < 0.0167 (0.015). Size effect is medium to high (r = -0.514). Firms following an immediate productions strategy PS₃ (performing pre-production and assembly in-house and outsourcing part production) have higher product innovation performances than firms following PS₈ (outsourcing all three production activities).

Table 77. Immediate production strategies PS₃ and PS₈ and product innovation, Post-hoc tests

Product innovation	
Mann-Whitney U	35.500
Wilcoxon W	80.500
Z	-2.519
Asymp. Sig. (2-tailed)	.012
Exact Sig. [2*(1-tailed Sig.)]	.055 ^a
Exact Sig. (2-tailed)	.015
Exact Sig. (1-tailed)	.015*
Point Probability	.009

n=24; *p<0.0167

a. Not corrected for ties.

Table 78. Immediate production strategies PS₅ and PS₈ and product innovation, Post-hoc tests

Product innovation	
Mann-Whitney U	10.000
Wilcoxon W	55.000
Z	-1.957
Asymp. Sig. (2-tailed)	.050
Exact Sig. [2*(1-tailed Sig.)]	.112 ^a
Exact Sig. (2-tailed)	.086
Exact Sig. (1-tailed)	.063
Point Probability	.063

N=14; p<0.0167

a. Not corrected for ties.

Table 79. Immediate production strategies PS₇ and PS₈ and product innovation, Post-hoc tests

Product innovation	
Mann-Whitney U	14.000
Wilcoxon W	59.000
Z	-2.265
Asymp. Sig. (2-tailed)	.024
Exact Sig. [2*(1-tailed Sig.)]	.071 ^a
Exact Sig. (2-tailed)	.034
Exact Sig. (1-tailed)	.029
Point Probability	.029

N=16; p<0.0167

a. Not corrected for ties.

It is interesting to note that, while PS₃ is significantly higher than PS₈, the product innovation performance scores for PS₅ (mean = 3.00) and PS₇ (mean =3.00) s are higher than the PS₃ score (mean =2.87) (Table 75). What this finding suggests is a possible Type II error which may be caused by different sample sizes: the sample sizes used in the two tests, which produced no significance but had the highest innovation scores, are smaller than the sample used in the positive test e result (despite scoring lower innovation scores). There is a strong probability that the product innovation scores of firms following PS₃, PS₅ and PS₇ are significantly higher than firm that follow PS₈ if a larger sample size is surveyed.

36 Summary of the test findings

The test statistics results suggest that innovation performance is associated with core outsourcing. Critical to this study, firms that do not outsource core activities are associated with higher innovation performance than firms that outsource. The other key result shows that firms performing core assembly activities in-house are associated to higher innovation performance.

The findings from the statistical tests offer no evidence to support the research proposition H1a (a positive association between peripheral activity outsourcing and innovation performance). The study does provide evidence to support the hypothesis H1b (a positive association between core activities performed in-house and innovation performance). Specifically, the analysis found that:

- i. the greater the number core activities outsourced (as measured by outsourcing intensity), the less process active firms are;
- ii. firms performing the manufacturing assembly in-house are more successful in product innovation than firms outsourcing.

The second set of hypotheses tests explored the possible relationships among innovation capabilities and innovation performance, and innovation capabilities and outsourcing. The findings from the statistical tests suggest a number of strong associations. Innovation performance is positively associated with innovation capabilities (H2a). For successful product innovators, the important capabilities are technology competence, innovation strategies and project management implementation. For successful process innovators, key capabilities are technology competence, innovation strategies, project management implementation and external scanning.

The tests results for peripheral activities and innovation capabilities associations are inconclusive. The prediction was that firms that outsource peripheral activities will make use of innovation capabilities to a greater extent. However, the tests revealed that firms, which do not outsource any peripheral activities, ranked supportive technology capabilities higher than firms that outsource. In support of the

predictions, supplier collaboration is more important by outsourcing firms than by firms which do not outsource peripheral activities, H2b is not supported at this time.

Firms outsourcing core activities are associated with innovation capabilities. Firms, which perform all their core activities in-house, ranked project management implementation and evaluation capabilities higher than outsourcing firms. Despite the positive association between performing core assembly in-house and innovation performance, no association was found between this specific activity's outsourcing strategy and innovation capabilities.

Firm size is also associated with innovation performance, particularly medium size firms out performing small firms. More importantly, customer-focus strategies are linked to product innovation performance and, specifically, to in-house core assembly activities. Firms which outsource all three immediate production functions, indicate lower product innovation performance than firms which follow other immediate production strategies.

The next chapter provides discusses the findings. The strategy implication are discussed which may be relevant for current and future analysis of the boundary of the firm and innovation performance.

Chapter 8. Theoretical Contributions and Management Implications

This study advances several theoretical insights through the application of an industrial organisation framework. The applied research framework is augmented with the collection and testing of empirical data. The findings are discussed in this chapter. The foremost outcome shows that innovation performance is affected by outsourcing decisions. The previous documented relationship between capabilities and product and process innovation is supported by revealing enablers, which are particular to the furniture industry. Revealingly, there is a strong correlation between customer-focus strategies and innovation performance: furniture manufacturers are attuned to customer design preferences through critical buyer channels. Other key findings highlight the association between firm size and innovation and the importance of innovation capabilities for medium size firms. A summary of the findings are presented in Table 80.

In addition to contributing to the discourse on outsourcing and innovation, this study establishes a methodology that is suitable for management and policy. The sequential research methodology guided a mix of qualitative and quantitative inquiries to amass a rich data set unique to the case industry. However, the findings are limited to one industry, in one location and in one period. I propose that this outsourcing - innovation performance framework could be replicated in other industries to compare inter-industry outsourcing patterns. Generalisation can occur only through multiple applications of the research framework, directed at different industries, across vicinities and in different periods. In the final section, decision making and innovation outcomes is discussed in a wider context.

Table 80. Summary of Hypotheses test results

Hypotheses	Test results	Associations
H1a: Firms outsourcing peripheral activities are higher innovation performers than firms performing peripheral activities in-house.	No association	
H1b: Firms performing core activities in-house are higher innovation performers than firms outsourcing strategic activities.	Positive associations	<ul style="list-style-type: none"> a) Firms performing a greater share of their core in-house are more process innovation active. b) Firms performing core assembly activities in-house are more successful at product innovation.
H2a: High innovation performing firms make use of specific innovation capabilities to a greater extent than lower innovation performing firms.	Positive associations	<ul style="list-style-type: none"> a) Supportive technology, innovation strategies and project management are more important to successful product innovators. b) Supportive technology, innovation strategies, project management and external scanning are more important to successful process innovators.
H2b: Firms that outsource peripheral activities make use of specific innovation capabilities to a greater extent than firms that perform activities in-house.	Inconclusive	<ul style="list-style-type: none"> a) Suppliers are more important for firms that outsource a greater share of their peripheral activities. b) Supportive technology is more important for firms that do not outsource peripheral activities.
H2c: Firms that perform core activities in-house make use of specific innovation capabilities to a greater extent than firms that outsource core activities.	Positive association	Project management and evaluations capabilities are more important to firms that perform core activities in-house
	No association	Performing core assembly activities in-house is not associated with any innovation capabilities.
H3a: Firm size is associated with innovation performance and outsourcing	Positive association	Medium firms are higher innovation performers than small firms
H3b: Buyer preferences are associated with innovation performance	Positive association	<ul style="list-style-type: none"> a) Customer preferences (product variety and launching new products) are more important for product innovation active firms. b) Customer preferences (high quality, innovative designs, flexible production, launching new products and customisation) are more important to firms performing core assembly activities in-house
H3c: Buyer types are associated with innovation performance	No association	
RP _e : There is an optimal immediate production strategy	Positive association	Firms which outsource all three immediate production activities have lower product innovation scores than firms following other immediate product strategies.

37 Outsourcing and innovation in the UK furniture industry

This study tests assertions about the relationship between outsourcing and innovation. The fundamental premise is that firms will outsource business activities based on transaction cost and capability considerations (Pitelis and Pseiridis 1999; Jacobides and Winter 2005; McIvor 2009). Two related queries were investigated.

The first hypothesis (H1a) stated that firms which outsource peripheral activities (that is, activities which do not contribute to the value of a product appreciably) will experience greater innovation performance than firms which perform these activities in-house (Prahalad and Hamel 1990; Quinn 1999). Performance is expected to differ because firms that outsource peripheral functions will release labour and capital resources for new investment (e.g. innovation). Conversely, firms performing non-strategic function in-house will have less resource flexibility.

The second research proposition (H1b) states that firms which outsource core activities will devalue their current and potential stock of capabilities (Teece 1986; Chesbrough and Teece 1996; Brusoni, Prencipe and Pavitt 2001). The hollowing of capabilities can occur through a number of mechanisms including supplier opportunism and a loss of scanning capacity to keep abreast of new technological developments. The expected outcome is lower innovation performance in firms which outsource core activities than in firms which perform core activities in-house.

37.1 Outsourcing peripheral activities in the UK furniture industry

The test results for H1a found no association between the number of peripheral activities firms outsource and innovation performance (Table 80). This finding suggests that the resources released from outsourcing peripheral activities do not raise innovation performance to a measurable (significant) extent. The reason for outsourcing peripheral activities is to derive cost savings (Gilley and Rasheed 2000). Firms may consider the ability of the new suppliers to meet non financial performance measures but the financial benefits outweigh any risk of lost capacity to perform peripheral activities. There was no evidence - either from case interviews or from the survey - indicating that firms directed these savings towards upgrading innovation performance (negating a positive association).

Most peripheral activities are not linked directly to innovation goals. Administration, after-sales services, logistics and, to a lesser extent, distribution were classified as

peripheral activities. The capabilities associated with these activities are not considered part of the critical resource base used by furniture manufacturers to design products or improve production processes. Removing these functions and their resource assets from the organisation mix (by outsourcing) may not affect innovation performance. Storey also found no link between employment contracts and innovation goals (Storey, Quintas, Taylor and Fowle 2002). Peripheral activities and innovation are not associated.

37.2 Outsourcing core activities in the UK furniture industry

Outsourcing core activities, however, is associated with performance. The test results for H1b produced two positive outcomes (Figure 22). First, I tested if the number of core activities performed in-house or outsourced affected innovation performance. The test results indicated that those firms performing more core activities performed in-house have higher performance scores for process innovation. The second finding showed that the furniture manufacturers which undertake one specific activity in-house – namely, core assembly activities - are more successful at product innovation than firms which outsource this core activity. Both findings support the assertion that maintaining core activities is associated with greater innovation performance than firm firms which outsource core activities.

Figure 22. Relationships between outsourcing and innovation performance in UK furniture manufacturing

	PROCESS INNOVATION	PRODUCT INNOVATION
<i>In-house</i>	Firms with a greater number of core activities performed in-house are more active	Firms controlling core assembly activities are more successful
<i>Outsource</i>		

High innovation performers

Low innovation performers

The findings support Prencipe's assertion that strategic production should be retained to ensure continuous upgrading of technological capabilities (Prencipe 1997). Firms that outsource production will be disadvantaged. UK furniture manufacturers identified core activities to be, primarily, immediate production activities and marketing. Performing operational tasks in-house requires firms to maintain a high level of production knowledge. In order to meet changing customer demand (and to match or differentiate product offering from rivals), firms have to upgrade their operational and technology capabilities. Performing more core activities in-house should correspond to firms requiring greater operational management capabilities.

According to Wheelwright and Clark, firms increase their operational capabilities by adopting industry good practice (Wheelwright and Hayes 1985). Once industry good practices are reached, operations can contribute to the core resource base and influence the strategic direction (including innovation endeavours). Once at this high level, firms can emphasise strategic process innovation by anticipating and directing research and investment towards ground breaking process technologies (for instance). Operational functions at this high level can contribute to other business functions and support wider business objectives (Leong and Ward 1995). For example, advances in electronic on-line ticketing have influence sales and marketing activities in the airline industry with companies such as Southwest Airlines and Ryanair using operational prowess to drive sales (Slack, Chambers and Johnston 2010).

Removing core operational activities from the control of a company (by outsourcing) will diminish the contributions from operations towards process innovation and business strategy. For instance, incremental process innovation, which spans continuous improvement, total quality management (TQM) and other quality initiatives, builds on the close relationship between operational tasks and problem identification and problem solving (Bessant 1997). Process innovation is inherently a 'learning-by-doing' activity and entails participation from employees engaged with the explicit procedures and the unmodified routines of the job. This relationship between process innovation and core activities is captured in the H1b test results.

The second finding pertaining to core outsourcing reveals that those furniture manufacturers, which perform core assembly activities in-house, are more successful

at product innovation than firms which outsource (Table 80). The assembly activity is the primary manufacturing activity for many medium size furniture firms. Since the introduction of modularity and flat pack furniture designs in the 1980s, the assembly stage is increasingly important for firms to manage trade-offs in small and medium size batch orders (Spalding 2001 and Company Interviews). What Lampel and Mintzberg call, 'customized-standardization', furniture manufacturers make use of standard components which can be configured or customised within a pre-determined range at the assembly stage (Lampel and Mintzberg 1996). Design practices such as design for manufacturing also entails input from immediate production to transform designs for batch to mass production (Ulrich, Sartorius, Pearson and Jakiela 1993). Should furniture manufacturers not perform the assembly function, important design inputs will be lost.

The importance of the assembly function in furniture manufacturing is also supported by the test results of the exploratory research proposition (RPe). Of the six immediate production strategies, firms that outsource all three immediate production functions (pre-production, parts production and assembly), have lower product innovation performance compared to the other immediate product strategies. Firms pursuing four immediate production strategies (PS1, PS3, PS5 and PS7) control the assembly function in-house and reported higher product innovation performance than firms following strategy PS8 (in PS8, the assembly function is outsourced). The post-hoc tests reveal that firms performing pre-production and assembly in-house and outsource parts production (immediate productions strategy PS3) have significantly higher product innovation performances than firms which outsource all three production functions (immediate productions strategy PS8).

Therefore, the optimal production strategy for UK furniture manufacturers is a combination of vertical integration and outsourcing. Assembly is the one critical core activity which should remain under the firm's governance. This mixed governance strategy supports the findings reported in Chesbrough (Chesbrough and Teece 1996) and in Rothaermel (Rothaermel, Hitt and Jobe 2006).

37.3 Local production networks versus global production networks

Is the location of suppliers a factor in determining innovation performance? Analysis of the data suggests that firms engaging in local production networks secure greater

innovation performance than firms working in global networks. Overall, local manufacturers purchase immediate production inputs from local UK suppliers. This local outsourcing production strategy follows a modular production network found in the U.S. contract electronics industry (Sturgeon 2002; Plambeck and Taylor 2005). U.S. contract manufacturers bundle production activities and offered production services to OEMs. These contract manufacturers offer cost and quality advantages by producing large volumes and, by focusing solely on operation, logistical and distribution activities, can produce cumulative operational benefits (Ferdows and Demeyer 1990). Another advantage is the apparent cluster effect facilitated by labour flexibility and mobility, shared learning and a core capability situated in an accessible locale. Modular production networks and production sharing are strategies followed by some U.S. furniture manufacturers as the industry has widened outsourcing to include Mexican manufacturers (thus taking advantage of NAFTA) (Spalding 2001).

Evidence from Sturgeon suggests that local production sharing has had a positive impact on supplier upgrading in the US electronics industry (Sturgeon 2002). The long-term effects from modular production and contract manufacturing on innovation performance and supplier relationships are unclear however. Further analysis of the data from this survey suggests that firms performing in-house assembly activities have (significantly) higher product innovation performance than (a) firms which outsource locally or (b) firms which outsource to suppliers outside the UK.

To explore whether supplier location is significant, the location variable for core assembly is disaggregated into three locations: (i) perform in-house, (ii) UK suppliers and (iii) non-UK suppliers. In Table 81, supplier location is cross-tabulated with product innovation performance for those respondents which are product innovation active. The median scores show that product innovation performance is highest for firms performing core assembly in-house (Mdn = 2.79), followed by UK suppliers (Mdn = 2.50) and finally non UK suppliers (Mdn = 2.00).

Table 81. Location of core assembly activities and product innovation performance, descriptive statistics

Core strategy	N	Mean	Median	Std. Deviation
In-house	43	2.79	3.00	.600
UK suppliers	4	2.50	2.50	.577
Non UK suppliers	6	2.00	2.00	1.095

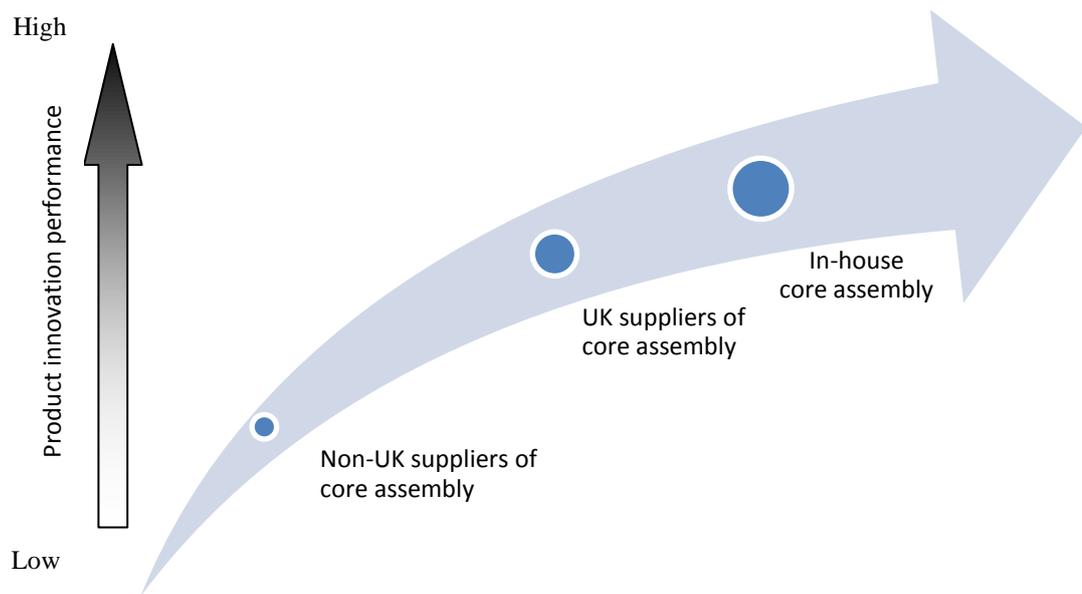
N=53

Supplementary tests (Kruskall Wallis non-parametric tests) are applied to the cross tabulated results for the three locations (in-house, UK suppliers and non-UK suppliers) and their product innovation performance. The test results are reported in Appendix 4. Only core assembly is tested in this exercise as this function indicated a significant relationship with product innovation (as per the findings for H1b). Product innovation performance is significantly different among supplier locations indicating a close relationship with the location of the core assembly function. Further post hoc tests reveal, however, no significant associations among the specific locations and product innovation¹⁷. Therefore, while there is a relationship between outsourcing location and product innovation in general, relationships between a specific location and higher performance are only indicative.

Figure 23 suggest a possible preference for governance and supplier location for furniture assembly activities. Firms managing assembly activities in-house are associated with higher product innovation, followed by firms which outsource to local suppliers. Firms that outsource assembly activities to non-UK suppliers are associated with low product innovation performances.

¹⁷ Firms which perform core assembly in-house would have a significantly higher product innovation score than firms which outsource to non UK suppliers if the Bonferonni correction is not applied.

Figure 23. Governance preference of the core assembly function for UK furniture manufacturing



37.4 Design and the extended boundary of the firm

Intuitively, outsourcing the product development function should have negative ramifications to product innovation performance. Product development in traditional industries such as furniture manufacturing takes the form of incremental change and favours new design, new features and aesthetic alterations (Von Tunzelmann and Acha 2005). Design is the predominant product development strategy for furniture firms rather than developing new technological architecture. New designs are introduced seasonally (e.g. garden furniture) or may be associated with wood types (e.g. Danish pine furniture) or brands based on an array of criteria (e.g. Tudor period reproduction furniture) (Company interviews).

As noted in Chapter 5, although design is often a core function, it is not necessarily embedded in furniture manufacturing operations (Company interviews). Firms can manufacture products based on their own designs but it is not uncommon for firms to engage professional designers. In addition, buyers such as IKEA will provide designs to manufacturers. Some firms will pursue different combinations of all three design sources.

Figure 24. Source of designs for UK furniture manufacturers

Manufacturers have embedded design capabilities
Manufacturers outsource or sub-contract the design activities to professional design houses
Buyers provide designs to manufacturers

Source: Company interviews

The case firms revealed that outsourcing design activities does not diminish product innovation performance (in their assessment). For example, purchasing designs from professional design houses is a strategic decision by furniture manufacturers to maintain an edge in new product designs. Whether the manufacturer designs the product or the designs come from outside, the manufacturer is in control of this process. The designs brought into the firm have to undergo a number of modifications (i.e. design for manufacturing) to ensure the product can be replicated during the production process. More importantly, manufacturers place orders to the outside designers and thus have control over the specifications, size, colour and other features. Firms include product development activities within their offerings if they (the manufacturers) control the design process (but not actually perform the design).

Buyers in the furniture industry often dictate the design specifications however. Large buyers will specify and even supply a design to manufacturers, which suggests that buyers, and not the manufacturers, have control of the design function in this situation. Interestingly, the firms interviewed for this study received designs from buyers and produced their own product designs. The test statistics (Chapter 7) did not reveal any association between design (product innovation) performance and design outsourcing. Furniture manufactures do not differentiate between the performance of own-designs, and receiving and adapting designs from design houses (suppliers) or from buyers. However, even if the new product development is outsourced, firms should still retain some technical knowledge to ensure that the designs are suitable for production and accepted by the market (Takeishi 2002).

38 Capabilities supporting innovation in the UK furniture industry

The discussion so far has focused on whether innovation performance is associated with outsourcing core or peripheral activities. This discussion has taken on a particular view of capabilities, that is, a level of competence is expected for firms to perform a given function. This investigation followed the definition of outsourcing proposed by Gilley which assumes that all firms have, within their reach, capabilities to perform the tasks surveyed (Gilley and Rasheed 2000). Firms have either (a) decided to maintain these capabilities if the activity is performed in-house or (b) decided to forego these capabilities if the activity is outsourced. The findings are limited to the impact which outsourcing may have on innovation; the study is not an inquiry into the affect which outsourcing may have on operational performance or operational competence.

The supporting capabilities directly applied to product innovation and process innovation by UK furniture manufacturers are identified in the test results of H2a (Table 80). The findings highlight the importance of a unique set of organisational routines and enablers, organisational networks and technology support. This inquiry is exploratory in that no specific capability is predicted to be more important than any other capability. However, I did expect higher or more successful innovation performers to make use of (at least one) capability to a greater extent than other firms. The tests revealed that high innovation performing firms do indeed make use of specific innovation capabilities to a greater extent than lower innovation performing firms. Higher innovation performance and the corresponding importance of unique capabilities are recorded for both product innovation and process innovation.

38.1 Successful product innovators

The study shows that (i) supportive technology, (ii) innovation strategies and (iii) project management are more important to successful product innovators than unsuccessful innovators in the UK furniture industry.

New product development (NPD) is an organisational process which entails three inter-linking stages. The first stage entails the managerial practices needed to capture the signals or signposts from external market place and the internally driven design, technological and scientific creativity that leads to new ideas (Rothwell 1992;

Rothwell 1994). The second stage - the development funnel – transforms the ideas and concepts of the first stage into a technically and marketable product (Wheelwright and Clark 1992). Development activities include engineering, testing, prototypes, market forecasting, design and production feedback. The final stage includes all the activities required for ramping-up for the market launch. Stages and activities can often overlap and may require input from different internal functions (and inputs from external sources) with a wide array of capabilities.

Successful product development activities occur either as an ad hoc activity, which is outside the formal business functions or as a designated function with its own structure (i.e. the design function). Whether infrequent or embedded, NPD can be managed under a project environment. Managing projects entail an effective employment of labour and other resources. Successful firms pay close attention to the composition and structure of the team and how the work is organised (Clark and Wheelwright 1992). Firms also make use of technology enablers, which facilitate communication between internal functions and between other organisations and accelerate the flow and improves the quality of information gathering activities.

Technology enablers

The use of computer aided design (CAD) and other technology aids in the development process can improve quality, lower costs and accelerate activities. These systems have advanced from electronic drafting boards in the 1980's to a fully integrated system in which all design, technical, supplier and marketing data can be shared electronically among functions and other organisations (Wheelwright and Clark 1992). Suppliers can now work with organisations on design specifications simultaneously. Linkage can be extended to customers, improving market response. For example, designing aircraft engines utilises an elaborate partnership between suppliers, project managers and customers (Rothwell 1994). These tools, if used effectively and if staff has been properly trained, can greatly improve the process.

Innovation strategy and leadership

Strategy is very important to firms striving for successful innovation (Tidd, Bessant and Pavitt 2005; Cooper 2008). Cooper's studies show that innovation strategy has to be aligned with the overall business strategy to avoid conflict and ineffective use of resources (Cooper 2008 p. 228). Control over staff, budgets and activities may

require approval or at least consultation from managers not directly part of the project. Senior management support in allocating resources should be accompanied by internal political support when changing routines, fast tracking activities and establishing links with other organisations (for instance, suppliers) (Gupta and Wileman 1990; Cooper and Kleinschmidt 1995). Key individuals not directly involved with the team can hold valuable information (Katz and Tushman 1981). This support may not be explicitly stated but, over time, project teams will recognise valuable resource people. In large firms, the champion may not always be at the grass-roots level of the project.

Project management

Effective planning is critical for all project but innovation projects require various degrees of freedom and control. Early, creative tasks performed by suppliers may require tighter contractual safeguards than later stages (Carson 2007). Prioritising activities and responsibilities, identifying problems early and establishing budget approval protocols can save time, money and improve the quality of the end result (Brown and Eisenhardt 1995). Stop/ go milestones or gateways should be built into the implementation stages: these mini-evaluations should follow strict guidelines to avoid delays (Cooper and Kleinschmidt 1995). Milestones include activity audits as well as financial opportunity costing. Identifying suppliers and customer linkages can also be directed at the planning stage. Finally, a post-project audit, reflecting on the experiences and learning from the project, should be planned for the end of the project (Wheelwright and Clark 1992; Leonard-Barton 1995).

Studies show that successful project teams consist of members from more than one function; ideally teams will include members from relevant functions that offer value to a new product (Lawrence and Lorsch 1986; Takeuchi and Nonaka 1986).

Functional diversity increases and deepens the information pool available to the team. Through this flexible organisational structure, projects allow specialists to handle technical tasks while shared activities can be approached from a wider perspective (Leonard-Barton, Bowen, Clark, Holloway and Wheelwright 1994).

Capabilities are also required to manage the involvement of suppliers in new product development projects. (Takeishi 2001). Problem finding and problem solving tasks are integral to innovation. Sobrero showed that performance outcomes can be

influenced by type of problem-solving activities outsourced and interdependency these tasks have with the rest of the project (Sobrero and Roberts 2001).

38.2 Successful process innovators

The second finding associated with innovation capabilities reveals that (i) supportive technology, (ii) innovation strategies, (iii) project management and (iv) external scanning are more important to successful process innovators than unsuccessful innovators in the UK furniture industry. Business quality programmes are synonymous with business process innovation and are embedded in operations management texts (for example, see Slack, 2010). Process improvement programmes include total quality management, continuous improvement and lean manufacturing and most programmes make use of similar quality techniques (for example, Pareto analysis, Ishikawa diagrams and six sigma). The emphases of the programmes can differ in their scope (incremental or radical change) or their approach to organisational culture (employee empowerment or top down). Unlike the product development process though - which has a set of definable stages - the literature, surprisingly, does not form a coherent narrative on a typical process innovation method. This lack of an integrated implementation approach is a contributing factor for the failure of many business process re-engineering (BPR) programmes (Al-Mashari, Irani and Zairi 2001).

Scanning

Similar capabilities were ranked highly by process innovators and product innovators (despite the different orientation) and include the use of technology enablers, innovation strategies and implementing project management practices. Only process innovators exhibited scanning capabilities. Innovation active firms demonstrate capabilities that allow them to learn from existing knowledge bases and capabilities to produce new knowledge (Cohen and Levinthal 1990; Zahra and George 2002). Absorptive capacity is a dual process that entails external scanning capabilities of new knowledge such as breakthrough technologies and the capabilities to internally integrate external knowledge (Arbussa and Coenders 2007). Moreover, scanning activities are occasionally open-ended with no pre-defined outcomes or objectives. For example, meetings with potential partners at business network events or scientific collaborators are non-commercial activities that may pay-off in the future. The benefits of these non-commercial activities are latent but often enable absorptive

capacity.

38.3 Innovation capabilities and outsourcing

In addition to the positive relationship between performing core activities in-house and innovation (H1b), firms that perform core activities in-house make use of specific innovation capabilities to a greater extent than firms that outsource core activities. Specifically, the study shows that implementation capabilities, such as project management and project evaluations and post project reviews, are more important to firms that perform a greater share of core activities in-house than in firms which outsource core activities (H2c in Table 80). This result complements the findings from Brusoni (Brusoni, Prencipe and Pavitt 2001) and Prencipe (Prencipe 1997). Both papers raised concerns about the loss of technology capabilities in firms outsourcing production. While these earlier studies studied complex technologies, I found similar results in a more traditional technology industry.

Although this inquiry did not reveal any association between outsourcing of peripheral activities and innovation performance (H1a), peripheral activities are associated with one specific innovation capability. Suppliers, which are engaged in innovation activities, are more important to firms that outsource a greater share of their peripheral activities (H2b in Table 80). Establishing supplier linkages can accelerate the development process (Gupta and Wileman 1990) and improve product quality (Clark and Fujimoto 1991). Activities can be scheduled in parallel if they are broken down and assigned to different organisations. Early involvement of suppliers can reduce the likelihood of potential problems, again reducing time. Closer supplier networks can also be a source of extensive knowledge exchanges (Leonard-Barton 1995). Nonetheless, innovation performance is not affected by a set of capabilities ranked more important by peripheral activity outsourcing.

Strategically, manufacturing capabilities ought to be upgraded over time which can change the future nature of trade-offs. This means that no one capability or manufacturing focus need be at the expense of another. To support this, firms need two kinds of learning process: i) *adaptive learning* in which they learn and continuously improve on their capabilities, and ii) *generative learning* in which firms learn to reframe and reconfigure their capabilities. This second order learning equates to dynamic capabilities, which are closely associated to the unique

technology path and routines and position bounded with each firm (Teece and Pisano 1994; Schroeder, Bates and Junttila 2002).

39 Customer-focus strategies and innovation

Agency can determine monopolistic and other firm behaviour through buyer and supplier concentration and the intensity of rivalry and substitution (Bain 1968). Buyers particularly can have influences on product and service scope and innovation performance. For example, Kaplinsky found that buyer types can support – and hinder – product and process innovation in furniture manufacturing (Kaplinsky, Morris and Readman 2002a). Agents and small firms are indifferent to supplier upgrading while large firms would often support process upgrading through training and even provide financial incentives. Large multi-store furniture buyers, though, send out mixed messages about product design with some firms accepting – and even seeking - products designed by manufacturers while other buyers insist on controlling the design process. This study did not find any evidence to support the assertion that buyer types are associated with either product or process innovation (H3c in Table 80).

The analysis did reveal that buyers influence innovation performance through their customer preferences and, therefore, strategy. Skinner reminded practitioners (and academics) that manufacturing should be aligned with overall corporate objectives with fulfilling customer demand and preference a strategic priority (Skinner 1969). Berry advanced the alignment of operations and strategy and introduced a framework to interpret customer preference for effective operation strategy (Berry, Hill and Klompmaker 1995). Firms could use ‘order winner’ and ‘order qualifier’ criterion to inform the application of appropriate process types and layouts (Slack, Chambers and Johnston 2010). This suggests that customer preferences are an indicator of business strategy.

Customer preferences are associated with product innovation and with core assembly activities in the UK furniture industry ((H3b in Table 80). Specifically, the study shows that:

- i. customers of product innovation active firms prefer greater *product variety* and the *availability of new products* to a greater extent than inactive firms;
- ii. customer of firms which perform core assembly activities in-house prefer

high quality, innovative designs, flexible production, launching new products and customisation to a greater extent than firms that outsource.

The findings illuminate two insights into the relationship between strategy and innovation performance. The first characteristic recognises that customer interfaces are crucial to pick up and relay market signals. The second element suggests that specific strategies can direct the nature and scope of immediate product designs.

39.1 Buyer channels and signals

How do firms determine which preferences to prioritise? Responsive strategies are based on an informed view of the industry and the challenge for firms is to find an appropriate scanning and evaluation method which can both reflect the demands of the market place and relay appropriate process information to the firm. A viable information source about changing preferences, new developments in the market place, including a competitive analysis, are customers. Customers can also present their product requirements in terms of value criteria which can be translated into a corporate and manufacturing strategy (Berry, Hill and Klompmaker 1995). Buyers take on the role of a strategy signaller. These signals can be transactional by means of describing narrow purchasing specification, transactional relationships such as technical staff interactions for purchases and strategic which explore issues outside immediate purchasing decisions. Examples of strategic mechanisms include customer surveys, focus groups and network dialogues. Explicit strategic signalling contributes to the development of market-based relationship resources (Srivastava, Fahey and Christensen 2001).

Besides capabilities in process technology, product architecture organisational structures, customer strategies entail buyer interaction or customer channels. Component architecture, particularly modularity, facilitates supplier production sharing. Modularity has enabled the inclusion of suppliers in customer oriented strategies such as mass customisation (Ro, Liker and Fixson 2007). The findings show that customisation is a very important customer preference among product innovative active UK furniture manufactures and by firms that held on to core assembly activities.

Buyer channels enable the flow of immediate buyer preferences (value criteria). Not all channels communicate strategic intent though. Firms have to step outside

transactional activities to pass along these high-level messages. Cultivating buyer relations can benefit firms in this regard. Such relations assist firms in other ways as well. Buyers have access to information to the competitive environment and they have access to end-user and distribution channels, important to SMEs limited by their own sales and marketing capacity (Srivastava, Fahey and Christensen 2001).

The findings suggest that high product innovators in the UK furniture industry are attuned to buyers. The criteria, which are significantly more important, inform furniture manufacturers on product design specifications. Buyers in a buyer-driven value chains such as the furniture value chain hold the obvious but critical role of value criteria generator (Kaplinsky, Morris and Readman 2002a). Firms transform these criteria into a strategy and align their internal resources and capabilities accordingly (Figure 25).

39.2 Responsive innovation

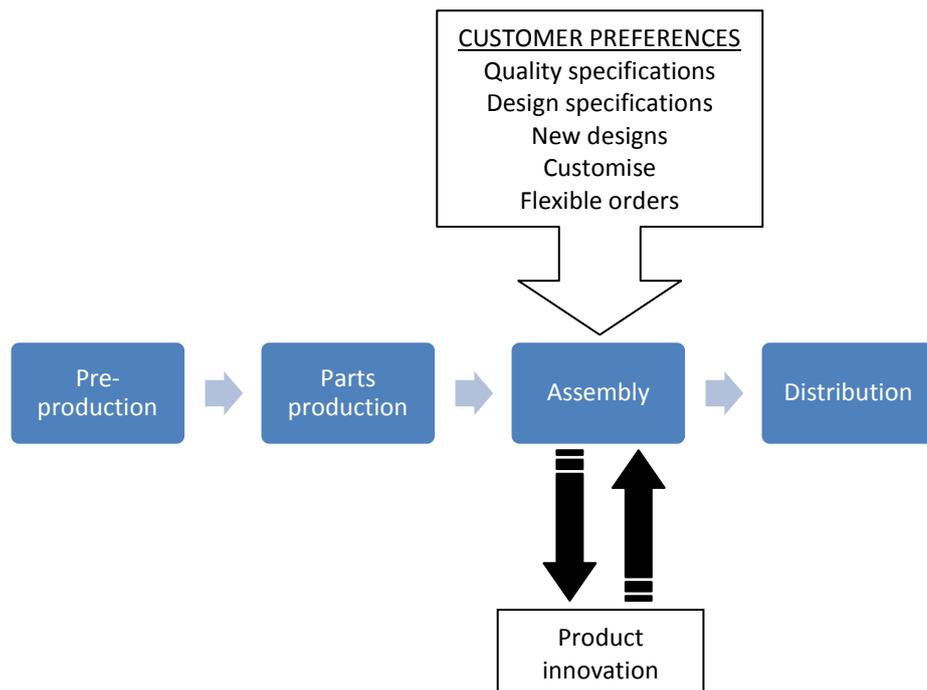
Central to an effective manufacturing strategy is the ability to frame and shape organisations around demand. Demand is measured not only by volume orders but also by differentiation factors which particular market segments find valuable. This places a premium on manufacturing strategy, both in terms of being able to frame these challenges and also to develop and deploy an increasingly wide range of capabilities and to reconfigure them in an agile fashion. Customer preferences are an example of one type of strategy manifestation: preferences inform the nature and scope of a strategy and firms configure their production processes and supply chains to meet this customer demand (Skinner 1974).

The findings show that customers with high preference for product variety and new product launches inform UK furniture innovators. These product innovation strategies suggests that the trade-offs involved in any one strategy are not so great: indeed, firms often follow more than one strategy for a single product. Agile manufacturing proponents suggest that firms can respond to variances in volume or different products, for example, without foregoing benefits of costs, quality or on-time delivery of mass production (Duguay, Landry and Pasin 1997). Agile enablers such as multi-skilled people, flexible processes and technology, organisational structures and external scanning capabilities facilitate a timely and appropriate response (Bessant, Francis, Meredith, Kaplinsky and Brown 2001).

The development of core manufacturing capabilities is time and resource dependent. Firms have to invest in process innovation and learning to acquire good practice capabilities and, increasingly, to advance operations into a strategic resource (Wheelwright and Hayes 1985). Capabilities, which support manufacturing advantages are cumulative and high performance in one priority can lead to high performance in other priorities (Schonberger 1986). For example, capabilities can be developed to effect improvements in quality, delivery, flexibility and finally cost either in a sand cone sequence (Ferdows and Demeyer 1990) or through a flexible capability platform which can focus on any one element (Collins, Cordon and Julien 1998). At the level of good practice, manufacturing strategies should respond to competitive pressures and – increasingly – changing customer preferences. Once operational capabilities become strategic assets, then manufacturing strategy can lead strategy.

Hollowing out operation capacity by outsourcing core activities would cause havoc not only on the cumulative advantages enjoyed by operations but also, so it seems from this study, innovation performance. Firms that cannot meet customer preferences through internal operations will have to rely on their supply base. The control of core activities such as the assembly function is critical to respond effectively to customer preferences through product innovation as noted in Section 37.2. Figure 25 depicts furniture product innovators absorbing customer preference signals at the assembly stage with a customer interface established to take in design specifications, alterations and bespoke design and volume orders. However, buyers will only identify a narrow band of value criteria, which correspond to existing production processes and product offering. Customer preferences are a useful mechanism for current and incremental innovation activities (such as seasonal design changes) but are not especially useful for more radical product development.

Figure 25. Customer-focus strategies and product innovation in UK furniture manufacturing



40 Firm size and innovation in the UK furniture industry

The question whether innovation is associated with firm size has a long pedigree. Schumpeter speculated that innovation in SMEs varied across industries and sectors and performance would also depend on the stage of industry development (Schumpeter 1934). The evidence that firm size is a contributing factor to innovation performance is mixed and often inconclusive (Cohen, Levin and Mowery 1987). On one hand, large firms are resource-rich and can develop capabilities in all facets of the innovation process most notably ramping up for product launches. On the other hand, large bureaucratic M-form firms can hinder entrepreneurial activity and discourage novel initiative. Moreover, large technology firms are often bounded by technological trajectories which can limit developments outside a narrow and deterministic path (Dosi 1993).

Small firms, especially those firms not locked into an older technological path dependency, are seen to be flexible and innovative (Rothwell 1992; Rothwell and Dodgson 1993).. However, Narula has shown that large firms have advantages through collaborations and managing multi-technology complexity which SMEs do not have (Narula 2004). Size may continue to influence the innovation patterns of

particular industries or firms with unique technology bases.

Firm size is defined by the number of employees and the demarcation of the different categories is arbitrary. Small firms include sole proprietors (zero to one employee) and micro size firms (one to nine employees) and other small firms (10 to 49 employees) while the employee band for medium size firms is 50 to 249 employees. It is common to conflate the categories of small and medium size firms into one category (i.e. SMEs). The SME classification is used by policy makers and academics to portray firms which have limited resources (for example, Rothwell 1992). However, the larger of the medium size firms can demonstrate organisational structures and behaviour characteristics similar to that of large firms (over 250 employees). This study retained the three size classification for convenience and the test results are not tied to a primary research proposition.

The study shows that firm size is associated with innovation performance. Specifically, the tests show that medium size firms are associated with higher innovation performance than small firms (H3a in Table 80). Higher performance is noted for both product and process innovation. One reason for this finding could be an inadequate survey sample. Small firms (micro and other small firms) make up 94% of the all firms in the UK furniture industry compared to 67% of survey respondents which are small firms. Small firms are underrepresented in this study – although, as noted in Chapter 5, firms which sell in the mass market tend to be medium and large firms.

Three supplementary tests are performed to offer an (partial) explanation why firm size is associated with innovation. Significance tests are carried out to ascertain if there are any associations between the following:

- i. firm size and business functions;
- ii. firm size and innovation capabilities and
- iii. firm size and customer preferences.

First, firm size could indicate a unique resource configuration. This would suggest that firm size categories (small, medium or large) are associated with a unique blend of business functions which could explain different innovation performances. Alas, supplementary tests did not find any correspondence between firm size and business

functions (Appendix 2).

Second, firm size could be associated with specific innovation capabilities. A positive association could provide an insight into innovation performance especially should the same size category which tested for higher innovation performance (i.e. medium size firms) also indicate a greater proficiency towards specific capabilities. The supplementary test results indicate a significant association between firm size and (a) innovation capabilities used for product innovation and (b) innovation capabilities used for process innovation (Appendix 2). Furthermore, these tests compliment the results of H3 which show medium size firms have higher innovation performance than small firms. The specific capabilities ranked more important by medium size firms include the following:

- i. for product innovation – medium size firms make use of research institutes to a greater extent than small firms;
- ii. for process innovation – medium size firms make use of implementation practices to a greater extent than small firms and large firms. Additionally, medium size firms make use of technology enablers to a greater extent than small firms.

One possible explanation for the different performance results is that medium size firms use a unique set of (innovation) capabilities to a greater extent than small firms. The furniture research institute (FIRA) in the UK is significantly important to medium size firms in product development initiatives (Readman, Bessant and Neely 2009). FIRA provides testing facilities and problem solving consultancy and the use this bridging institute suggests strong outward facing absorptive capacity. Small firms are disadvantaged compared to medium size and larger firms when collaborating with external institutions (Narula 2004). For process innovation, medium size firms show superior appreciation of internal implementation practices and the use of technology enablers.

The third set of tests reveals that firm size is associated with customer preferences. Supplementary tests indicate that large firms are associated with buyers requiring low prices and buyers preferring brand name products to a greater extent than small firms (Appendix 2). However, the relationship between customer preferences and large firms does not explain why medium size firms outperform small firms in

innovation activities.

41 Contributions to the outsourcing discourse

This study investigated two complimentary, but different, perspectives of outsourcing. First, scholars claimed that outsourcing peripheral activities will have a positive impact on innovation performance (Prahalad and Hamel 1990; Quinn 1999). Firms outsource non-core activities if the cost of managing the transaction is lower than difference between the cost of producing in-house and the supplier cost (and if there is no perceived threat of opportunism). Innovation performance can be increased once resources are released performing peripheral activities and these resources could be assigned to upgrading core or strategic activities. This study found no evidence to support any claims that outsourcing peripheral activities will have a positive impact on innovation performance.

In the second outlook, the decision to outsource core activities has a negative association with innovation performance. Why would firms outsource core activities if the logic of transaction costs and capability suggest otherwise? Firms may have applied an incorrect calculus when selecting which activities are core or peripheral. As McIvor notes, emphasising either a transaction costs objective or resource-based objective at the expense of the other may deliver unclear or unintended outcomes (McIvor 2009). Even when firms consider transaction costs and capabilities together, innovation performance may not have been an objective. Storey also noted low innovation priorities when firms engage temporary employment (Storey, Quintas, Taylor and Fowle 2002).

For example, furniture manufacturers measure the performance of core operations activities (pre-production, component manufacturing and assembly) using key measures such as quality, dependability, speed, flexibility and costs (Slack, Chambers and Johnston 2010). The capability to improve these functions – in other words, process innovation – is not on this list of performance measures. Transaction costs and capabilities can illuminate costs and current operational competences but does not consider the extent of innovation capacity unless it is explicitly stated. Innovation performance should be included in the deliberation to outsource activities –that is if firms deem innovation relevant and important.

Innovation performance in the UK furniture industry is closely associated to both a resource-based and market-based perspectives. Holding onto core business activities essentially means firms retain key operational competences. In the case of the UK furniture industry, controlling the core operational functions is also associated with higher innovation capacity. However, it is the interface with customers which may hold the key for product innovation. Successful innovators demonstrate competences to receive external signals from buyers and translate these messages into their design process. Customer-focus strategies connect market-based pressures and demands with the firm's resource-based assets and capabilities. This dynamic exchange between signal capturing and operations will rupture if capabilities are downgraded with innovation performance suffering the consequences.

42 Further gaps in the knowledge base

Social organisation theory building is an inductive process and a number of issues have emerged from this study which could be extended. Future research is proposed in three related areas: advancement of outsourcing practices, enablers and inhibitors to innovation and theory development. Issues pertaining to the research methods were discussed on Chapter 4.

42.1 Management practices in outsourcing

Management practices would be formulate through additional case studies. This study followed a mixed research mode and the sequential approach could be complimented by returning to the original case firms. For instance, the findings and the supporting analysis are limited to the factors raised in the survey. The survey findings could be explored in detail through further case study investigations. Related to more case study work, future research could apply this framework and update the UK furniture industry analysis. This analysis will provide a deeper longitudinal picture of changes in this traditional industry.

Second, this investigation only explored a number of possible factors that may have an association with innovation performance. Other outcomes could be measured in addition to innovation performance such as financial performance. A hierarchy could be introduced which could demonstrate cumulative outcomes and complexity.

42.2 Enablers and inhibitors to innovation

The discussion on innovation enablers should be expanded. The advent of new collaborative organisational structures in the creative industries, for example, suggests that organisational behaviour enablers play a critical role in innovative activities. Further work would also open up various technology enablers and guides such as communication tools (e.g. the role of social media) and automated design software.

In addition to extending the list of possible enablers to innovation, further research would highlight the obstacles firms come across when exploring innovation. This study's questionnaire did have an option for respondents to indicate if the highlighted innovation capabilities had enabled or hindered innovation. However, respondents did not reveal any of the capabilities to have a negative influence on innovation. This finding could be partly due to survey design fault. Further work should identify the inhibitors to innovation through a separate exercise.

42.3 Theory building by extending the research methodology across industries, sectors and countries

Finally, the outsourcing and innovation framework and the complimentary methodology developed in this study could be applied to different industries and sectors in the UK. The application of the research programme across countries and regions would be applicable and would provide a deeper understanding of national and sectoral innovation systems. This rich economic database would offer opportunities to policy makers and academia for a multitude of inquiries. This enterprise would also contribute to the on-going inductive theory building quest as the assumptions and relationships between outsourcing and innovation could be meticulously tested.

43 Conclusion - decision-making and unintended outcomes

This investigation follows a post-positivist methodological approach in which the research follows a structured protocol and hypotheses are tested using tried and tested statistical formulas. The process, while recognising the existence of multi-complex relationships, is rooted in cause and effect parameters. Single factor relationships were measured. These linear relationships consider one factor leading to a particular outcome. The results show that the outsourcing decisions taken by

UK furniture manufacturers from 2005 to 2006 affect innovation performance.

The UK furniture industry has faced turbulent times since the survey (2005). The local consumer market for household furniture fell by 46% from £8,658 million in 2007 to £4,676 million in 2011 (Key Note 2012). Two of the UK's largest multi-store retailers, both of whom contributed formally and informally to the study, are no longer trading. Courts Plc. was beset with problems and went into administration in 2004, due to their Caribbean supply base being decimated by hurricanes (Wallop 2004). The economic downturn and the accompanying unavailable short term credit led MFI to file for administration in 2008 (The Financial Times 2008). The number of UK VAT or PAYE registered furniture manufacturers declined by 10 per cent from 2004 to 2011(ONS 2011b). The number of UK manufacturers producing for the mass market decreased at a greater rate (Source: BFM).

The remaining manufacturers continue to change their strategic mix of activities. It is instructive to return to the case companies which informed this study. In 2008-09, Company A restructured after a management buy-out. The company shed most of its parts and component production and assembly activities. For the first few years after the buy-out, low-wage country producers manufactured the furniture parts while a local UK supplier managed pre-production and assembly activities. Product design specialists continued to provide new product designs while Company A maintained the finishing activities unique to reproduction furniture. Since 2009, low-wage country producers manage all pre- production, the manufacturer of parts and components and product assembly. (Source: Company A email, 2009).

Company C had moved into the 'indoor and outdoor' market segment in 2008. Furniture produced for this market can be used inside the house and for gardens/ patios. During this time, a new factory was established in the Philippines. In 2010, the Ghana entity sold their shares in the company and a new principal owner from Bolivia took over. Company C's primary wooden furniture ranges are now manufactured in Bolivia. Woven furniture, using traditional hand-made weaving techniques, is manufactured in the Philippines. The company no longer sources large volumes of Ghanaian produced furniture parts or complete items. (Source: Company C email 2009 and website).

The decision of one or even several firms to outsource and focus on key activities may bring about positive outcomes. Firms can achieve higher financial performance by focusing on brand names and marketing (Kaplinsky, Morris and Readman 2002b). Nevertheless, as this survey revealed, firms that relinquish control of operations are in danger of undermining innovation performance.

Decision-making is often depicted as a rational process. Decisions are based on informed views, partly drawn from past events. For example, planning weekly demand scheduling use simple forecasting techniques, which are informed by past events. Sophisticated forecasting techniques are used if demand is uneven, cyclical or seasonal. Uncertainty remains but informed decision makers look to other information sources. Outsourcing decisions however entail uncertainty and risks. Firms are faced with choices and outcomes which are not so apparent. Limited information and the capability of managers to get hold of and digest of the available information informs managerial decisions (Taylor, Hyman, Mulvey and Bain 2002).

The expected value arising from outsourcing and the experience (or outcome) do not always coincide (Fontana, Geuna and Matt 2006). Outsourcing decisions are based on asymmetric information and the reliability of future predictions will vary among firms. Moreover, firms will evaluate the risks and uncertainties associated with the unknowns differently. The evidence from this study shows that the unintended outcome of outsourcing is a relative fall in innovation performance. Unforeseen events, such as the 2008 economic recession, can cause havoc to entire industries.

The factors underpinning the decisions to perform internally or outsource come down to costs and capabilities. The logic of the transaction cost framework often overwhelms capability factors as the desirable outcomes are measured by the cost advantages (Williamson and Masten 1995). While providing an invaluable framework, transaction cost analysis also has a normative worldview by prescribing appropriate market and hierarchy typologies. All decision are formulated to either engage in market activities or keep activities in-house (Ghoshal and Moran 1996). While some firms may maintain control of operations if their capabilities are equal to or superior to those of suppliers, cost factors are dominate most strategy conversations. Outsourcing has contributed to the hollowing of firm competences, and specifically, innovation performance in UK furniture manufacturing.

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Appendix 1. Interview participants for Research Method 1

1. DTI Competitive Steering Group

Members of the competitiveness steering group

Jackie Bazeley	Furniture, Furnishings and Interiors National Training Organisation	FFINTO
Peter Beele	Furniture Industry Research Association	FIRA
Peter Bridgman	P J Bridgman & Co. Ltd	MANUFACTURER / LOFA
Mike Clare	Dreams Plc	RETAILER
David Clark	British Shops and Stores Association Limited	bssa
Josephine Collins	Furniture Manufacturer	JOURNAL
Hayden Davies	Furniture Industry Research Association	FIRA
Phil Davies	CFTA Section - GMB	UNION
Steve Egan	Contour Mobel Ltd - Christie Tyler	MANUFACTURER
Pat Fawson	MFI Furniture Centres	RETAILER
Simon Gilbert	Wood Bros. Furniture Ltd	MANUFACTURER
David Hawkrigde	Mobeltest - Christie Tyler	MANUFACTURER
Graham Hayden	The Kitchen Specialists Association	KSA
David Jevons	British Thornton ESF Ltd	MANUFACTURER/BESA
Andrew Kidd	Cabinet Maker	JOURNAL
Ray Leigh	Worshipful Company of Furniture Makers (WCFM)	LIVERY COMPANY
Martyn Lincoln	British Contract Furnishing Association	BCFA
Roger Mason	British Furniture Manufacturers	BFM
Donald McGregor	GMB	UNION
Rodney McMahon	Morgan Contract Furniture PLC	BCFA / WCFM
Michael Morgan	Qualitas	QUALITAS
Mike Powell	Julius Blum UK Ltd	SUPPLIER / ASFI

2. Expert interviews

Mr. Roger Mason, BFI

Dr. Peter Beele, FIRA

3. Company interviews

Mr. Borge Leth, Alexander Rose

Mr. Martin Petry, Bevan Funnel

Ms. Jo Sue Shephard, Courts Plc

Charles Jacobs, Jacobs Furniture

Mr. Pat Fallon, MFI

Ms. Jackie Smith, Wyevale

Anonymous, Tetrad

Appendix 2. Research Method II Survey Instrument

The Innovativeness of the UK Furniture Industry

The objective of this survey is to find out how UK furniture companies innovate and your participation would be greatly appreciated. This questionnaire will take 15 minutes to complete. Please return the completed questionnaire using the SAE. If you have any questions or comments please contact:

Jeff Readman
 CENTRIM, The Freeman Centre, University of Brighton, Falmer, Brighton BN1
 9QE
 E-mail: j.a.readman@bton.ac.uk/ Tel: (01273) 877 962

Both sides of the page are used.

ALL INFORMATION THAT YOU PROVIDE WILL BE CONFIDENTIAL. A report detailing the results will be sent to you once the analysis is completed.

Please refer to the UK business you work at when answering the following questions.

SECTION A: COMPANY ACTIVITIES

1. What products and services are produced by your company and to what extent do these products and services contribute to your turnover? Please tick one box for each product and service.

	VERY SIGNIFICANT	SIGNIFICANT CONTRIBUTION	SOME EXTENT	TO A LESS EXTENT	DO NOT PRODUCE
Wooden office furniture	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Wooden kitchen furniture	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Wooden bedroom furniture	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Wooden furniture for dining / living rooms	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Wooden furniture for shops	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other wooden furniture	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Wooden furniture parts or components	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other <u>non-wooden</u> furniture	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Services to furniture manufacturers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Distribution / agent / importer	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Retail or selling direct to end-user	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Services to distributors or retailers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

2 a) Have you moved into a new business (different from the furniture industry) since 2001?

Yes No

2 b) If you have moved into a new business, please describe the new venture.

3. Furniture production and other activities contribute to the final cost incurred by the end-user or consumer of your product. We assume that overheads and margins are included in these activities.

In your estimation – and even if it is something your company does not do itself – what is the contribution of the following activities to the final cost? Please rank the following with 10 representing the highest cost and 1 representing the lowest cost.

	LOWEST COST					HIGHEST COST				
	1	2	3	4	5	6	7	8	9	10
Pre-production (raw materials, panels, etc.)	<input type="checkbox"/>									
Product design	<input type="checkbox"/>									
Inbound logistics	<input type="checkbox"/>									
Component and part production	<input type="checkbox"/>									
Product assembly	<input type="checkbox"/>									
Administration e.g. finance, HR	<input type="checkbox"/>									
Marketing and sales	<input type="checkbox"/>									
After-sales support	<input type="checkbox"/>									
Product distribution / agent/ import/ export charge	<input type="checkbox"/>									
Retail or selling to end-user	<input type="checkbox"/>									

4. Which activities do you perform in-house and which activities do you buy-in or outsource to UK suppliers, other EU and North American suppliers and low-wage country suppliers? Please tick all that apply for each activity.

	PERFORM IN-HOUSE	OUTSOURCE ALL OR PARTS TO UK FIRMS	OUTSOURCE ALL OR PARTS TO EU OR N. AMERICAN FIRMS	OUTSOURCE ALL OR PARTS TO LOW WAGE FIRMS
Pre-production activities	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Product design	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Inbound logistics	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Components and parts production	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Product assembly	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Administration	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Marketing and sales	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
After-sales support	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Product distribution	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Retail	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

5. What motivated you to outsource some or all of your activities? Please tick all that apply. If you do not outsource, please go to Q. 6.

- | | |
|----------------------------------------------------------------------------------|-------------------------------------------------------------------------|
| <input type="checkbox"/> Pressure to lower cost base of non-strategic activities | <input type="checkbox"/> Suppliers can deliver faster |
| <input type="checkbox"/> Suppliers can produce it cheaper than we can | <input type="checkbox"/> Suppliers can deliver on-time constantly |
| <input type="checkbox"/> Suppliers can provide equal or higher quality | <input type="checkbox"/> Suppliers are more technically capable than us |
| <input type="checkbox"/> Suppliers are more innovative | |

6. If you do not outsource, what are the reasons? Please tick all that apply.

- | | |
|---------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| <input type="checkbox"/> Suppliers cannot produce the product any cheaper | <input type="checkbox"/> Suppliers cannot provide flexible volume services |
| <input type="checkbox"/> Suppliers cannot provide a quality product | <input type="checkbox"/> Supplier cannot build-to-order |
| <input type="checkbox"/> Suppliers cannot deliver any faster than us | <input type="checkbox"/> Suppliers are not innovative or cannot provide new products |
| <input type="checkbox"/> Suppliers cannot deliver on- time | <input type="checkbox"/> We want to control strategic activities |

SECTION B: INNOVATIVE ACTIVITIES

7. Have you moved into or tried to move into any new activities related to the furniture industry since 2001? Please tick one box for each activity.

	PERFORMED BEFORE 2001	NEW SINCE 2001	ON-GOING (UNFINISHED)	TRIED BUT FAILED TO MOVE INTO THIS AREA	DO NOT PERFORM or N/A
Pre-production activities	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Product design	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Inbound logistics	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Components and parts production	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Product assembly	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Administration	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Marketing and sales	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
After-sales support	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Product distribution	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Retail	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

8. If you have moved into new activities related to the furniture industry since 2001, which of the following contributed to this change? Please tick one box for each factor. If you have not moved into any new activities please go to Q. 9.

	CRITICAL INPUT	LARGE EXTENT	TO SOME EXTENT	MINIMAL INPUT	NO INPUT	DO NOT KNOW
YOUR OWN CAPABILITIES						
Skilled employees, problem solving capabilities, etc.	<input type="checkbox"/>					
Management, leadership, idea champion	<input type="checkbox"/>					
Technology e.g. CAD, CAM, Information Systems, etc.	<input type="checkbox"/>					
Innovation strategies	<input type="checkbox"/>					
Implementation e.g. project management, team work, etc.	<input type="checkbox"/>					
External scanning e.g. benchmarking, forecasting, etc.	<input type="checkbox"/>					
Reviews, evaluations, measuring, other learning	<input type="checkbox"/>					
OTHER SOURCES						
Parent company/ subsidiary	<input type="checkbox"/>					
Competitors	<input type="checkbox"/>					
Retailers/ buyers	<input type="checkbox"/>					
Consultancy	<input type="checkbox"/>					
Suppliers	<input type="checkbox"/>					
Mergers and acquisitions	<input type="checkbox"/>					
Universities/ technical colleges	<input type="checkbox"/>					
Research institutes (e.g. FIRA)	<input type="checkbox"/>					

9. If you wanted to move into new activities and failed or found the exercise difficult, which of the following represent constraints, and to what extent? Please tick one box for each factor.

	NO BLOCKAGE	MINIMAL BLOCKAGE	TO SOME EXTENT	SIGNIFICANT BLOCKAGE	VERY SIGNIFICANT	DO NOT KNOW
Technical know-how, e.g. engineering / design	<input type="checkbox"/>					
Marketing and sales capabilities	<input type="checkbox"/>					
Availability of skilled labour	<input type="checkbox"/>					
Your company's culture	<input type="checkbox"/>					
Your parent company	<input type="checkbox"/>					
You do not have satisfactory suppliers	<input type="checkbox"/>					
You do not want to antagonise key suppliers	<input type="checkbox"/>					
Customers are not supportive	<input type="checkbox"/>					
Access to financial resources	<input type="checkbox"/>					
Availability of natural resources	<input type="checkbox"/>					

10. Has your company undertaken any new products (new designs) or process initiatives (lean, CI, etc.) related to your most important product or service since 2001? How innovative would you rate these initiatives? Please tick one box for each innovation type.

	NEW TO THE INDUSTRY	NEW TO OUR FIRM	ON-GOING (UNFINISHED)	TRIED BUT FAILED	NO ACTIVITY
<i>New products</i> (different from previously designed and produced)	<input type="checkbox"/>				
<i>Process innovation</i> (the adoption of new/ improved production methods)	<input type="checkbox"/>				

11. Which of the following contributed to or constrained your most innovative initiative?
Please tick one box for each factor.

	CRITICAL INPUT	LARGE EXTENT	TO SOME EXTENT	MINIMAL INPUT	NO INPUT
YOUR OWN CAPABILITIES					
Skilled employees, problem solving capabilities, etc.	<input type="checkbox"/>				
Management, leadership, idea champion	<input type="checkbox"/>				
Technology e.g. CAD, CAM, Information Systems, etc.	<input type="checkbox"/>				
Innovation strategies	<input type="checkbox"/>				
Implementation e.g. project management, team work, etc.	<input type="checkbox"/>				
External scanning e.g. benchmarking, forecasting, etc.	<input type="checkbox"/>				
Reviews, evaluations, measuring, other learning	<input type="checkbox"/>				
OTHER SOURCES					
Parent company/ subsidiary	<input type="checkbox"/>				
Competitors	<input type="checkbox"/>				
Retailers/ buyers	<input type="checkbox"/>				
Consultancy	<input type="checkbox"/>				
Suppliers	<input type="checkbox"/>				
Mergers and acquisitions	<input type="checkbox"/>				
Universities/ technical colleges	<input type="checkbox"/>				
Research institutes (e.g. FIRA)	<input type="checkbox"/>				

SECTION C: WHAT DO CUSTOMERS WANT?

12. Companies can sell directly to distributors and import/export agents, to single and multi-store retailers and to end-users (consumers, architects, government offices, etc.). What share of your turnover is attributed to the following customer types? Please tick one box for each type.

	76% -100% OF TURNOVER	51%-75% OF TURNOVER	26%-50% OF TURNOVER	1%-25% OF TURNOVER	NOT AT ALL
Sell directly to end-users/ consumers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Multi-store retailers/ large chains	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Single store retailers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Distributors/ agents / importers/ exporters	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

13. Customers want different things when looking for products and services. How important are the following factors to your most important customers (based on share of turnover)? Please tick one box for each factor.

	CRITICAL WILL WIN AN ORDER	VERY IMPORTANT COULD WIN AN ORDER	IMPORTANT QUALIFYING THRESHOLD	IMPORTANT TO SOME EXTENT	NOT IMPORTANT
Lowest price	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
High quality	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Fast delivery	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
On-time delivery	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Innovative designs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Product variety / range of products	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Flexible production volume	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Bringing out new products	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Customisation (build to order)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Services linked with products	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Associated with a brand-name	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Product/ service warranty	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Meeting social/ labour/ environmental standards	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sell directly to end-users	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

SECTION D: COMPETITION

14. Is the rivalry with competitors located in different regions significant today? Was this rivalry significant in 2001? Please tick one box for each year.

	SIGNIFICANT TODAY		SIGNIFICANT IN 2001	
	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Competitors within the UK	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Competitors from other EU countries	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Competitors from Central and Eastern Europe	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Competitors from North America	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Competitors from Latin America and the Caribbean	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Competitors from China	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Competitors from other Asian countries (excluding China)	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Yes	<input type="checkbox"/> No

15. How do your most significant rivals compete against your most important product or service today? Please tick one box for each strategy type.

	VERY SIGNIFICANT	SIGNIFICANT STRATEGY	SIGNIFICANT TO SOME EXTENT	OCCASIONAL STRATEGY	NOT SIGNIFICANT	DO NOT KNOW
Lower prices	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Higher quality	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Faster delivery	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
On-time delivery	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Innovative designs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Product variety / range of products	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Flexible production volume	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Bringing out new products	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Customisation (build to order)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Services linked with products	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Respected brand-name	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Product/ service warranty	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Promotion of social/ labour/ environmental standards	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sells direct to end-users	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

SECTION E: MARKET POSITION

16. What share of your turnover is attributed to the following markets?

	76% -100% OF TURNOVER	51%-75% OF TURNOVER	26%-50% OF TURNOVER	1%-25% OF TURNOVER	DO NOT SELL IN THIS MARKET
UK market	<input type="checkbox"/>				
Other EU markets	<input type="checkbox"/>				
N. American markets	<input type="checkbox"/>				
Other international markets	<input type="checkbox"/>				

17. In your opinion, has the market share for your most important product or service changed since 2001? Please tick one box for each market.

	MARKET SHARE INCREASED	MARKET SHARE STAYED THE SAME	MARKET SHARE DECREASED	DO NOT SELL IN THIS MARKET
UK market	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other EU markets	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
N. American markets	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other international markets	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

18. Has the price you can charge for your most important product or service changed since 2001, and, if it has, by how much? Please tick one box for each market.

	I CHARGE MORE TODAY THAN 2001		PRICE IS THE SAME AS 2001	I HAVE HAD TO DROP MY PRICES SINCE 2001		DO NOT SELL IN THIS MARKET
	Increased by more than 10%	Increased by 1% to 10%		Dropped by 1% to 10%	Dropped by more than 10%	
UK market	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other EU markets	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
N. American markets	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other international markets	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

19. Has the profit margins of your most important product or service changed since 2001? Please tick one box for each market.

	MARGINS HAVE INCREASED SINCE 2001	MARGINS HAVE STAYED THE SAME SINCE 2001	MARGINS HAVE DECLINED SINCE 2001	DO NOT SELL IN THIS MARKET
UK market	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other EU markets	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
N. American markets	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other international markets	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

20. What factors have positively and negatively affected (if any) the change to prices and market share of your most important product or service since 2001? Please tick one box for each factor.

	SIGNIFICANT POSITIVE IMPACT	FAIRLY POSITIVE IMPACT	NO IMPACT	FAIRLY NEGATIVE IMPACT	SIGNIFICANT NEGATIVE IMPACT
New processes you introduced	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
New products you introduced	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
New activities you perform	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
New materials	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Changes to the supply of qualified labour	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Price of raw materials	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Outsourcing to suppliers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Changing demands from customers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
New markets/ new customer types	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Environmental/ social regulations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Removal of trade barriers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Currency fluctuations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Improved competitors	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
New competitive entrants	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Mergers and acquisitions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (please specify):					

SECTION F: COMPANY BACKGROUND

21. What is the name of your company?

23. Which of the following best describes your company? Please tick only one.

- Sole business (not part of any group) Subsidiary of a foreign business or multinational
- Subsidiary of an UK business Other (please specify):

24. Is your company a...

- Private company Not for profit company
 Public company Other (please specify):
 Public and traded company

25. How many employees work at your UK company today and in 2001?

	1-9	10-49	50-249	250 and above
Today	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2001	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

26. What is your name?

27. What position(s) in the company do you hold? Please tick all that apply.

- Owner Manufacturing/ Operations Manager
 Managing Director Other Manager
 Sales or Marketing Director/ Manager Other (please specify):

Would you like a copy of the results? Yes No

If you would like an electronic version of the results, please provide an email address:

Please post the survey using the SAE or to: Jeff Readman, CENTRIM,
The Freeman Centre, University of Brighton
Falmer, Brighton BN1 9QE
E-mail: j.a.readman@bton.ac.uk

ALL INFORMATION WILL BE HELD IN CONFIDENCE. Thank you for participating.

Appendix 3. Missing values

Missing values were re-calculated to reflect the average profile of similar respondents. One respondent did not answer the value adding question (Q. 3) but did answer all the other questions so the case was included. An average firm profile was generated based on the product types manufactured by the missing case. The average value-added manufacturing cost scores from similar respondents were substituted for the missing values.

The variable profile filter selected product and service types that are very significant to turnover (Q.1). The missing case company manufactured non-wood furniture and provided direct sales/ retail services. The profile filter identified five similar cases that manufactured non-wooden furniture and provided direct sales/ retail services. The average value-added manufacturing costs for the similar cases is presented in Table 82. These data are substituted for the missing case.

Table 82. Average value-added manufacturing costs, mean and standard deviation, profile of missing case

	Normalised Mean	Normalised SD
Preproduction	8.87	7.116
Product design	12.21	5.961
Logistics	9.64	5.702
Parts production	10.42	6.666
Assembly	11.55	4.761
Admin	10.93	3.677
Marketing	13.32	4.304
After-sales	12.09	4.167
Distribution	10.97	6.981

N=5

Appendix 4. Supplementary tests for Chapter 8

1. Local production networks

Supplementary tests (Kruskall Wallis non-parametric tests) are applied to the cross tabulated results for the three locations (in-house, UK suppliers and non-UK suppliers) and their product innovation performance. Table 83 shows that product innovation performance is significantly different amount the three locations indicating a relationship between location and product innovation ($H=7.269$; $p<0.05$ (0.026)).

Table 83. Location of core assembly and product innovation performance, Kruskal Wallis test results

Product innovation	
Chi-Square	7.269
Df	2
Asymp. Sig.	.026
Exact Sig.	.029
Point Probability	.000

a) N=53
P<0.05

Post hoc tests results are presented in Table 84 and Table 85. Two Mann-Whitney tests are performed on two independent group comparisons. The significance level is adjusted as per the Bonferonni correction ($p < \frac{0.05}{2} = p < 0.025$).

Table 84. Core assembly activities performed in-house and outsourced to UK suppliers and product innovation performance, Mann-Whitney test results

Product innovation	
Mann-Whitney U	57.000
Wilcoxon W	67.000
Z	-1.787
Asymp. Sig. (2-tailed)	.074
Exact Sig. [2*(1-tailed Sig.)]	.290 ^a
Exact Sig. (2-tailed)	.100
Exact Sig. (1-tailed)	.100
Point Probability	.013

N=47
P<0.025

Table 85. Core assembly activities performed in-house and outsourced to non-UK suppliers and product innovation performance, Mann-Whitney test results

Product innovation	
Mann-Whitney U	78.000
Wilcoxon W	99.000
Z	-2.425
Asymp. Sig. (2-tailed)	.015
Exact Sig. [2*(1-tailed Sig.)]	.126 ^a
Exact Sig. (2-tailed)	.031
Exact Sig. (1-tailed)	.031
Point Probability	.027

N=49

P<0.025

2. Firm size and core activity outsourcing – no association

Table 86. Firm size and core activities performed in-house, Chi square test results

	Small	Medium	Large	N	Fisher's Exact Test
Preproduction	64.40%	24.40%	11.10%	45	0.618
Design	70.80%	16.70%	12.50%	24	0.642
Logistics	37.50%	50.00%	12.50%	8	1.000
Parts	64.80%	25.90%	9.30%	54	0.143
Assembly	67.90%	22.60%	9.40%	53	0.552
Admin	63.30%	26.70%	10.00%	30	0.293
Marketing	64.90%	32.40%	2.70%	37	0.151
After	66.70%	26.70%	6.70%	15	0.067
Distribution	83.30%	12.50%	4.20%	24	0.724

3. Firm size and innovation capabilities

Firm size is associated with product and process innovation capabilities. Specifically, medium size firms use research institutes to a greater extent than small firms for product innovation, and medium size firm use implementation practices and technology enablers to a greater extent than small firms for process innovation.

Table 87. Firm size and product innovation capabilities, Kruskal Wallis test results

	Chi-Square	df	Asymp. Sig.	Exact Sig.	Point Probability
Skilled employees	1.944	2	0.378	0.387	0
Management	1.756	2	0.416	0.423	0
Technology	5.153	2	0.076	0.072	0
Innovation strategies	2.505	2	0.286	0.286	0
Implementation	5.646	2	0.059	0.055	0
External scanning	1.426	2	0.49	0.49	0.002
Evaluations	0.919	2	0.632	0.642	0
Competitors	1.382	2	0.501	0.51	0.001
Retailers	0.875	2	0.646	0.654	0
Consultancy	1.229	2	0.541	0.552	0.002
Suppliers	1.043	2	0.594	0.607	0.001
Mergers and acquisitions	3.873	2	0.144	0.122	0.002
Universities	2.747	2	0.253	0.25	0.012
Research institutes	6.261	2	0.044	0.044	0.001

N= 63; P<0.05

Table 88. Medium size firms and small firms and product innovation capabilities, Mann Whitney test results

	Mann-Whitney U	Wilcoxon W	Z	Asymp. Sig. (2-tailed)	Exact Sig. (1-tailed)	Point Prob
Skilled employees	253	1114	-1.359	0.174	0.09	0.005
Management	270	1131	-1.062	0.288	0.146	0.001
Technology	210	1071	-2.204	0.028	0.014	0
Innovation strategies	248	1109	-1.51	0.131	0.063	0.002
Implementation	217.5	1078.5	-2.053	0.04	0.021	0.001
External scanning	270	1131	-1.135	0.256	0.141	0.017
Evaluations	304	440	-0.451	0.652	0.336	0.017
Competitors	282.5	418.5	-0.888	0.375	0.192	0.014
Retailers	279	415	-0.934	0.35	0.177	0.002
Consultancy	282	1143	-1.058	0.29	0.171	0.02
Suppliers	290	426	-0.748	0.455	0.246	0.022
Mergers and acquisitions	262	1123	-1.942	0.052	0.03	0.011
Universities	281	1142	-1.465	0.143	0.065	0.025
Research institutes	239.5	1100.5	-2.478	0.013	0.008	0.004

N= 57; P<0.025 (Bonferonni correction p<0.05/2)

Table 89. Firm size and process innovation capabilities, Kruskal Wallis test results

	Chi-Square	df	Asymp. Sig.	Exact Sig.	Point Probability
Skilled employees	3.178	2	0.204	0.209	0.001
Management	2.327	2	0.312	0.319	0
Technology	7.041	2	0.03	0.023	0
Innovation strategies	2.999	2	0.223	0.227	0
Implementation	7.88	2	0.019	0.014	0
External scanning	0.482	2	0.786	0.796	0.001
Evaluations	0.12	2	0.942	0.941	0.001
Competitors	0.081	2	0.96	0.964	0.002
Retailers	0.978	2	0.613	0.625	0
Consultancy	1.095	2	0.578	0.581	0.016
Suppliers	0.672	2	0.715	0.715	0.007
Mergers and acquisitions	2.211	2	0.331	0.333	0.028
Universities	3.522	2	0.172	0.219	0.022
Research institutes	4.549	2	0.103	0.086	0.011

N= 36; P<0.05

Table 90. Medium size firms and small firms and process innovation capabilities, Mann Whitney test results

	Mann-Whitney U	Wilcoxon W	Z	Asymp. Sig. (2-tailed)	Exact Sig. (1-tailed)	Point Prob
Skilled employees	68	321	-1.753	0.08	0.041	0.004
Management	86	339	-1.003	0.316	0.159	0.003
Technology	49	302	-2.573	0.01	0.005	0.001
Innovation strategies	70.5	323.5	-1.67	0.095	0.05	0.002
Implementation	45.5	298.5	-2.769	0.006	0.003	0.001
External scanning	99	352	-0.471	0.638	0.319	0.011
Evaluations	103	356	-0.302	0.763	0.378	0.027
Competitors	105	358	-0.225	0.822	0.425	0.032
Retailers	108	361	-0.086	0.931	0.45	0.01
Consultancy	90.5	343.5	-0.92	0.357	0.228	0.084
Suppliers	101.5	156.5	-0.378	0.706	0.367	0.044
Mergers and acquisitions	91.5	344.5	-1.106	0.269	0.162	0.061
Universities	85	338	-1.61	0.107	0.065	0.041
Research institutes	78	331	-1.805	0.071	0.046	0.027

N= 32; P<0.025 (Bonferonni correction p<0.05/2)

Table 91. Medium size firms and large firms and process innovation capabilities, Mann Whitney test results

	Mann-Whitney U	Wilcoxon W	Z	Asymp. Sig. (2-tailed)	Exact Sig. (1-tailed)	Point Prob
Skilled employees	18	28	-0.297	0.767	0.421	0.06
Management	15.5	70.5	-0.662	0.508	0.335	0.14
Technology	9	19	-1.591	0.112	0.066	0.018
Innovation strategies	12.5	22.5	-1.091	0.275	0.153	0.036
Implementation	8.5	18.5	-1.677	0.094	0.048	0.01
External scanning evaluations	14.5	24.5	-0.871	0.384	0.335	0.24
Competitors	18	28	-0.296	0.767	0.492	0.201
Retailers	13.5	68.5	-0.995	0.32	0.196	0.084
Consultancy	19.5	74.5	-0.077	0.939	0.594	0.252
Suppliers	17	27	-0.497	0.619	0.462	0.252
Mergers and acquisitions	14	24	-1.183	0.237	0.33	0.33
Universities	14	24	-1.183	0.237	0.33	0.33
Research institutes	12	22	-1.422	0.155	0.21	0.21

N= 14; P<0.025 (Bonferonni correction p<0.05/2)

4. Firm size and customer preferences

Buyer preference are associated with firm size. Specifically low costs and brand-names, are more important to large firms than small firms

Table 92. Firm size and customer preferences, Kruskal Wallis test results

	Chi-Square	df	Asymp. Sig.	Exact Sig.	Point Probability
Lowest price	9.59	2	0.008	0.006	0
High quality	0.237	2	0.888	0.896	0
Fast delivery	5.175	2	0.075	0.071	0
On-time delivery	1.426	2	0.49	0.49	0.001
Innovative designs	1.605	2	0.448	0.464	0
Product variety	0.534	2	0.766	0.78	0
Flexible production	1.725	2	0.422	0.429	0
Bringing out new products	1.664	2	0.435	0.445	0
Customisation	2.078	2	0.354	0.362	0
Services linked with product	1.636	2	0.441	0.451	0
Associated with a brand name	8.224	2	0.016	0.013	0
Product/ service warranty	3.32	2	0.19	0.189	0
Sell directly	0.695	2	0.706	0.715	0
Sell directly to e	0.428	2	0.807	0.813	0

N= 65; P<0.05

Table 93. Large and small firms and customer preferences, Mann-Whitney tests results

	Mann-Whitney U	Wilcoxon W	Z	Asymp. Sig. (2-tailed)	Exact Sig. (1-tailed)	Point Prob
Lowest price	47.5	1037.5	-2.606	0.009	0.005	0.002
High quality	127.5	148.5	-0.144	0.886	0.437	0.019
Fast delivery	65	1055	-2.07	0.038	0.026	0.01
On-time delivery	104.5	1094.5	-0.887	0.375	0.219	0.08
Innovative designs	110	1100	-0.678	0.498	0.285	0.058
Product variety	111	1101	-0.654	0.513	0.238	0.016
Flexible production	94.5	1084.5	-1.152	0.249	0.117	0.004
Bringing out new products	95.5	1085.5	-1.123	0.261	0.134	0.012
Customisation	109.5	130.5	-0.701	0.483	0.23	0.017
Services linked with product	116	1106	-0.494	0.621	0.325	0.008
Brand name	46	1036	-2.692	0.007	0.004	0.002
Product/ service warranty	122	1112	-0.314	0.753	0.405	0.024
Sell directly	127.5	1117.5	-0.138	0.89	0.478	0.062

N= 65; P<0.025 (Bonferonni correction p<0.05/2)

Table 94. Large and medium firms and customer preferences, Mann-Whitney tests results

	Mann-Whitney U	Wilcoxon W	Z	Asymp. Sig. (2-tailed)	Exact Sig. (1-tailed)	Point Prob
Lowest price	34	170	-1.094	0.274	0.168	0.064
High quality	44.5	180.5	-0.302	0.763	0.515	0.134
Fast delivery	25	161	-1.875	0.061	0.046	0.018
On-time delivery	32.5	168.5	-1.3	0.194	0.16	0.069
Innovative designs	31	167	-1.322	0.186	0.124	0.051
Product variety	38	174	-0.829	0.407	0.304	0.186
Flexible production	30	166	-1.4	0.162	0.109	0.042
Bringing out new products	43	179	-0.391	0.696	0.402	0.012
Customisation	44	180	-0.305	0.76	0.414	0.05
Services linked with product	44	65	-0.305	0.76	0.419	0.042
Brand name	21.5	157.5	-2.054	0.04	0.026	0.014
Product/ service warranty	35	56	-1	0.318	0.17	0.003
Sell directly	43	179	-0.382	0.703	0.399	0.068

N= 65; P<0.025 (Bonferonni correction p<0.05/2)