COLLABORATIVE NEW PRODUCT DEVELOPMENT: A STUDY OF GOVERNANCE AND OUTCOMES.

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DECLARATION

I, **Hamieda Parker**, do hereby declare that this dissertation titled

COLLABORATIVE NEW PRODUCT DEVELOPMENT: A STUDY OF GOVERNANCE AND OUTCOMES

is my own unaided work, save to the extent indicated in the Acknowledgements, References and comments included in the body of the Dissertation.

I further declare that this Dissertation, or any part of it, has not been, or is to be, submitted to any other University for degree purposes.

The information used in this Dissertation has been obtained by me while a registered student at the University of Cape Town, and while at Oxford University (October 2000 – October 2001) on the Sainsbury Doctoral Research Fellowship (a research fellowship awarded by the Sainsbury-Linbury Trust and administered by the University of Cape Town Postgraduate Scholarships Office).

Signed by candidate

Hamieda Parker

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ABSTRACT

This study contributes to the understanding of the role of relational governance and formal contractual governance within short-term new product development focused alliances and proposes relevant managerial implications. This work draws on the relational exchange perspective, transaction cost theory and the resource-based view in order to develop a conceptual framework of the role of relational and formal contractual governance on the outcomes of short-term new product development focused alliances. Survey data collected from British new technology-based firms, operating in three industry sectors, was used to examine the propositions emerging from the framework. Regression analysis was used to test the hypotheses.

The results indicate that both higher levels of relational governance and increased comprehensiveness in the formal contractual governance structure were positively associated with new product development performance. Further, alliance team effectiveness was found to mediate the relationship between governance and new product development performance. Relational governance was found to have a positive relationship with the acquisition of knowledge-based and social resources by the new technology-based firms engaged in collaborative new product development. Increased comprehensiveness in the formal contractual governance structure was found to be associated with lower levels of harmful knowledge loss, and lower levels of costs incurred due to the collaborative nature of the product development. Furthermore, the results indicated that collaboration costs were negatively associated with new product development performance. These findings support the view that relational governance enhances a firm's ability to acquire valuable resources through inter-firm collaboration. The findings however challenge the views that formal contractual governance exacerbates collaboration costs, and that formal contractual governance is redundant when relational governance structures have been developed.

Key Words

Collaboration, new product development, new technology-based firms, alliances, relational governance, formal contractual governance, knowledge acquisition, knowledge loss, collaboration costs.

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CHAPTER 1

INTRODUCTION

"A changing kaleidoscope of alliances and joint ventures is also likely to characterize firms that elevate the entrepreneurial over the administrative."

(Nonaka and Teece, 2001:333)

Alliances and other types of inter-firm linkages are increasingly being associated with entrepreneurial behaviour and entrepreneurship as highlighted above. Also, closely associated with the concept of entrepreneurship is the concept of innovation (Schumpeter, 1934). Schumpeter stresses that it is the entrepreneur's ability to combine resources in uncertain environments that leads to the development of new products, services and processes, which lead to disequilibrium in markets and subsequently to economic development. Critical to engaging in new product development, however, is the entrepreneurial firm's ability to access the requisite resources, which is often a very difficult task (Eisenhardt and Schoonhoven, 1996). For resource constrained new firms, entering into cooperative inter-firm linkages can provide an avenue to complementary requisite resources (Mills, Platts, Bourne and Richards, 2002). This study focuses on the type of cooperative linkages that new technology-based firms form in order to develop new products, referred to as collaborative new product development or new product development focused alliances.

In an article entitled "Why businesses crash" (Smith, 2003), economist Anders Aeroe draws attention to the steep challenges new firms face in trying to access needed resources. Whilst Aeroe discusses these challenges in the context of start-up firms in South Africa, similar observations have been made by numerous entrepreneurship researchers around the world, for example Elfring and Hulsink (2000) in the Netherlands; Keogh, Stewart and Taylor (2000) in the United Kingdom; Khavul (2001) in Israel; and Bygrave (2001) in the United States.

In the preface to the 1995 reprint of her seminal 1959 book, '*The theory of the growth of the firm*', Penrose proposes that understanding inter-firm linkages have become critically important, as their prevalence was increasing:

> "*this type of organisation is likely to continue to spread for some time and continue to engage in a competition very different from that analyzed between firms in so-called free markets. This may call for a new 'theory of the firm'* "
> (page 20 (xx) of preface)

The formation of linkages between the entrepreneurial firm and external firms in order to access resources has been studied by a number of researchers (for example, Brush and Chaganti, 1996; Jarrillo, 1988; Larson, 1992). This use of inter-firm linkages with external firms has been referred to as a leveraging strategy that allows firms to pursue opportunities without being constrained to owning the resources needed to capitalize on an opportunity (Morris, 1998; Jarrillo and Stevenson, 1990).
For entrepreneurial firms active in new product development, in addition to the acquisition of tangible resources, the acquisition of intangible resources such as knowledge-based resources are particularly important for their growth (Penrose, 1959), for increasing innovation output (von Hippel, 1988) and for achieving a competitive advantage (Prahalad and Hamel, 1990; Eisenhart and Martin, 2000). In particular, the formation of linkages with customers and/or suppliers have been found to positively influence a firm's knowledge acquisition and new product development efforts (von Hippel, 1988; Yli-Renko et al., 2001). Further, the diversity of these linkages have been associated with enhanced knowledge acquisition for the entrepreneurial firm (Zahra, Ireland, and Hitt, 2000). Drawing on the early work of Richardson (1972), it is clear that innovation and new product development have been closely linked to inter-firm relationships, particularly between a firm and its suppliers and customers. More recently, there has been a growing realisation that particularly in industries where technological innovation is rapid (for example, in information and communication technology sectors) collaborative new product development provides firms with benefits that cannot be easily achieved through independent, single firm new product development (Van de Ven, Polley, Garud and Venkataraman, 1999; Littler et al., 1995; Ebers and Grandori, 1997, Child and Faulkner, 1998; Doz and Hamel, 1998).

However, despite the numerous benefits to entrepreneurial firms engaging in collaborative linkages with external firms, managing collaborative new product development is complex. New product development is a challenging endeavour in that it is associated with great uncertainty, and in technology intensive industries it is also associated with demanding time pressures (Littler, Leverick and Bruce, 1995; Griffin, 1997; Eisenhart and Martin, 2000). In-house, single firm new product development requires integration of different functional areas such as engineering and marketing, while inter-firm new product development collaboration also requires integration of other firms. The need to cross both functional boundaries and organisational boundaries in inter-firm collaborative new product development intensifies the risks and complexity of the co-ordination requirements, as observed by Yoshino and Rangan (1995: 137):

> *"New product development calls for close, active, ongoing involvement by R&D, design, engineering, manufacturing, and marketing. Books have been written about the difficulty of assembling product development teams in-house. Imagine the complexities that emerge when the team is to serve in a collaborative effort with another firm."*

In addition to the coordination challenges posed by collaborative new product development, collaboration also exposes firms to numerous risks, such as the risk of losing valuable technical advantages to competitors through intentional and unintentional revelation of commercial secrets (Littler et al., 1995). This risk is particularly great for small firms who do not have the experience or resources to safeguard their intellectual property (Lawton-Smith, Dickson and Lloyd-Smith, 1991:464). Hamel (1991) showed through a case analysis of nine international alliances that collaboration provides the opportunity for one partner to gain the skills of the other. The asymmetries in learning within the alliance may result in a shift in relative competitive position and advantage between the partners when they function outside the alliance. Thus inter-firm learning within the alliance could have the consequence of turning collaborators into competitors. Exposure to these risks can lead to alliance failure and can even threaten the survival of a vulnerable new firm (Alvarez and Barney, 2001).

Furthermore, despite the increased research interest in alliances and cooperative inter-firm linkages, there is significant evidence to suggest that the potential benefits of these linkages are often not realized (Robertson and Gatignon, 1998) and that failure rates are high (Zajac, 1998). This emphasises the need to better understand how these linkages should be governed in order to maximize the realized benefits and minimise the risks and costs (Ebers and Grandori, 1997).

Governance of Inter-Firm Collaborative Relationships

Research on the governance of inter-firm linkages involving entrepreneurial firms has often focused on and emphasised the benefits of the use of social norms, processes and the use of relational governance (for example, Swedburg, 2000; Uzzi, 1997; Larson, 1992). This research mirrors a similar focus by marketing channel researchers on examining the use of relational governance within buyer-supplier linkages (for example, Noordewier, John and Nevin, 1990; Heide and John, 1992). These studies have, however, most often been done in the context of long-term inter-firm relationships (Lambe, Spekman and Hunt, 2000). In contrast, for many firms particularly in information and communication technology industry sectors[1], engagement in new product development focused alliances with a customer or supplier is of a transient nature. That is, a short-term alliance focused on capitalizing on a very specific opportunity is formed (Das and Teng, 2002; Lambe and Spekman, 1997). Then, if the firm does not need that same complementary resource to pursue a different opportunity, it would not form another close new product development focused alliance with that customer or supplier again.

Thus, the focus on relational governance may be appropriate for long-term, relatively enduring relationships which are aimed at, for example, the long-term improvement of buyer-supplier exchange performance, the exchange of knowledge, or the improvement of inter-firm logistics. However, a focus on relational governance may

[1] Day (2000:25) contends that while certain buyer-supplier relationships may look collaborative, the linkage may merely be aimed at "locking in" a buyer or supplier. He observes, however, that firms in technology-intensive industry sectors are more inclined to form real collaborative partnerships due to the more prevalent product development foci in these partnerships.

be inappropriate for short-term, focused inter-firm relationships (Das and Teng, 2002; Lambe et al., 2000; Lambe, Wittman and Spekman, 2001). The early work of Stinchcombe (1965) also challenges the use of relational controls to govern inter-firm relations involving new firms. Stinchcombe (1965) draws attention to the vulnerability of new firms, which he terms their "liability of newness". He attributes this vulnerability to a number of factors, including the need for those in start-up firms to learn "new roles", the lack of established ties with customers or suppliers and the lack of familiarity of a new firm with others in a market. "New organisations must rely heavily on social relations among strangers. This means that relations of trust are much more precarious in new than old organisations" (1965:149). Stinchcombe further argues that certain structures such as contracts can be used as a substitute for trust.

1.1 RATIONALE FOR RESEARCH ON COLLABORATIVE NEW PRODUCT DEVELOPMENT INVOLVING NEW TECHNOLOGY-BASED FIRMS

A review of the literature on inter-firm relationships and recent conceptual discussions regarding the governance of inter-firm relationships (Lambe et al., 2000 and Lambe et al., 2001) indicates that the study of short-term, focused inter-firm relationships has been neglected and that there is a real need for studies to investigate the governance of short-term focused inter-firm relationships. A second shortcoming of research examining the governance of inter-firm relationships is the focus on a single governance control mechanism, and despite the "clarion call for further examination of multiple control mechanisms, few empirical studies have investigated this issue" (Jap and Ganesan, 2000:228). Third, the few studies that have investigated the use of more than one governance type, that is, the use of both relational governance and formal contractual governance, report conflicting findings. For example, Jap and Ganesan (2000) found that formal contractual governance negatively affected inter-firm relationship outcomes, while Poppo and Zenger (2002) found that formal contractual governance positively affected inter-firm relationship outcomes. Further, the few studies that have examined the effect of both formal contractual governance and relational governance, examined it in the context of long-term, relatively enduring buyer-supplier relationships.

A fourth limitation of extant research examining the governance of inter-firm relationships is the focus on a single outcome, namely, satisfaction with exchange performance (for example Cannon, Achrol and Gundlach, 2000; Poppo and Zenger, 2002). Clearly, in inter-firm relationships aimed at developing a new product, particularly those involving new firms who are vulnerable, multiple outcomes need to be examined. Further, in attempting to understand the effect of different governance mechanisms on new product development performance, there is a need to move beyond merely using a count of the number of products developed as a measure of new product development performance (for example, Deeds and Hill, 1998; Yli-Renko, Autio and Sapienza, 2001), and to examine how the governance mechanisms used affect development time and profitability.

A fifth shortcoming of current research is that analysis regarding the costs associated with inter-firm collaboration has been neglected (Ebers and Grandori, 1997, Gulati and Singh, 1998). Although these costs are exacerbated in technology development alliances where coordination requirements are heightened, examination of these costs has remained sparse (Gulati and Singh, 1998). A related limitation identified within the research on inter-firm relationships is its neglect of 'time'. In new product development-focused inter-firm linkages (particularly within information and communication technology sectors), the opportunity being pursued by the new firm is often of a transient nature and meeting time-pressured schedules and minimising time loss is imperative. A final shortcoming identified is that despite the realisation that firms increasingly need to form partnerships or alliances in order to access the necessary resources for new product development, "the study of the new product development typically focuses on activities within a single firm" (Millson, Raj and Wilemon, 1996:41), rather than focusing on collaborative new product development where development activities span traditional firm boundaries.

This study seeks to address the limitations in the research on the governance of short-term focused inter-firm relationships as discussed above, by investigating how the governance mechanisms employed in new product development collaborations involving new technology-based firms is associated with collaboration outcomes.

contrary, they are exposed to greater risks through collaboration. De Laat (1997:168) articulates this as follows:

> *"It seems that in the UK certain large firms specialise in drawing innocent small firms into a research and development alliance, and then opportunistically use the occasion to behave in a 'predatory manner' (Dickson et al, 1991, Lawton-Smith et al, 1991)."*

The research sample for this study is drawn from the population of new technology-based firms in the United Kingdom. Criteria applied in creating a sampling frame to select firms were that the firm be under 10 years old, have under 100 employees, be independent (that is, it is not a subsidiary of a large firm), and come from one of the three technology-intensive sectors studied (namely, the computer and information processing technology sector, the communications technology sector and the electronic and instrumentation technology sector). As mentioned, this study focuses on the short-term collaborative linkages that new technology-based firms form with other firms in order to develop a new product. Whilst the collaboration partner may be a customer or supplier, the focus of this research is not on long-term buyer-supplier relationships.

1.3 RESEARCH QUESTIONS

The central research question guiding this research study is:

How do the alliance governance mechanisms employed affect collaborative new product development outcomes for the new technology-based firms?

In examining the role of alliance governance on the alliance outcomes for the new technology-based firms in new product development-focused collaboration, the specific research questions which guide this study are:

Research question 1

How do the governance mechanisms employed to govern the new product development alliance affect new product development performance?

Research question 2

How do the governance mechanisms employed affect the new technology-based firm's acquisition of resources?

Research question 3

How do the governance mechanisms employed affect potentially damaging knowledge loss from the new technology-based firm?

Research question 4

How do the governance mechanisms employed affect transaction costs incurred due to the collaborative nature of the new product development?

Research question 5

How do transaction costs incurred due to the collaborative nature of the new product development affect new product development performance?

1.4 RESEARCH METHODOLOGY

The unit of analysis for this study is the dyadic inter-firm relationship aimed at collaborative new product development. Drawing on theory and relevant empirical studies, a conceptual framework and hypotheses were developed.

The methodology for the empirical research comprised three stages. The first stage involved conducting exploratory interviews with managers at new technology-based firms, managers at large firms and legal experts. This was aimed at informing the design of a questionnaire and to develop an understanding of how important theoretical concepts underpinning this research were perceived by managers with experience in inter-firm collaborative new product development.

The second stage of the process involved designing a questionnaire and piloting the questionnaire.

The third stage of the process involved administering the questionnaire survey to British new technology-based firms identified as fulfilling specific sampling criteria. Data collected through the questionnaire survey was subjected to statistical analysis appropriate to assessing the questionnaire's adequacy in, firstly measuring relevant constructs and secondly to evaluating relationships proposed in the governance - outcomes framework developed in this study. Confirmatory factor analysis was used to test the proposed item-construct structure, and to assess the validity and reliability of the constructs. Regression analysis (the forward stepwise procedure) was used to examine the proposed relationships.

The empirical research design follows recommendations by Bailey (1987) to use exploratory interviews as a preparatory step to more detailed empirical work. The statistical methods used are in keeping with recent studies examining inter-firm relationships (for example, Nooteboom, Berger and Nooderhaven, 1997; Cannon et al., 2000).

1.5 CHAPTER INTEGRATION AND STRUCTURE OF THE DISSERTATION

This dissertation has been arranged into seven chapters. Chapter 1 drew attention to the importance of inter-firm collaboration in facilitating new product development in new, resource-constrained firms. Several shortcomings within the extant literature were noted which emphasized the need to focus more research attention on the role of governance in collaborative new product development. The context for this is technology intensive sectors in the United Kingdom and the focus is on new small firms. The central research question guiding this research is: How do the mechanisms employed to govern the collaborative new product development affect collaboration outcomes? In order to explore the central question and five related research questions, this study draws on economic, sociological and strategic perspectives. The structure of the rest of the dissertation is described below.

Chapter 2 presents a review of pertinent research on inter-firm linkages. Since, this research is grounded in three theoretical perspectives, namely the relational exchange perspective, transaction cost theory and the resource-based view, the review is arranged with regard to the appropriate theoretical perspective being examined, and both conceptual and empirical research is discussed and limitations within the current literature are highlighted. Chapter 3 continues the discussion of the literature, focussing on specific studies; this chapter proposes a theoretically and empirically derived conceptual framework and develops hypotheses which are used to examine the research questions. Chapter 4 presents the methodology for the empirical study, which examines the framework and the relationships proposed in the previous chapter. The reliability and validity of the empirical study is also discussed. Chapter 5 describes the firms in the response sample and their relationship to their alliance partners. It presents the results of the regression analyses, while Chapter 6 discusses these results. Finally, chapter 7 concludes by discussing the contribution to research made by this dissertation study and the implications for managers of these findings. Limitations of this study and avenues for future research are also identified in the final chapter.

CHAPTER 2

LITERATURE REVIEW

The previous chapter introduced how new firms are able to access complementary resources needed for new product development through collaboration with another firm. There are numerous benefits to new firms engaging in collaborative new product development. However, often these benefits are not realised and firms are exposed to heightened risks through collaboration. High reported failure rates for alliances are an indication of this (Zajac, 1998). These high failure rates further suggest that more research attention needs to be devoted to understanding how inter-firm collaborative relationships should be governed in order to realise the anticipated benefits and minimise the exposure to risks (Ebers and Grandori, 1997).

This chapter presents a review of the research on inter-firm linkages arranged around three broad theoretical perspectives in which this study is grounded, namely:

- Social exchange theory and the relational exchange perspective.
- Transaction cost economics
- The resource-based view.

As this study examines the ability to access social and knowledge-based resources through new product development-focused alliances, literature which provides an insight into these specific resources is discussed. This is followed by a discussion regarding alliance governance which integrates the relational exchange and transaction cost economics literature and highlights the need to examine governance within short-term focused alliances, as this is an area which has remained under-explored. The review is concluded highlighting that independently, each perspective fails to address how short-term, new product development focused alliances should be governed in order to maximise benefits whilst minimising risks. This identified limitation suggests that integration of these perspectives is needed.

2.1 SOCIAL EXCHANGE THEORY AND THE RELATIONAL EXCHANGE PERSPECTIVE

Social exchange theory was originally developed with a focus on interpersonal relations (Blau, 1964; Homans, 1958; Thibaut and Kelley, 1959). Although the theory was developed at the level of the individual, it has been extended to the organisational and inter-organisational levels (Aiken and Hage, 1968; Levine and White, 1961). It has subsequently been used to examine inter-firm linkages, particularly in the marketing channel, long-term buyer-supplier relationship context (Dwyer, Schurr and Oh, 1987; Wilson, 1995; Heide and John, 1992; Anderson and Narus, 1990). "Social exchange theory views exchange as a social behaviour that may result in both economic and social outcomes" (Lambe et al., 2001:6).

Thibaut and Kelley (1959) contributed significantly to the development of social exchange theory, particularly with regard to their conceptualisation of measures for exchange benefits. They use the concepts CL (Comparison Level) and CL_{alt} (Comparison Level of Alternatives) to enable evaluation of benefits in a specific exchange relationship. They explain that CL is the minimum benefit one expects to receive from the relationship and one's degree of satisfaction with the relationship is based on how much higher the actual outcomes of the relationship are compared to the minimum expected (CL). CL_{alt} represents outcomes from the best possible alternative exchange relationship. It is argued that while the benefits derived (evaluated as both social and economic) from one's existing exchange relationship exceed CL_{alt}, one will be satisfied and will want to continue the relationship (Thibaut and Kelley, 1959).

Blau (1964) observed that social exchanges are characterized by the presence of *trust* and *social norms* of behaviour, as opposed to formal contracts. In describing norms, Thibaut and Kelley offer the following definition: "A norm is defined as a behavioural rule that is accepted to some degree by both members of a dyad.... Both members feel some obligation to adhere to the rule, so it introduces a certain amount of regularity or practicability into their interaction" (1959:147). They have proposed that norms are developed as interactions between groups continue over time, and that the presence of norms serve to regulate actions and deter parties from behaving opportunistically.

The concept of trust is defined as a belief that the other party is reliable, that promises will be kept and obligations will be fulfilled in an exchange relationship (Blau, 1964). Trust has been described as a central variable in social exchange theory and researchers examining inter-firm relationships have dedicated extensive research attention to the study of trust (for example, Gambetta, 1988; Sako, 1992; 1998; Dodgson, 1993; Sydow, 1998; Lane and Bachman, 1998).

The concept of trust is multifaceted (Rousseau, Sitkin, Burt and Camerer, 1998), and researchers have distinguished between different types of trust. Ring and Van de Ven (1992), for example, distinguish between 'fragile' and 'resilient' trust. Fragile trust can be said to exist when parties are confident that mutual expectations will be met, whilst resilient trust exists between parties when the parties are not only confident that expectations will be met, but they are also confident that parties will act in a manner that enhances the goodwill between them. Ring and Van de Ven (1994), propose that parties may progress from having fragile trust to having resilient trust, through a cyclical process of recurrent economic exchange. They propose that while formal contractual governance may be important at the beginning of an interfirm relationship, as the relationship develops, fragile trust can grow into resilient trust, and they suggest that the use of formal contractual governance will then give way to greater use of trust as a governance mechanism.

The Relational Exchange Perspective

Researchers have extended social exchange theory to focus on inter-firm relationships, and have found that the social exchange process can act as a "social contract" that reinforces positive behaviours and discourages negative behaviours from interacting parties (Macneil, 1980; Morgan and Hunt, 1994; Dwyer, Schurr and Oh, 1987).

In his book *The new social contract: an inquiry into modern contractual relations* Macneil (1980), describes discrete and relational transactions. Discrete transactions are market exchanges where the identity of parties are irrelevant, they require a low level of interaction and a low level of information beyond the contract, and can easily be governed by an agreement for exchange to be accomplished. Relational transactions, in contrast, occur over time, are embedded in a relationship, and are

characterised by the need for information flows and the expectation that they will continue through time. Macneil (1980:60) argues that the discrete transaction is a fiction: "discreteness is the separating of a transaction from all else between the participants at the same time and before and after. It's ideal, never achieved in life". Relational transactions are viewed as being far more common and a more realistic description of exchange. Macneil (1978; 1980) has built on the idea of a social contract governing exchange relationships and argues that in reality social norms and the social processes characterising the exchange relationship have a greater significance than a legal contract.

The early work of Kotler (1972), Bagozzi (1975) and Hunt (1976) identified the study of exchange as being critical to the study of marketing and, as noted by Lambe (2001:2), this early work has had a strong influence in guiding business to business marketing researchers to focus on the concept of exchange and the mechanisms that govern exchange. These marketing researchers (for example, Dwyer et al., 1987; Anderson and Narus, 1990; Heide and John, 1992) have contributed to the study of relational exchange, having done extensive work in an attempt to operationalise the norms and relationship characteristics discussed by Macneil (1978; 1980).

Empirical work and critique of social exchange theory and the relational exchange perspective

Relational norms and the presence of trust have been found to be positively associated with exchange performance (Artz, 1999; Zaheer and Venkatraman, 1995; Heide and John, 1992). It has further been shown that under the conditions of interdependence characterising the context of this study, (which is, collaborative new product development): firstly, relational norms and trust improve co-ordination (Gulati and Singh, 1998) and secondly, behavioural rules represented by norms act as a lubricant to facilitate information flow and effective communication (Gulati, 1995; Grannovetter, 1985).

In addition to finding that the presence of norms and trust improve coordination processes between groups, it has been suggested that trust and norms create a deterrent to opportunistic behaviour and are an effective substitute to contracts (Thibaut and Kelley, 1959). Opportunistic behaviour in alliances can take the form of failing to fulfil commitments, misleading the partner, or using the partner firm's

technology in a self-serving way that can harm the partner firm (Deeds and Hill, 1998). A firm is often described as behaving opportunistically when it acts in a self-interested way in order to make gains at the expense of a partner firm (Parke, 1993).

Deeds and Hill (1998) examined 109 research alliances in the biotechnology industry and found evidence to suggest that relational variables (in particular, frequency of communication and congruence in alliance partners' backgrounds) were more effective in deterring opportunism than transaction-specific investments and contracts. That social processes, norms and trust act to avert opportunism has been empirically supported, particularly amongst Japanese manufacturers (Dyer, 1997; Dore, 1983; Sako, 1992). Dyer (1997) and Dyer and Singh (1998) have referred to these social norms and the reliance on trust as constituting a "self-enforcing safeguard", and contrast it to contractual safeguards which require enforcement by a third party. Despite the evidence to suggest that social processes and the threat of social sanctions deter opportunistic behaviour, Das and Teng (2002) question the effectiveness of this in the context of alliance dyads.

In an alliance network (more than two firms), when a firm acts in a norm violating or untrustworthy way, social sanctions applied by an alliance partner firm will affect the deviating firm very negatively, as the firm will be badly viewed and will have lost credibility amongst all its other alliance partners in the network. The need to maintain a good reputation in alliance networks is thus a strong deterrent against opportunistic behaviour by firms in alliance networks (Nooteboom, 1999). Das and Teng (2002:450) argue that:

> *"social sanctions in dyadic alliances [only two firms] are much less effective [than in network alliances] because there are no third parties in the monitoring process. If an alliance firm deviates from an agreement, only its partner can spread the word about the defection with no support from additional observers and messengers".*

This indicates the limitations on the effectiveness of social sanctions in simple, dyadic, inter-firm collaborative projects.

An additional concern regarding the effectiveness of social processes and the threat of social sanctions in deterring firms from behaving opportunistically, has been articulated by Lambe *et al.* (2001:26) who argue that:

"as much as transactional cost analysis has been criticised for its assumption of universal opportunism, social exchange theory should be criticised for its implicit assumption that relational exchange is devoid of opportunism".

As mentioned earlier, social exchange theory and the relational exchange perspective propose that as interactions continue over time between parties, norms and social processes are developed which constitute an efficient governance structure for the relationship. In short-term inter-firm relationships, there is very little time to develop norms and social processes, and recent research has therefore questioned the extent to which social exchange theory and the relational exchange perspective is able to explain exchange governance in short-term relationships (Das and Teng, 2002; Lambe et al., 2000).

Another concern with the extant literature on relational exchange is the strong focus on examining performance satisfaction as the outcome variable. Performance satisfaction, (which refers to satisfaction with the performance of the exchange relationship) is the most commonly studied outcome variable in research examining relational governance (Lambe et al., 2001). Performance satisfaction is often operationalised as an evaluation of the satisfaction a firm has with various aspects of the exchange relationship including, for example, the exchange partner's level of service, product quality, and costs (Cannon et al., 2000; Poppo and Zenger, 2002).

The focus on performance satisfaction as an outcome variable can be seen to be linked to the early work of Thibaut and Kelley (1959) and their concepts of CL and CL_{alt}, which focuses on evaluating the relationship (both in social and economic terms) and comparing it to the potential outcome with the best alternative arrangement. This focus is, however, limiting when examining outcomes in contexts beyond marketing channel contexts. In particular, in the context of collaborative new product development involving new technology-based firms, there are a number of additional outcomes which are of importance, such as new product development performance, the realisation of benefits associated with the collaborative relationship, and outcomes concerning the new firm's exposure to risks.

An additional concern regarding the relational exchange perspective is the extent to which relational exchange, as described in much of the marketing channel literature,

is actually practised (Morris, Brunyee and Page, 1998; Morris, Pitt and Honeycutt, 2001). Morris et al., have found evidence that suggests that while channel member firms have become more aware of the benefits of a collaborative relationship, the shifts towards increasing the relational content of their exchange have been "more attitudinal than behavioural" (1998:369).

Negative aspects of the presence of relational norms

A somewhat less explored perspective regarding relational norms is that strong norms and group cohesiveness may lead to inferior new products by encouraging 'groupthink'. Groupthink is the seeking of conformity while discouraging alternatives (Janis, 1983). Ayers, Dahlstrom and Skinner (1997) cite the work of Souder (1980;1988), who describes the 'too-good-friends' syndrome as the tendency for groups who have strong inter-group relationships to encourage agreement and to avoid conflict. Ayers et al. (1997) further highlight examples where group cohesiveness negatively influenced new product success. They explain that although relational norms lead to increased satisfaction, dissident opinions which may be critical to improving product design are discouraged. Groupthink can be particularly problematic in the new product development context, as new product development requires creative, unconstrained thinking and pressure to conform to a group opinion may detrimentally affect the innovativeness of a new product. Thibaut and Kelley note that; "in reaching decisions, a group may discourage the person from mentioning an unusual idea or quickly override him when he does suggest it" (1959:271).

This negative influence of relational norms in development contexts has been examined in in-house, independent, cross-functional new product development (Ayers et al., 1997; Souder, 1980; 1988) but not in an inter-firm new product development context. Ayers et al. (1997) found that stronger relational norms between research and development and marketing functions were associated with higher levels of new product development failure. Further, a recent study by Florida, Cushing and Gates (2002:30) show that communities which exhibit high levels of shared norms, trust and reciprocity encourage a type of conformity which is detrimental to innovation.

Another less examined perspective is that relational norms and trust may in certain circumstances have a negative influence on exchange outcomes. Moorman, Zaltman

The inadequacies of this theory in explaining short-term relationships is particularly pertinent to this study, as this study focuses on new product development alliances in technology sectors where product development cycle times are very short. Also very relevant to this study, is the theory's limitations in addressing opportunistic behaviour in exchange relationships. These limitations are further discussed in the section 2.6 (Alliance Governance).

2.2 TRANSACTION COST ECONOMICS

A key focus of transaction cost economics is the efficiency of different governance structures in minimising transaction costs, that is the costs associated with the exchange of resources between firms (Coase, 1937; Williamson, 1975; 1985). The early work by Coase (1937) attempted to address why firms internalised transactions which could occur externally in markets. Later, in addressing this question, Williamson (1975) proposed a market – hybrid – hierarchy structure for organising transactions, referring to alliances as a hybrid governance form.

> *"Suppose that transactions were to be arrayed in terms of the degree to which parties to the trade maintained autonomy. Discrete transactions would thus be located at the one extreme, highly centralized, hierarchical transactions would be at the other, and hybrid transactions would be located in between."* Williamson (1985:83).

Williamson (1985:72) argues that "the principle dimensions for describing transactions are asset specificity, uncertainty and frequency." He sees transactions that involve uncertainty in outcome, that occur frequently, and that require an investment in transaction–specific assets as being optimally governed within a hierarchy. Transactions that are simple, infrequent and do not require an investment in transaction-specific assets are best governed by the market. The hierarchy form of control is seen to reduce opportunistic behaviour as self-interested actions are reduced by authority internal to the firm.

Transaction costs include the costs of planning, negotiating, executing and monitoring a task (Williamson, 1985). Williamson (1985) further draws an analogy between transaction costs and energy loss due to friction in a mechanical system. The

following conditions have been identified as causing transactional inefficiencies: bounded rationality, uncertainty, complexity, asymmetric information and opportunism (Williamson, 1975). The results of these identified conditions include the conclusions that contracts can never be complete as managers are "boundedly rational" and that transactions are exposed to risks because of opportunism. Williamson (1991:79) therefore asserts that "added value will be realised by organising in such a way as to economize on bounded rationality and to safeguard transactions against the hazards of opportunism." Transaction cost economics can be seen to be focused on choosing governance mechanisms that minimise the costs associated with a transaction (given the identified conditions which cause inefficiencies).

> "*The main hypothesis out of which transaction cost economics work is this: align transactions, which differ in their attributes, with governance structures, which differ in their costs and competencies, in a discriminating (mainly, transaction cost economizing) way.*" Williamson (1991:79)

Transaction Cost Economics: Empirical Examination and Critique

A number of studies focusing on "hybrid" alliance arrangements have drawn on concepts which are core to transaction cost reasoning. Research on why firms choose a certain governance structure have focused on the choice between joint venture, equity arrangement and non-equity arrangement, with joint venture representing the most hierarchical (Gulati, 1995; Pisano, Russo and Teece, 1988). Concerns regarding behavioural uncertainty, that is, the inability of a firm to predict another firm's actions, the risk that the other firm will behave opportunistically and associated concerns regarding how profits will be shared have been shown to influence the choice of governance (Pisano, Russo and Teece, 1988). Structures representing a higher degree of hierarchical control (such as a joint venture) have been found to be associated with more serious profit-sharing concerns (Gulati, 1995; Gulati and Singh, 1998).

Investments by alliance partners in transaction-specific assets have received extensive attention from marketing channel researchers, who have generally found these

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investments to positively influence alliance performance (Heide and John, 1988; Dwyer and Oh, 1988; Young-Ybarra and Wiersma, 1999; Parkhe, 1993). Transaction cost explanations have been used to examine the choice of firms to "make or buy" with "make" referring to the decision to hierarchically control the activity within the firm (Walker and Weber, 1984; Poppo and Zenger, 1998; Montevrede and Teece, 1982).

It is, however, clear that empirically examining transaction costs is difficult (Shelanski and Klein, 1995) and that few researchers have attempted to do this. "As a consequence, transactional frictions, which do not yield easily to formal analysis, have been relatively neglected" Williamson (1975:249). Williamson (1975:22) further acknowledges that "empirical research on transaction cost matters almost never attempts to measure such costs directly." Thus the difficulties of operationalising transaction costs have left a number of transaction cost propositions unexplored.

Transaction cost economics has received strong criticism from a number of researchers, most notably from Ghoshal and Moran (1996), who argue that transaction cost economics is "bad for practice". These criticisms include transaction cost economics' behavioral assumptions that man is inclined to act opportunistically and in a self-interested way (Ghoshal and Moran, 1996) and that transaction cost economics is particularly questionable in relational exchange relationships (Heide and John, 1992; Morgan and Hunt, 1994).

In alliance studies, transaction cost economics has been criticised for its focus on static costs and its neglect of value creation processes (Madhok and Tallman, 1998). Its neglect of social processes which have been shown to reduce transaction costs (Gulati, 1995) is also argued to be problematic. Further, transaction cost economics in no way addresses interdependencies between firms arising from value creation activities such as joint product development alliances (Zajac and Olsen, 1993).

Due to the limitations of transaction cost economics, empirical studies have often needed to augment transaction cost economics with other theories. An example of this is the study by Artz (1999) which sought to link transaction-specific assets and

relational norms in long-term buyer-supplier relationships to performance. In his study, transaction cost economics was augmented by the relational exchange perspective (Macneil, 1978; 1980). Relational norms were found to positively influence exchange performance. Investment in transaction-specific assets by one firm had a negative influence on performance, while a reciprocal investment by the partner firm increased performance. In an ethnographic study of alliance dyads, Larson (1992) found that social controls and trust were more effective in improving alliance effectiveness and reducing opportunism than the formal controls suggested by transaction cost economics.

Furthermore, Gulati (1995) found that the "atomistic" view of firms held by transaction cost economics was very limiting and neglected the social context within which firms were embedded. Transaction cost economics was found to be too narrow in its focus to explain with whom firms formed alliances. His empirical work, using data on 1,570 alliances formed by large, prominent American, European and Japanese firms, provided evidence for the significant role of social structure in explaining the choice of alliance partner.

Poppo and Zenger (1998) have highlighted difficulties in providing empirical evidence to support the relationship between exchange attributes and market and firm performance, as prescribed by transaction cost economics. Thus, the lack of evidence linking transaction cost economics with performance and value, and the dearth of studies measuring or estimating transaction costs (Shelanski and Klein, 1995) is problematic.

2.3 THE RESOURCE-BASED VIEW

The resource-based view regards firms as "a collection of productive resources" (Penrose, 1959:31). Penrose further defines the firm as an "administrative organisation" aimed at organising its "own resources" along with those acquired externally (1959:31). In an extension of Schumpeter's notion of "new combinations", the resource-based view states that combining resources which are rare, long-lasting, not easily exchanged and difficult to copy can lead to the creation of value (Barney, 1991; Peteraf, 1993; Amit and Schoemaker, 1993; Wernerfelt, 1984; Rumelt, 1984).

Foss (1997) traces the roots of the resource-based view to a number of sources, including the early work of Edith Penrose (1959), and Alfred Chandler (1962) and the seminal articles, "A resource-based view of the firm" by Birger Wernerfelt (1984) and "Towards a strategic theory of the firm" by Richard Rumelt (1984).

Resource-based research argues that in addition to accumulating valuable resources, firms can develop capabilities which allow them to create value (Teece, Pisano, Shuen, 1997; Mills et al., 2002). Thus, organisational capabilities associated with co-ordination, integration or transformation allow firms to earn profits through processes such as new product development, alliance formation and management, and the creation and transfer of knowledge (Eisenhart and Martin, 2000).

Grant (1998) draws from Nelson and Winter's (1982) concept of organisational routines to explain the relationship between resources and capabilities. Organisational routines are sequences of actions which have been developed by an organisation and facilitate smooth, efficient operation (Nelson and Winter, 1982). In using the concept of routines, Grant (1998:186) highlights the challenge of developing capabilities. "Creating capabilities is not simply a matter of assembling a team of resources: capabilities involve complex patterns of co-ordination between people and between people and other resources. Perfecting such co-ordination requires learning through repetition. A capability is, in essence, a routine, or a number of interacting routines."

The Resource-Based View and Alliances involving Entrepreneurial Firms

The formation of alliances between the firm and external organisations in order to access resources necessary for growth has been studied by a number of researchers interested in the growth of the entrepreneurial firm (for example, Brush and Chaganti, 1996; Larson, 1992; Jarillo, 1988) and researchers examining innovation and new product development (Eisenhart and Schoonhaven, 1996). The research linking alliance formation with the acquisition of resources which are valuable for growth and innovation builds on the notion that alliance formation is a strategy to "leverage resources". That is, it is a strategy to acquire requisite resources to allow an

entrepreneur to pursue opportunities without constraining the entrepreneur to "owning" the resources (Morris, 1998; Jarillo and Stevenson, 1990).

Jarillo and Stevenson (1990:23) define entrepreneurship as follows: "entrepreneurship is a process by which individuals – either on their own or inside organisations – pursue opportunities without regard to the resources they currently control". Morris (1998) supports this view and emphasises the importance for entrepreneurs to leverage resources in order to minimise the risks they are exposed to.

Hamel and Prahalad (1998:43) also show that alliances allow firms to leverage their resources by "borrowing" the resources of other firms. In addition they observe that the attitude with which firms enter into alliances strongly determines how much they will gain from the alliance, and suggest that firms that enter the alliance as students with humility will gain far more than firms who enter as teachers with arrogance (1998:44). They further make the observation that when "borrowing" resources, absorptive capacity is as important as inventive capacity.

Eisenhart and Schoonhaven have found that entrepreneurial firms are driven to forming alliances by the necessity of accessing crucial resources. "Alliances form when firms are in vulnerable strategic positions for which they need additional resources that alliances can provide to compete effectively" (1996:139).

The perspective that alliances allow firms to access resources has been extended to examine how firms access resources through multiple alliances or networks of linkages. Burt's (1992) and Nohria and Eccles' (1992) conceptual discussion regarding resource and information flows via direct and indirect linkages has been furthered by researchers such as Gulati (1995), and Das and Teng (2002). Increasing the number and diversity of inter-firm linkages has also been associated with the acquisition of technological expertise (Zahra et al., 2000).

Strong empirical evidence has been found showing the effectiveness of transferring knowledge resources across networks of firms, although research in this area has been dominated by studies in the biotechnology sector (Powell, Koput and Smith-Doerr, 1996; Shan, Walker and Kogut, 1994; Walker, Kogut and Shan, 1997; Stuart, Hoang

and Hybels, 1999; Mowery, Oxley and Silverman, 1996; Hoang, 2001). These empirical studies also demonstrate the facilitation role the network plays in driving innovation and product development, and emphasise the rich advantages for a firm positioned within a network of alliances.

Saxenian (1991) found in her study entitled "The origins and dynamics of production networks in Silicon Valley" that physical proximity between linked firms enhanced innovation and product development. Through her examination of three cases in the computer industry, she showed "how inter-firm networks help account for the sustained technological dynamism of the regional economy" (1991:423).

Resource types

Resources have been classified as physical capital, human capital and organisational capital resources (Barney, 1991), as well as financial, physical, managerial, human, organisational and technological (Hofer and Schendel, 1979). Grant (1991) distinguishes between tangible and intangible resources. Entrepreneurship research that has examined the transfer of intangible resources such as knowledge has found the transfer of these resources to have a positive impact on firm performance and growth (Zahra, Ireland and Hitt, 2000; Yli-Renko et al., 2001; Van de Ven et al., 2000).

Das and Teng (2000) draw on the work of Miller and Shamsie (1996) who classify resources as being either property-based or knowledge-based, with property based resources being owned by the firm and legally protected by property rights. Das and Teng (2000) explain how various property-based resources exhibit different characteristics with regard to their mobility, inimitability and substitutability. Thus, human resources are relatively immobile, it may be possible to lure away an employee, but it would be difficult to get an entire workforce, except through acquisition. Business location and established distribution channels are examples of resources that have low substitutability. Intangible resources such as patents, copyrights and trademarks are valuable as they are not easily copied, that is, they have low imitability, and have property rights (Das and Teng, 2000:36). In addition, other intangible resources such as reputational resources and social resources (Eisenhart and

Schoonhaven, 1996) have been identified as valuable. Knowledge-based and social resources are discussed in greater detail in the following subsections.

The Relational View

More recently, a related perspective has emerged which proposes that the **relationship** between firms be viewed as the relevant unit of analysis, as it is suggested that the inter-firm relationship is a source of competitive advantage. This view suggests that a firm's resources may extend beyond a firm's boundaries and may be embedded in inter-firm resources and processes, and argues that firms enter into alliances in order to realise supernormal profits via inter-firm knowledge-sharing routines, the use of complimentary resources and the employment of an effective governance form for the relationship (Dyer and Singh, 1998). This extension of the resource-based view has been termed the relational view, by Dyer and Singh (1998) who stress the need for future research to focus on the alliance relationship and to examine the factors that hinder firms from creating value through alliances.

In utilising the alliance as the unit of analysis, this study responds to the call by Dyer and Singh (1998) to use the alliance as the unit of analysis and empirically examine the role of governance in influencing the benefits and the value derived from the new product development alliance. This is a departure from using the firm as the unit of analysis when drawing on the resource-based view.

Critique of the Resource-Based View

The resource-based view has recently been criticised on a number of fronts (Priem and Butler, 2001a, b; Barney, 2001). In particular, Priem and Butler (2001a, b) criticise the resource-based view as being tautological and having concepts which are difficult to operationalise, making it difficult to provide useful prescriptions for practitioners.

In addition to these, there are a number of limitations of the resource-based view which are particularly pertinent to this study of collaborative new product development. They are as follows:

- Extension of the resource-based view from the firm level to the alliance level has been limited (Das and Teng, 2000).
- Lack of consideration of context and environment has also been a source of criticism against the resource-based view (Foss, 1997; Easton and Araujo, 1996).
- The resource-based view's "static approach" has also been criticised (Teece et al., 1997)
- The focus of the resource-based view on resource-acquisition and its neglect of resource loss is problematic.

Priem and Butler (2001a:30) argue that statements underpinning the resource-based view are tautological. For example, Barney (1991:107) states that possessing resources that are valuable and rare can provide a firm with a competitive advantage. Priem and Butler assert that "competitive advantage is defined in terms of value and rarity" (2001a:30) which renders Barney's (1991:107) statement regarding resources tautological.

Operationalising concepts associated with the resource-based view has been difficult (Reed and De-Fillipi, 1990) and where constructs have been measured using secondary data, the proxies that have been used have been very industry-specific (for example, Miller and Shamsie, 1996) which limits generalisabilty (Das and Teng, 2000).

The inability of the resource-based view to provide "actionable prescriptions for practitioners" (Priem and Butler, 2001a:31) has been viewed as a limitation. Mills *et al.* (2002) have, however, attempted to address this limitation in their book *Strategy and performance: competing through competencies,* which draws on the resource-based view and provides practitioners with guidelines to improve their competitive position.

Das and Teng (2000:31) argue that the "resource-based view of the firm has not been systematically applied to strategic alliances". Of particular relevance to this study is that the resource-based view is focused on the firm level and neglects to consider the alliance relationship. Although alliances may be motivated by resource transfer and

gain, the alliance will fail if no consideration is given to the management of the alliance relationship despite each firm possessing complementary resources (Das and Teng, 2000).

In order to address this limitation, alliance researchers using the resource-based view have therefore needed to augment the view with other perspectives. In particular, social exchange theory and transaction cost theory have been used to augment the resource-based view and to address the relationship aspect of the alliance, particularly in buyer-supplier linkages (Day, 1995).

Social capital theory has also been used to supplement the resource-based view. Social capital theory addresses how the relationship a firm has with its suppliers, customers and other partners influences its ability to acquire resources and identify opportunities (Yli-Renko et al., 2001; Lee, Lee and Pennings, 2001). Lee *et al.* (2001) combine the resource-based view and social capital theory in order to empirically test the influence of internal capabilities and external linkages on the creation of competitive advantage in the context of technology-based start-up firms. They note that "social capital theory implies that start-ups should pursue strategies focusing on the development of valuable networks with external resource holders in order to succeed" (2001:616).

Another criticism levelled at the resource-based view is its lack of consideration of the firm's environment and context (Easton and Araujo, 1996; Foss, 1997). Easton and Araujo (1996) suggest that in the resource-based view, the firm is treated like a black-box, isolated from the dynamics of the competitive environment it is positioned in. In comparing co-operative strategies and resource acquisition behaviors of firms in technology-intensive contexts with firms that are not, Brush and Chaganti (1996) draw attention to the important influence of context. Hence, the lack of consideration of context by the resource-based view is problematic (Foss, 1997; Priem and Butler, 2001a).

The resource-based view can also be criticised for its static approach. While the extension to the resource-based view, called the 'dynamic capabilities approach', attempts to address this (Teece, Pisano and Shuen, 1997; Eisenhart and Martin, 2000),

much empirical work has reinforced the resource-based view's static approach. Exceptions to this are the work by Miller and Shamsie (1996) and Jap (1999), who examine sources of competitive advantage in longitudinal studies (Miller and Shamsie used a 30-year period while Jap used a 1-year period).

A limitation of the resource-based view which this study views as particularly problematic is its overriding focus on the acquisition of resources, and relative neglect of resource loss. New firms are particularly vulnerable to resource loss (Lawton-Smith et al., 1991; De Laat, 1997; Meyer and Alvarez, 1998; Alvarez and Barney, 2001). Resource flow can occur in two directions, and even as resources flow into a firm, the firm may also suffer from undesired resource loss. The view that firms are repositories of valuable resources, however, ignores the dynamic properties of those resources. This study, therefore, explicitly examines both knowledge acquisition and loss in order to address this limitation.

Although the range of resources that are important to the entrepreneurial firm's, growth is broad, evidence has been found indicating that entrepreneurial and technology-based firms are strongly motivated to form alliances to access intangible resources such as marketing and technical knowledge, and to expand their business network (Parker and Campbell, 2001; Meyer and Alvarez, 1998). The importance of knowledge-based resources and social resources is supported by a number of studies which have linked these resources to entrepreneurial firm growth and innovation output (Zahra et al., 2000; Yli-Renko et al., 2001; Powell et al., 1996; Larson, 1992; Shan, Walker and Kogut, 1994). This study, therefore, focuses on knowledge-based resources and social resources, and they are discussed in greater detail in the following two sub-sections.

2.4 KNOWLEDGE-BASED RESOURCES

"In an economy where the only certainty is uncertainty, the one sure source of lasting competitive advantage is knowledge"

Ikujiro Nonaka (**1991: 96**)

Dyer and Singh suggest that the ability of alliance partners to learn from one another would be enhanced as individuals in each firm become sufficiently acquainted to "know who knows what and where critical expertise resides within each firm" (1998:665). Whilst emphasising how social, informal interaction may increase a firm's absorptive capacities in an alliance, they do not ignore the possibility that certain types of more formal processes may also increase firms' absorptive capacities. For example, they cite the case of Fuji and Xerox, who have developed a "communications matrix" which identifies individuals [the 'who'] and their relevant area of knowledge [the'what they know'] in each company. This formalisation or codification of appropriate information is referred to as a "knowledge-sharing routine" (Dyer and Singh, 1998:665), and is a way in which firms can encourage information sharing and increase their absorptive capacity.

Alliances and Knowledge Resources

The acquisition of knowledge is a strong motivator for firms to form alliances and closer linkages with customers or suppliers (Prahalad and Hamel, 1990; Yoshino and Rangan, 1995; Doz and Hamel, 1998; Kogut and Zander, 1992; Ebers and Grandori, 1997). Nelson and Winter (1982) explain how firms can accomplish much more by drawing on capabilities from external firms and individuals than they are constrained to do by their own internal firm capacity. The role of inter-firm linkages in facilitating knowledge transfer in technology intensive industries has received strong support (Hagedoorn, 1993; Powell et al., 1996; Yli-Renko et al., 2001; George, Zahra, Wheatley and Khan, 2001). Meyer and Alvarez (1998) and Alvarez and Barney (2001), demonstrate that alliances also provide a channel for the transfer of managerial skills.

Lipparini and Sobrero (1997) empirically compared the roles of entrepreneurs and managers in new product development focused linkages. They found that entrepreneurs are more inclined to use inter-firm linkages with other firms to develop products than managers from older, established firms. They also found that entrepreneurs engaging in new product development alliances were more likely to engage in more innovative and complex developments than were managers from established firms.

Researchers have provided evidence that entrepreneurial firms attempting to commercialise new technologies realised significant benefits through engaging in alliances, and that the innovation output of start-up and new firms is positively correlated with the number of alliances they engaged in (Shan, Walker and Kogut, 1994; Deeds and Hill, 1996). Product development alliance studies have, however, often focused on development within a joint venture or equity alliance structure, while non-equity structures have received less attention (Yoshino and Rangan, 1995). Although the majority of empirical studies on inter-firm alliances, knowledge transfer and innovation have focused on the biotechnology and pharmaceutical sectors, other technology-based industry sectors such as information technology and communications technology have also found alliances to be positively associated with innovative performance.

Although alliances and inter-firm linkages provide a channel for resource exchange between firms, they may also create a situation of dependence, where the entrepreneurial firm is often the more resource dependent partner and therefore vulnerable to a number of risks associated with this condition (Larson, 1992; Venkatraman et al., 1990). These risks to the new firm include being exploited and not receiving a fair share of alliance benefits because benefits are appropriated by the stronger partner (Alvarez and Barney, 2001). Dependence between partner firms has received significant attention from researchers investigating buyer-seller relationships (Reve, 1992; Heide and John, 1988; Anderson and Narus, 1990; Frazier, 1999), who emphasise the need for dependence balancing in order to create healthy inter-firm relationships. Frazier (1999) suggests that mutual dependence is positively associated with the development of trust between partners. The early seminal work by Thibaut and Kelley (1959) can be extended to inter-firm relationships, and suggests that interdependence between exchange partners is beneficial to the development of relational norms.

Unlike the traditional transaction-governed buyer-supplier relationships which are vulnerable to asymmetries in dependence, new product development alliances are characterised by interdependency (Teece, 1992; Gulati and Singh, 1998; Das and Teng, 2000). Teece (1992) explains how both vertical and horizontal linkages can be beneficial to a firm's innovation endeavours, and further argues that the condition of

interdependency created between firms engaging in joint development make the alliance "hybrid" structure more effective and more efficient than either market or hierarchy. An alliance is preferred over the market mechanism as it facilitates constructive co-ordination and reduces concerns regarding the loss of valuable technological expertise. It is also preferred to the hierarchy structure since the nature of the alliance structure provides more incentives for technological innovation and provides accelerated feedback mechanisms which are faster than within the hierarchical firm (Ebers, 2001:10).

Knowledge Loss

While the advantages of beneficial knowledge transfer between alliance partners is widely recognized, the risks of undesirable knowledge loss has received considerably less empirical attention. Pitkethly (2001), however, emphasises that in examining 'knowledge management', it is critical to have an understanding of how to appropriately protect knowledge. He observes that knowledge management in the context of inter-firm relations, "means management not just of Knowledge or Intellectual Property *per se,* but of the legal rights that define them in those dealings – the Intellectual Property Rights that a company controls" (Pitkethly, 2001:425).

As discussed in the previous section, property-based resources are more easily managed because they are protected by property rights. While certain knowledge-based resources can be protected by intellectual property rights such as patents and copyrights, their protection is often less certain than the protection of physical and tangible resources. Nonaka and Teece (2001:13) explain that there can be "holes" in intellectual property protection which could allow a patent to be "invented around" and further, that intellectual property protection in the form of patents or copyrights could expire, leaving a firm vulnerable. Many firms, therefore, use "secrecy" as an intellectual property protection method (De Laat, 1997:135) even though secrecy in itself has other disadvantages if it is not maintained.

The effective transfer of knowledge between the two firms engaging in joint product development is important for collaborative success (Littler et al., 1995). The transfer of technological knowledge is, however, challenging, as it however is often difficult to codify and is therefore "sticky" (Szulanski, 1996). Moreover, the nature of

technological knowledge is that it is not easily contained and, therefore, difficulties arise in trying to specify what should be shared and what needs to remain secret and protected. In addition, specifying the limitations to the use of shared knowledge is often difficult (Anand and Khanna, 1997).

As mentioned, challenges arise in protecting intellectual property even in the presence of patent protection, as patents can be circumvented (Nonaka and Teece, 2001). It is thus conceivable that trying to manage and protect knowledge that is not legally covered by instruments such as patents would be significantly more challenging. Knowledge loss can therefore occur because of the difficulties associated with codifying and creating boundaries around it, because of difficulties in protecting it, and ambiguities that exist around specification of the limits of using it (Gulati and Singh, 1998; Anand and Khanna, 1997).

Knowledge can also be lost through the opportunistic behaviour of an alliance partner who uses the knowledge in a self-interested way, so that the entrepreneurial firm becomes vulnerable to being exploited by the alliance partner (Alvarez and Barney, 2001). An alliance partner may, for example, capture the technological research carried out by a smaller firm via a new product development alliance, but then proceed to commercialise the technology independently (rather than jointly). Alvarez and Barney (2001) further warn entrepreneurial firms that, although "alliances often create economic value, most of this value is appropriated by the large firm" (2001:140). Risks associated with unintended knowledge leakage and opportunistic use of this knowledge by an alliance partner are heightened for new firms as they often do not have the experience or resources to safeguard their intellectual property (Lawton-Smith et al., 1991).

2.5 SOCIAL RESOURCES

New and young firms do not have extensive performance histories. The quality of their management team is relatively untested and their competencies and capabilities are therefore ambiguous to external assessors. This "liability of newness" (Stinchcombe, 1965) causes these firms difficulty. Their lack of credibility and legitimacy negatively affects their efforts at trying to acquire resources or to leverage resources via an alliance (Baum and Oliver, 1991; Eisenhart and Schoonhaven, 1996).

In their study of the new product development alliance activity of 102 semi-conductor firms, Eisenhart and Schoonhaven (1996) emphasise the importance of credibility, social position and a network of business contacts, also referred to as "contacts and credibility" (D'Aveni, 1990). They argue that these social resources are critical for the growth of entrepreneurial firms and they provide evidence that shows how firms who do not have these social resources are denied the opportunity to grow through new product development alliances, thus revealing "the most fundamental irony of alliancing: firms must have resources to get resources" (Eisenhart and Schoonhaven, 1996:139).

Of the range of different aspects of social resources, "contacts and credibility" -- that is, the extent of network contacts and reputational assets - have received the greatest attention from entrepreneurship researchers (Chaganti, De Carolis and Deeds, 1996; Eisenhart and Schoonhaven, 1996; Baum and Oliver, 1991; Stuart, Hoang and Hybels, 1999; Coombs and Bierly, 2001), and have therefore been chosen for further investigation in this study.

Contacts

Network contacts are an important component of social capital. Social capital is described as having a structural, cognitive and relational dimension (Nahapiet and Ghoshal, 1998). Burt (2000:285) defines social capital in terms of the network of relationships a firm has and describes the two approaches taken to analyse the network. The first is to view the network as a "conduit" to sources of physical, human and intellectual capital and other resources. The second approach views the network as a valuable resource in its own right, and as another component of social capital. In this approach, the primary measure of social capital is network size. The two approaches are complementary in explaining the concept of social capital. As Burt suggests, "social capital is at once the structure of contacts in a network and resources they each hold" (2000:285). The benefits of developing a network of contacts are numerous and include heightened innovation output, knowledge acquisition, and access to financial resources (Powell et al., 1996; Oliver and Liebeskind, 1998; Cockburn and Henderson, 1998; Yli-Renko et al., 2001; Lee et al., 2001).

The biotechnology sector in particular, has provided evidence that larger networks are associated with higher levels of innovation (Powell et al., 1996) and that greater degrees of connectedness are linked to increased research output (Cockburn and Henderson, 1998). A further benefit of developing network linkages is shorter time to market for new products (Kogut, 2000). Research on entrepreneurial firms has found that not only is the firm's network of importance, but the network of the entrepreneur and the top management team is also important. It has been found that the social resources of the entrepreneur and managers influence the social resources of the entrepreneurial firm (Chaganti et al., 1996; D'Aveni, 1990). Managers who had previously held high status positions and are well-connected confer enhanced social resources onto their firm (D'Aveni, 1990).

Networks on the level of the individual are also associated with increased knowledge flow. Oliver and Liebeskind (1998) argue that the interchange of knowledge primarily occurs via the individual's network of relations.

Credibility

Nahapiet and Ghoshal (1998:243) argue that networks can also be a source of reputation: "social status or reputation can be derived from membership in specific networks." Nahapiet and Ghoshal (1998) highlight this by drawing on the work of Bourdieu (1985), Burt (1992), D'Aveni and Kesner (1993). Firms can enhance their credibility in two ways - either internally, by focusing on the social resources of their management team (Chaganti et al., 1996), or by seeking "external sources of endorsement" (Coombs and Bierly, 2001:383). D'Aveni (1990) provides evidence to show that the firm's image is closely linked to the social status and position of its management team. Chaganti et al. (1996) show that characteristics such as the education and experience of the management team influence the firm's legitimacy and signal the firm's credibility to providers of financial capital.

In addition, successful alliance formations with well-known firms (Baum and Oliver, 1991), and favourable coverage by the media (Stuart et al., 1999; Coombs and Bierly, 2001) have been found to have a positive impact on a firm's reputation and credibility. Although researchers are in agreement that high levels of credibility increase a firm's chances of entering into an alliance through which resources can be

accessed (Stuart et al., 1999; Eisenhart and Schoonhaven, 1996; Gulati, 1995) and that successful alliance formation subsequently further enhances the firm's credibility, creating an upward spiral, a question which remains is whether the governance structure of the alliance influences the degree to which the focal firm's credibility is enhanced.

Social Resources and Alliance Governance

Gulati (1995) argues that firms with more social resources, that is, larger networks and stronger reputations, will tend to enter into non-equity, contractually governed alliances rather than equity alliances, because their network size and reputation is a signal of their "trustworthiness" and as trust is a social control mechanism, stronger formal controls in the form of an equity governed alliance will not be needed to mitigate risk.

Contrary to the above, Hagedoorn (1993) argues that an equity structure in an alliance represents a 'hostage investment'. This investment into an equity alliance places alliance partners under greater pressure to be committed than a non-equity alliance would, so that an alliance partner would prefer to engage with a firm that is believed to be "trustworthy". Hence, although Gulati (1995) suggests that firms with more social resources (large network and high credibility) will tend to use non-equity contractually governed alliances, Hagedoorn (1993) differs and argues that these firms will tend to use equity alliances. Coombs and Bierly (2001) present and test each of these two views using data from the Recombinant Capital Biotech Alliance database. Their findings support Hagedoorn's (1993) view that firms with larger networks and higher levels of legitimacy are more likely to enter into equity alliances.

Although these studies have given us an insight into the link between social resources and alliance governance, they have maintained a focus on the choice between equity or non-equity contractually governed alliances. Firms gain social resources through interaction with an alliance partner, yet much less attention has been given to examining whether and how the governance structure, including the relationship structure, affects the degree to which the focal firm's social resources are enhanced.

It is therefore pertinent and necessary to extend the previous focus of equity versus non-equity governance to governance forms which are more prevalent in short-term

alliances, that is, relational and contractual governance mechanisms. Further, it is necessary to ascertain whether and how short-term alliance governance mechanisms influence social resource acquisition by the new technology-based firm.

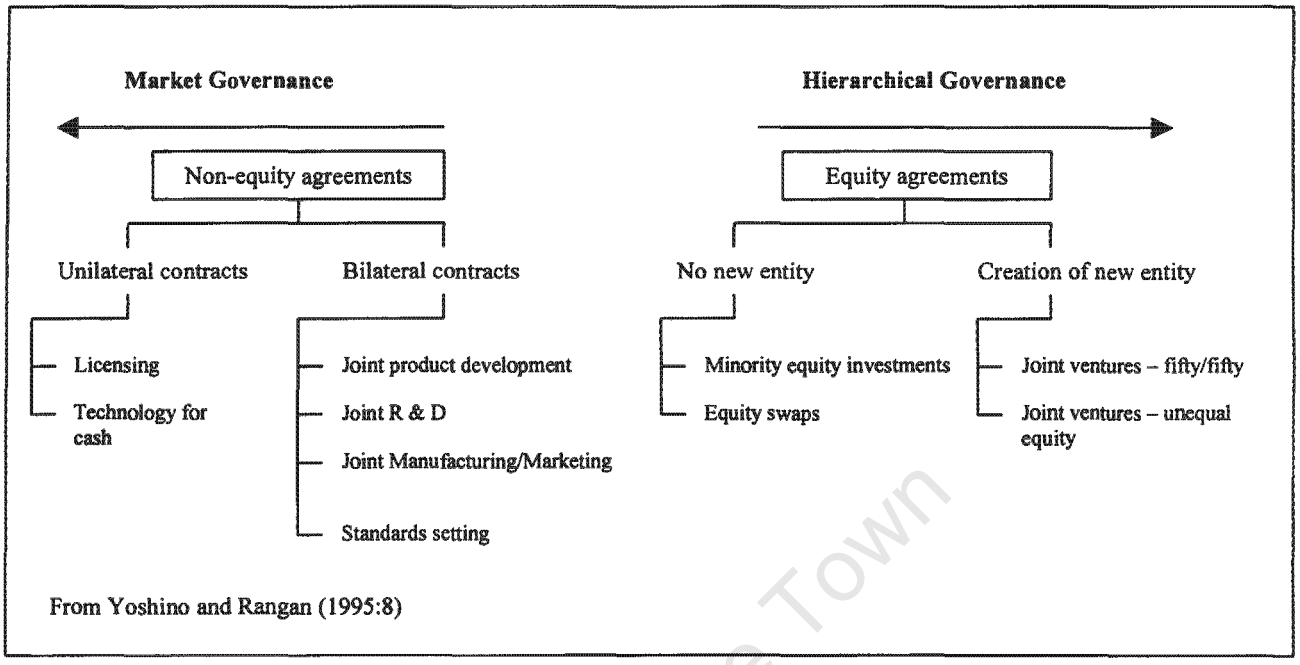
2.6 ALLIANCE GOVERNANCE

Governance, according to the Oxford English dictionary, refers to 'control'. Alliance governance therefore refers to the mechanism used to 'control' the alliance. Alliances can take numerous forms, from relatively simple licensing agreements to joint product development, joint research and development, buyer-supplier partnerships, through to complex equity agreements and joint ventures. Despite various definitions for alliances, researchers have focused on alliances as inter-firm agreements of an enduring or relatively long-term nature between co-operating firms (Weaver and Dickson, 1998; Dickson and Weaver, 1997; Jarrillo, 1988).

In order to organise the different forms of alliances, researchers have used the alliance governance structure as an indicator of where an alliance can be positioned on the continuum between the extremes of market and hierarchy proposed by Williamson (1975). Alliances with stronger hierarchical controls are considered to tend towards the hierarchy side of the continuum. A joint venture (the creation of a separate entity with significant equity investments from both alliance partners) is considered to be more hierarchical than a minority equity alliance agreement, while a non-equity alliance would be considered the least hierarchical of the three structures. How different alliance types can be arranged on this governance continuum is illustrated in the following figure, which is drawn from Yoshino and Rangan (1995:8).

Researchers examining alliance governance structures have tended to classify alliances as either equity or non-equity (Osborn and Baughn, 1990). While this is useful in simplifying the range of structures used for alliances, it has recently been heavily criticised as it "masks differences across each type of structure", and treats the issue of control in a dichotomous way (for example, yes = equity; no = non-equity), which is problematic (Gulati and Singh, 1998:782).

Figure 2.1 Types of Alliances Governed by Equity and Non-equity Agreements



Advantages of Non-Equity Alliances

As non-equity alliances do not require a separate entity to be formed, nor any changes in firm ownership structure, they are relatively easy to set up and dissolve. They can be organised quickly and can be more flexible than equity alliances. They are therefore the preferred alliance type for short-term alliances (Hagedoorn, 1993; Hagedoorn and Narula, 1996). Non-equity strategic alliances are often used for joint product development and joint manufacturing and marketing arrangements (Yoshino and Rangan, 1995).

A concern with both the strategy research and marketing channel research is that in examining alliances (both equity, non-equity contractually governed and relationally governed) the focus has been on long-term, relatively enduring alliances (Weaver and Dickson, 1998; Dickson and Weaver, 1997; Jarillo, 1988). This is understandable for equity alliances because the investment in a joint venture or equity agreement is substantial and the complex ownership structures created warrant a long-term orientation. A long-term orientation is also logical for buyer-supplier alliances. A long-term orientation is, however, neither necessary nor warranted for alliances aimed at capitalising on a transient opportunity (Das and Teng, 2002) such as new product

development alliances. The research focus on long-term and enduring inter-firm relationships has resulted in the study of short-term, focused inter-firm relationships being neglected (Lambe et al., 2000).

In examining non-equity alliances, researchers have primarily viewed governance from the economic or sociological perspective. Those viewing governance from the economic perspective often draw on transaction cost theory as articulated by Williamson, (1975;1985), while those viewing governance from a sociological perspective draw on social exchange theory (Blau, 1964; Homans, 1958; Thibaut and Kelley, 1959), and on the relational exchange perspective (which has been developed by drawing on the work of socio-legal scholars such as Macneil (1978;1980) and Macaulay (1963).

Transaction cost theory has often been associated with formal, contractual control structures, while the social exchange and relational exchange perspectives have been associated with informal social controls. The theories have largely been used to explain polar forms of governance. Williamson (1975; 1985) proposes that governance mechanisms may be arranged on a continuum, with markets at the one extreme, hierarchies at the other extreme, and relational exchange (Macneil, 1978) governed by relational norms in-between (Cannon et al., 2000). Bradach and Eccles (1989:97) propose an alternate perspective: that markets, hierarchies and relational governance mechanisms are independent governance forms and can be combined in a number of different ways. Cannon *et al.* (2000) follow this perspective and look at the effects of combining contractual governance and governance by relational norms. Their study examines the effect of governance on supplier performance (where performance is measured in terms of price, delivery, quality, and after sales service and technical support received from the supplier). Poppo and Zenger (2002) have similarly explored the relationship between governance and vendor performance.

Formal, contractual governance forms can be broadly classified according to the extent that the contract governs transactions characterised as market exchanges, or the extent to which the transactions depart from simple, market-based exchanges and approach long-term relational exchanges. Classical contracting, neo-classical contracting and relational contracting are the three broad classifications described by Macneil (1978) and by Williamson (1985:79). Classical contracting applies to the

governance of market-based transactions. Characteristics of classical contracting are that: first, the identities of the exchange partners are treated as irrelevant; second, the agreement is formal, that is, written rather than informal and verbal; third, consequences of non-performance are clearly specified (Macneil, 1978:864, cited in Williamson, 1985:69). In long-term exchanges, difficulties arise in writing a contract due to an unpredictable future, uncertainty and limited knowledge.

Neo-classical contracting was developed in order to address some of these difficulties. As opposed to the classical contract which attempts to cover actions for every conceivable turn of events, the neo-classical contract deliberately has "gaps" in the contract, allowing issues to be resolved if and when they occur. The "gaps" also serve to lessen the task of planning, as firms do not need to plan for every eventuality. Recourse to legal procedures is not encouraged in neo-classical contract law and third party assistance in conflict resolution is preferred. Neo-classical contracting is used for transactions of a longer duration and which require a more extensive interaction between parties in the agreement.

Relational contracting has developed for transactions which are very different from market exchanges. Transactions in this mode are long-term and complex in nature, and require extensive interaction between parties. Macneil specifies that the difference between relational contracting and neo-classical contracting is that in neo-classical contracting, although there are "gaps" in the contract, the reference point is still the contract, while in relational contracting, the reference point is the "entire relation as it has developed" (Macneil, 1978: 890, cited in Williamson, 1985:72). The development of trust and relational norms constitute the implicit "contract". This broad classification of contracting types is useful in seeking to understand why different types of alliances are governed under particular contracting regimes.

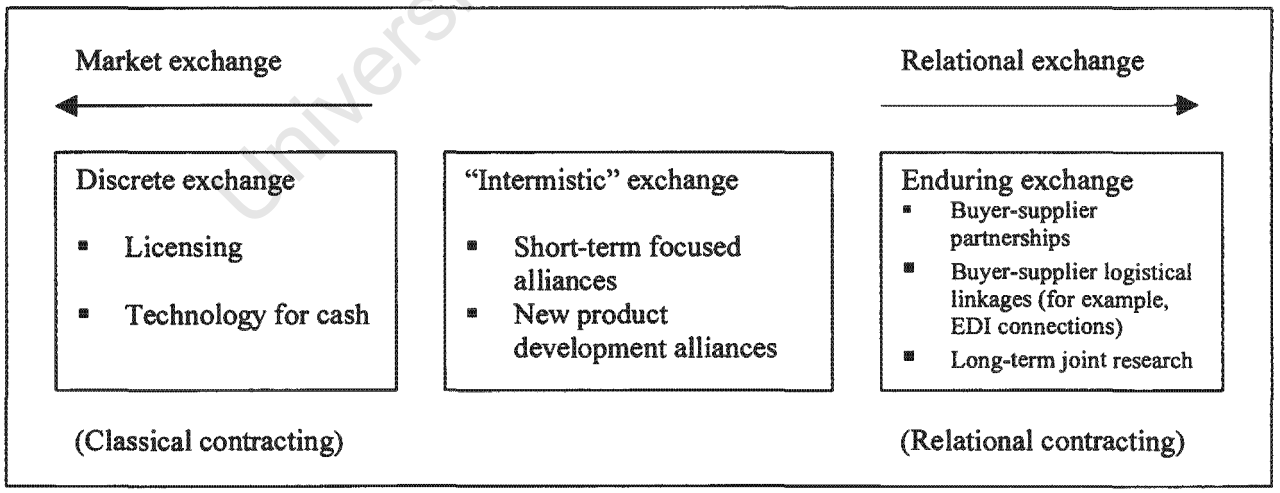
Alliances which are confined to the transfer of well defined resources with clear property rights such as licensing agreements or "technology for cash" arrangements (Das and Teng, 2000) can easily be governed by classical contracts because they approach simple arms-length market exchanges. Contracts governing this type of exchange are often referred to as unilateral contracts (Mowery et al., 1996; Williamson, 1985). This type of exchange does not require much collaboration or

interaction and therefore integration between the firms is usually at a very low level (Das and Teng, 2000).

In contrast to this, alliances which are focused on the development of new products or technologies, long-term research and development, or buyer-supplier partnerships, are characterised by high levels of interaction, collaboration, and integration, and require extensive co-ordination (Das and Teng, 2000). Clearly these types of alliances are more complex than the type previously described and creating an appropriate contract (explicit or implicit) will be more challenging.

Exchange can be governed "formally" by explicit contracts or "relationally" by informal, implicit relational contracts which consist of relational norms and trust developed between firms (Macneil, 1980). In formal contractually governed exchange, adherence to the agreement can be enforced by a legal court (classical contracts) or by suitable third-party assistance in resolving disputes (neo-classicial contracts) (Williamson, 1985:70; Macneil, 1978:865). In contrast, relationally governed exchange relies on mutual trust, norms and the enforcement of social sanctions to encourage adherence to the agreement (Macneil, 1980). These governance types are summarised in the following illustration.

Figure 2.2 Governance of Alliances and the Contracting Continuum



This framework is adapted from the work of Lambe, Spekman and Hunt (2000:215); Williamson (1985:79) and Macneil (1978).

Figure 2.2 summarizes the key dimensions of governance in alliances, that is the degree to which formal (legal, contractual) mechanisms are employed versus the degree to which informal (relational, social) mechanisms are employed to govern the alliance. Marketing channel researches have explored informal, relational governance mechanisms (the right-hand side of the continuum in figure 2.2) extensively and have found that as the quality and length of the relationship between the two firms increases, they will tend to move away from using formal contractual governance mechanisms towards using stronger informal relational governance mechanisms (Spekman et al., 1998; Sako, 1992; Ring and Van de Ven, 1992).

The strength of the formal, contractual governance mechanism employed has been measured as the comprehensiveness of the governing contract (Poppo and Zenger, 2002; Cannon et al., 2000). It has been proposed that the strength of the formal contractual governance mechanism used in an alliance is influenced by the familiarity between firms (Deeds and Hill, 1998), and the type of resources being shared, for example, when there is a greater need to share technological resources rather than marketing resources firms will tend to use stronger contracts to protect their intellectual property (Mitchell, Dussauge and Garette, 2002).

Governance of Short-term versus that of Long-term Alliances

Collaborative new product development is aimed at capitalising on an opportunity which is often transient (particularly in technology intensive industries where the window of opportunity is often very short).

Collaborative new product development differs from technology joint ventures and long-term research and development agreements, where the long-term nature of the alliance justifies the use of equity governance and is appropriately governed by equity arrangements. As an equity investment is substantial and the rearrangement of ownership structures complex, equity arrangements are more often associated with long-term alliances (Hagedoorn, 1993) aimed at the development of new technology platforms and research in areas with a long-term perspective on commercialisation. In contrast, collaborative new product development is more focused, of limited duration, and, as rapid capitalisation of an opportunity is required, time is critical. Collaborative new product development is therefore not often governed by complex equity

structures, but rather as non-equity arrangements (Das and Teng, 2000). Collaborative new product development also differs from marketing channel buyer-supplier linkages.

The aim of the entrepreneur in entering a new product development alliance is to access complementary resources which will enable the new firm to commercialise a new concept. Although these complementary resources may be held by a supplier or customer, the aim of forming an alliance with the holder of these complementary resources is not to form an "enduring" linkage, as is the focus of marketing channel participants, but rather to work collaboratively for a limited time in order to successfully develop a product.

Das and Teng (2002) suggest that long exchange horizons (that is, alliances with a long-term or enduring perspective) have an increased need to develop relational controls, as it is argued that it is harder to monitor whether a contribution from one firm to a partner firm has been adequately reciprocated due to the passage of long periods of time. Furthermore, difficulties in monitoring behaviours over long periods necessitate the use of social sanctions and the development of co-operative norms (Das and Teng, 2002).

Thus, while the marketing channel literature is relevant and contributes towards understanding new product development alliance relationships, new product development alliances are of a short-term nature whilst marketing channel relationships are of a long-term nature, and there is a need for research to explore the implications of this difference.

2.7 LITERATURE REVIEW CONCLUSION

This chapter discussed three perspectives for examining alliances.

Transaction cost theory was used to explain why a firm would choose a particular governance structure for a transaction (or set of exchange transactions). Transaction cost theory proposes that a firm will choose a governance structure, which minimises transaction costs (Williamson, 1975; 1985). Governance structure is seen to range from hierarchy (organisation of transactions within the hierarchical firm) and market

(organisation of transactions in the market where price mechanisms operate). The alliance form is considered to be a "hybrid" form.

Concepts drawn from transaction cost theory which are particularly relevant to this study are: transaction costs, alliance governance mechanisms, opportunism, and bounded rationality. At its core, transaction cost theory is concerned with governing transactions in a way that minimises transaction costs and risks in order to achieve efficiency.

Social exchange theory and the relational exchange perspective was discussed and provided a platform for reviewing studies which examined the development of relational governance mechanisms and the outcomes of interfirm relationships governed by relational elements. The bulk of the literature drawing on these theories has focussed on long-term relationships, and this singular focus has left a number of issues unexplored which were identified in the discussion.

The third perspective that was examined was the resource-based view. Unlike the previous two perspectives which are primarily concerned with governance, the focus of the resource-based view is on the acquisition of valuable resources and the development of competencies and capabilities. In particular, the acquisition of knowledge and social resources which are important to new technology-based firms were examined. Empirical work highlighting studies which are salient to the study of governance and outcomes were explained and discussed, and the paucity of work on short-term alliances in intense new product development contexts was identified.

Independently, each perspective fails to address how short-term new product development alliances can be governed to maximise new product development performance and knowledge and social resource acquisition, whilst minimising transactional co-ordination costs and knowledge leakage risks. This shortcoming suggests that integration of these perspectives is needed.

The next chapter builds on the theoretical and empirical work presented in this chapter and draws specifically on studies done in the context of innovation. It integrates the relevant literature and discusses the development of a conceptual framework and hypotheses which guide this study.

CHAPTER 3

CONCEPTUAL FRAMEWORK

This chapter integrates and elaborates on specific elements of the literature reviewed in the previous chapter.

This chapter develops hypotheses regarding the association of relational and formal contractual governance with multiple outcomes of the new product development-focused alliance. The hypotheses are arranged into a conceptual framework that has three components, namely:

1. Governance and new product development performance relationships
2. Governance and resource acquisition and resource loss relationships
3. Governance, collaboration costs, and new product development performance relationships.

It is through this conceptual framework that the influence of relational and formal contractual governance mechanisms on new product development performance, social resource and knowledge-based resource acquisition, exposure to the risks of knowledge loss, and increased collaboration costs are investigated. This chapter is concluded by presenting a list of the hypotheses and an overall governance-outcomes framework.

In addressing the heightened pressures associated with collaborative new product development, researchers have either emphasised the development of social processes between firms (Dodgson, 1993; Larson, 1992; Bonaccorsi and Lipparini, 1994) or they have highlighted the need for formal processes and controls (Mabert, Muth and Schmenner, 1992; Farr and Fischer, 1992). Insights on collaborative new product development can also be drawn from research on cross-functional new product development (Millson and Wilemon, 2001). Cross-functional new product development research has similarly tended to focus on either social or formal controls in new product development.

In addition to formal controls and social processes, the effectiveness of the new product development team has been suggested to have a significant impact on new product development performance (Ayers et al., 1997; Bonaccorsi and Lipparini, 1994; Millson and Wilemon, 2001; Olson et al., 2001).

3.1 GOVERNANCE AND NEW PRODUCT DEVELOPMENT PERFORMANCE RELATIONSHIPS

3.1.1 Formal Contractual Governance and New Product Development Performance

A number of studies are discussed below which provide useful insights and guidelines for examining the effect of formal processes on new product development performance and the alliance team's effectiveness.

Formal contractual governance, also called 'formal controls', refers to the presence of a contract between the two firms which clarifies roles, responsibilities, development schedules and intellectual property rights. It has been argued that formal planning and formal controls in highly uncertain environments, such as new product development in technology-based firms, may not be very useful due to the uncertainties and unknowns in this context (Eisenhart and Martin, 2000; Yli-Renko et al., 2001).

Certain formal controls such as the presence of schedules and milestones have, however, been found to be useful for accelerating in-house, single firm new product development in technology-based firms (Eisenhart and Tabrizi, 1995). Additionally, although it has been argued that monitoring (often associated with formal controls) results in time loss and transaction costs (Barney and Hansen, 1994; Sako, 1992; Uzzi, 1997; Dyer and Singh, 1998). Checking adherence to schedules using real data and objective information has been found to accelerate learning, as it forces managers to continuously collect data, evaluate it and make informed decisions about the direction of the development, thus, speeding up the development process (Weick, 1993).

When there is an absence of formal schedules and review points, managers tend to procrastinate. As highlighted by Eisenhart and Tabrizi (1995:93) who cite Gersick (1989), "frequent milestones also shorten development time because they are

motivating. Their frequency creates a sense of urgency that keeps developers from procrastinating". Without schedules and milestones, managers are not forced to discuss and evaluate progress, hence communication may occur less frequently. Problems may take longer to be picked up and become more difficult to rectify, lengthening product development time. The presence of schedules and milestones creates formal review points and prompts discussion between the firms developing the product. It is argued that this increased level of discussion and understanding between the firms' development teams leads to superior product development performance (Littler et al., 1995).

In addition to the presence of schedules and milestones, the protection of intellectual property is critical to new technology-based firms because intellectual property is often their most valuable asset (Alvarez and Barney, 2001).

Williamson (1975; 1985) highlights how behavioural uncertainty and fears of opportunistic behaviour will affect the strength of the safeguards used in the alliance governance structure. Contractual safeguards are a mechanism proposed by Williamson (1975; 1985) to address opportunism. However, despite the emphasis on contractual safeguards to protect transactions from the hazards of opportunism, Williamson (1985:32) admits that contracts can never be complete because the managers negotiating the contracts are boundedly rational.

It is therefore postulated that the extent to which the formal contract is able to comprehensively clarify ambiguities regarding roles, responsibilities, schedules and intellectual property ownership will influence its ability to provide an effective governance structure for collaborative new product development. Therefore increased comprehensiveness of the formal contractual governance structure is expected to be associated with increased new product development performance.

Hypothesis 1: **New product development performance is positively associated with increasing comprehensiveness in formal contractual governance.**

3.1.2 Formal Contractual Governance and Alliance Team Effectiveness

The effectiveness of the new product development team has often been associated with higher levels of new product development performance (Griffin and Hauser, 2001; Olsen, Walker and Ruekert, 1995; Song and Parry, 1997). In inter-firm collaborative new product development, the development team spans two firms and is referred to as the alliance team. Team effectiveness refers to the extent that the two firms are able to work well with one another, that is, whether they are well integrated, able to effectively meet alliance objectives and satisfied enough with their working relationship to want to work with one another again in the future (Anderson and Narus, 1990:46).

An extensive part of the literature on team effectiveness has tended to emphasise the role of social controls such as trust and norms (for example, Souder, 1988; Bonaccorsi and Lipparini, 1994; Olsen, Ruekert and Walker, 1995). However, studies in the new product development context have suggested that formal controls may improve team effectiveness. Milestones and schedules have been found to have a positive impact on team cohesion, as review points provide a forum for discussion which encourages team integration and an effective working relationship (Eisenhart and Tabrizi, 1995). Although review meetings of the progress of the project can be time consuming, the discussions allow managers to pick up problems earlier rather than later, and it allows firms to iron out any problems in the alliance relationship (Mabert, Muth and Schmenner, 1992; Bonaccorsi and Lipprini, 1994). It is therefore expected that comprehensiveness of the formal contractual governance structure will be associated with higher levels of alliance team effectiveness.

Hypothesis 2: **Alliance team effectiveness in new product development projects is positively associated with increasing comprehensiveness in formal contractual governance.**

3.1.3 Relational Governance, New Product Development Performance and Alliance Team Effectiveness

Relational governance (Macneil, 1978; 1980) refers to the presence of relational norms and trust, which have developed through the inter-firm relationship and which serve to control the behaviour of alliance partners.

New product development is a creative process where there are often many unknowns and potential problems which arise from conditions of uncertainty and a lack of prior knowledge (Crawford and Di Benedetto, 2000). Creativity has often been associated with team processes where social norms are established that foster idea generation and lateral thinking, and deter unconstructive criticism (Osborn, 1963). Informal communication increases the exchange of ideas and thereby improves the effectiveness of a team (Pinto, Pinto and Prescott, 1993; Mabert et al., 1992). Ayers *et al.* (1997:110) note that "relational norms facilitate the flow of information that enables people to present contingencies that may jeopardize performance. Flexibility provides the opportunity to make adjustments that increase the market value of new products. Conflict harmonisation and solidarity enable people to resolve disputes that may prolong development."

Ayers *et al.* (1997) observe that there are two views regarding the effect of relational norms on new product development. The first view argues that norms and social processes improve new product development. The second view, however, is that these processes can reduce new product development performance. It argues that shared norms and a high level of team cohesiveness may stifle new product development because of "groupthink", which Janis (1983) has termed the inclination of groups to seek agreement at the expense of new ideas and differing opinions. That is, in essence, the social relationships formed prevent conflicting ideas from being voiced. Souder's (1988) study of 289 projects over a ten year period supports Janis' (1983) "groupthink" discussion. The results of his study showed that high levels of social interaction between functional groups prevented objective discussion and criticism of ideas. However, Lane and Bachman (1998) have argued that groupthink is less likely to occur in inter-firm contexts than in single firm, in-house contexts, because norms are less established in inter-firm contexts. Additionally, this study is focused on short-term relationships where participants may well not have sufficient time to develop Souder's (1988) "too good friends" syndrome.

The discussed studies have found that relational governance has enhanced creativity, communication, flexibility and conflict harmonisation between groups. The threat of relational governance reaching a performance-damaging level due to groupthink has been argued to be less of a risk in inter-firm contexts where norms are less

established, than in in-house contexts. It can therefore be postulated that higher levels of relational governance will be associated with higher levels of alliance team effectiveness and new product development performance in inter-firm collaborative new product development contexts.

Hypothesis 3: **New product development performance is positively associated with higher levels of relational governance.**

Hypothesis 4: **Alliance team effectiveness in new product development projects is positively associated with higher levels of relational governance.**

3.1.4 Alliance Team Effectiveness as Mediator in the Governance and New Product Development Performance Relationships

It has been additionally suggested that new product development team effectiveness is positively related to new product development success (Ayers et al., 1997; Bonaccorsi and Lipparini, 1994; Mabert et al., 1992), even though evidence of this relationship has been somewhat mixed. Ayers *et al.* (1997) in their study of 19 new product development projects within one multinational computer manufacturer, however, find no significant relationship between product development team effectiveness and new product development success.

In contrast, Bonaccorsi and Lipparini (1994) found that higher levels of alliance team effectiveness (where the alliance is between the firm and a supplier) positively influenced new product development performance by shortening development time. They also found a positive association between effective firm-supplier working relationships and the rate of new products developed. Additionally, Mabert *et al.* (1992) found that firms who were able to improve the effectiveness of their team processes (by various methods such as having new product development participants in close proximity) were successfully able to reduce development time. Drawing on this discussion and the preceding discussion regarding the effect of governance on alliance team effectiveness and new product development performance, it is postulated that alliance team effectiveness mediates the relationship between governance and new product development performance.

Hypothesis 5: **Alliance team effectiveness in new product development projects mediates the relationship between governance and new product development performance.**

3.2 GOVERNANCE, RESOURCE ACQUISITION AND RESOURCE LOSS RELATIONSHIPS

3.2.1 Governance and the Acquisition of Social Resources

Social resource acquisition refers to the extent that the entrepreneurial firm has increased its "contacts and credibility" (D'Aveni, 1990; Eisenhart and Schoonhaven, 1996) through the new product development alliance. Legitimacy, reputation, credibility and a network of contacts are crucially important for new firms, who often lack these social resources and are therefore prone to "liabilities" associated with these inadequacies (Stinchcombe, 1965).

This lack of social resources manifests itself in difficulties the entrepreneurial firm faces in trying to acquire and access needed resources, alliance partners and opportunities for growth (Baum and Oliver, 1991; Eisenhart and Schoonhaven, 1996). Granovetter (1985) and Burt (2000) highlight that social resources such as reputation and contacts are acquired through relationships. The development of trust within a relationship is positively associated with the acquisition of social resources, and, in particular, the demonstration of process-based trust (Zucker, 1986) is argued to lead to reputation and credibility being ascribed to the firms involved (Sydow, 1998). Sydow (1998:43) describes process-based trust as the type of trust which develops from first-hand experience of trustworthy behaviour within social or economic exchange transactions.

The use of social processes has been found to be associated with an entrepreneurial firm's ability to gain useful contacts and expand its network (Birley, 1995; Swedburg, 2000; Larson, 1992). Larson (1992) has proposed that in a relationship where trust and relational norms have developed, the alliance partner will be more inclined to provide a reference for the entrepreneurial firm. Since the alliance partner has experienced working with the new firm, it will more readily vouch for the new firm's credibility and refer the new firm to other useful contacts based on "experienced-

based confidence that the connection will 'work'" (Cohen and Prusak, 2001:55). Cohen and Prusak (2001:23) argue that developing a relationship that leads to the acquisition of social resources and knowledge resources requires an "organic approach" and that formal controls are ineffective and may even damage attempts to develop a strong relationship and acquire these resources. It can hence be inferred that relational governance rather than formal contractual governance will enhance the firm's acquisition of social resources.

Hypothesis 6: **Social resource acquisition in new product development projects is positively associated with higher levels of relational governance**

3.2.2 Governance and the Acquisition of Knowledge-Based Resources

The acquisition of knowledge-based resources is critically important to firms developing new products, particularly in technology intensive industries where the rate of change and innovation is high and there is an imperative for firms to acquire and use new knowledge (Prahalad and Hamel, 1990; Nonaka, 1991). The nature of knowledge-based resources, however, makes transfer more complex than the transfer of more tangible resources (Das and Teng, 2000). Knowledge has been described as "sticky" (Szulanski, 1996) and "slippery" (Penrose, 1959). Researchers such as Polanyi (1966) and Nelson and Winter (1982) have differentiated between two types of knowledge: explicit "information" and tacit "know-how". Information can be transferred in written and verbal form, but tacit knowledge is significantly more difficult to transfer (Polanyi, 1966). Difficulties encountered in exchanging and copying tacit knowledge make it a valuable resource (Grant, 1996). Despite difficulties in exchanging knowledge, Nonaka and Takeuchi (1995) highlight the importance of transferring knowledge across firm boundaries in the creation of new knowledge and the development of new products. Researchers such as Kogut and Zander (1992), Lane and Lubatkin (1998), Doz and Hamel (1998), and Tsai and Ghoshal (1998) have presented a strong argument that knowledge transfer (particularly the transfer of tacit knowledge) in inter-firm contexts occurs primarily via inter-firm relationships and is facilitated by social processes, norms and trust.

Brown and Duguid (2001:59) highlight how social relationships create informal channels between groups allowing knowledge flow: "knowledge that seems sticky in formal channels may leak quite readily via valuable back channels". The idea that trust between firms is important in encouraging knowledge transfer has received strong support (Child, 1998; Barney and Hansen, 1994; Lane and Bachman, 1998). In addition to the presence of trust, the development of norms is posited to promote knowledge transfer by "opening access to parties for the exchange of knowledge" (Nahapiet and Ghoshal, 1998:255). Dyer and Singh (1998:665) suggest that an enhanced relationship and greater levels of acquaintance between alliance partners increases the absorptive capacity of the firms, improving their knowledge acquisition and knowledge assimilation efforts.

Despite the attention given to the acquisition of knowledge, Nahapiet and Ghoshal (1998) observe that no coherent theory has yet emerged. However, they note that "given the social embeddedness of intellectual capital, we suggest that such a theory is likely to be one that is primarily concerned with social relationships" (1998:250). It is therefore postulated that higher levels of relational governance are associated with increased knowledge acquisition.

Hypothesis 7: **The acquisition of knowledge-based resources in new product development projects is positively associated with higher levels of relational governance.**

3.2.3 Governance and the Loss of Knowledge-Based Resources

Nonaka and Teece (2001) stress that the loss of knowledge can expose the firm to a number of risks. Alvarez and Barney (2001) also highlight this and emphasise that entrepreneurial technology-based firms are especially vulnerable to risks associated with knowledge loss, as these risks could threaten their survival. Evidence of this risk is further provided by Littler et al.'s (1995) study of UK manufacturers of information and communication technology products. The results of their survey show that when respondents were asked about the risks of collaborative new product development, the overwhelming majority of respondents cited the risk of information loss as the major one.

When valuable proprietary knowledge belonging to the new firm is unfairly used by an alliance partner, it can be regarded as a form of opportunistic behaviour by the alliance partner (Alvarez and Barney, 2001). Two perspectives have most often been advanced regarding protecting a firm from harmful knowledge loss. The first draws on transaction cost theory (Williamson, 1975; 1985) and recommends the use of formal controls in the form of contractual safeguards. The second perspective recommends the development of a strong inter-firm relationship characterised by the presence of trust and relational norms. This perspective draws on social exchange theory (Thibaut and Kelley, 1959; Blau, 1964) and relational exchange conceptualisations (Macaulay, 1963; Macneil, 1978; 1980; Noordeweir, John and Nevin, 1990; Heide and John, 1992).

In support of the first perspective, Alvarez and Barney (2001) describe formal controls as an important mechanism for reducing opportunistic behaviour, particularly by large, established firms against smaller entrepreneurial firms. Cellini (1993) also recommends that a contract be negotiated in order to structure the agreement, clarifying what expertise will be shared and what will not. De Laat (1997:160, citing Levine and Byrne, 1986) describes how the use of a formal contract and an innovative commitment technique protected the smaller, lesser known firm, AMD (Advanced Micro Devices), and also ensured fair appropriation of benefits from the intellectual property developed through an alliance with Sony to produce SRAMS. "Both were to produce and market them separately. AMD feared it would be exposed to the threat of Sony freezing AMD out of the market by more efficient production techniques or plain dumping. It therefore required Sony to buy part of future AMD chips production for an adequate price. Sony signed a contractual price guarantee" (De Laat, 1997:160).

Richardson (1972), who observed how Marks and Spencer (a large British retail chain) has new products developed for their store through extensive cooperative relationships with manufacturers and suppliers along its supply chain made an early key contribution to the study of inter-firm linkages and innovation.

> *"Not only do Marks and Spencer tell their suppliers how much they wish to buy from them, and thus promote a quantitative adjustment of supply to demand, they concern themselves equally with the specification and*

development of products. ...Yet all this orchestration of development, manufacture and marketing takes place takes place without any shareholding by Marks and Spencer in its suppliers and without even long-term contracts" (Richardson, 1972:883).

Recently (1999), Richardson's observation regarding Marks and Spencer took on a new relevance, where the absence of a contract left a long-standing supplier very vulnerable. Marks and Spencer failed to meet the "obligation" implied by a long-standing cooperative relationship with a supplier as described by Richardson (1972), and this resulted in heavy losses for the supplier.

An extract from *The Daily Telegraph* explains the court's ruling on the situation.

> ***Supplier gives up M&S fight***
> *The clothing maker William Baird is set to relinquish his GBP53m claim for damages against Marks and Spencer after the House of Lords denied the firm's request to appeal against the ruling of the Court of Appeal in February, which stated that the case had "no real prospect of success". William Baird filed the lawsuit after Marks and Spencer ended their 30-year relationship with the firm, forcing it to close 16 factories and cut 4500 jobs. William Baird, which has incurred nearly GBP1m in legal fees, will now be forced to pay Marks and Spencer's undisclosed legal costs.*

Abstracted from: *The Daily Telegraph* on June 30, 2001

Deakin and Wilkinson (1998:151), in their paper entitled, "Contract law and the economics of inter-organisational trust", discuss why formal contracts and transaction cost theory is more appropriate to protecting a firm from the risks of opportunism than trust. In support of their assertion, they cite Williamson, who argues that:

> *"transaction cost economics refers to contractual safeguards, or their absence, rather than trust, or its absence. I argue that it is redundant at best and can be misleading to use the term 'trust' to describe commercial exchange for which cost effective safeguards have been devised in support of more efficient exchange"* (Williamson, 1996:256, cited in Deakin and Wilkinson, 1998:151).

Drawing on these views, it is hypothesised that increased comprehensiveness in the formal contractual governance structure will be associated with lower levels of knowledge loss.

Hypothesis 8: **Knowledge loss in new product development projects is negatively associated with increasing comprehensiveness in formal contractual governance.**

Despite the emphasis in transaction cost economics on contracts, Williamson (1975; 1985) has acknowledged the weaknesses of using contractual safeguards. In particular, 'bounded rationality' (limitations on the understanding and knowledge of managers involved in creating the contract), negatively affects their ability to write complete contracts which will provide comprehensive protection. Bounded rationality can be expected to be exacerbated in the context of new product development alliances which require firms to share knowledge, and to develop new products where outcomes are often characterized by great uncertainty. Codifying and containing what knowledge partners need to share, and what they need to retain tight ownership of, is difficult. The subsequent creation of contractual safeguards to accomplish this can be seen to be an even harder task (Nonaka and Teece, 2001). Teece highlights another weakness in the use of contracts to protect a firm's knowledge. He argues that in order to create a comprehensive contract, parties need to disclose a significant amount of information, rendering them vulnerable to opportunistic knowledge appropriation even before the contract has been forged and signed (Teece, 1988 cited in De Laat, 1997:153).

In order to overcome these difficulties associated with the protection of knowledge, researchers have drawn on social exchange theory and the relational exchange perspective and recommended the development of a strong relationship with high levels of trust between alliance partners as the only effective deterrent to harmful knowledge loss (Anand and Khanna, 1997; Gulati and Singh, 1998).

De Laat (1997:163) draws on the extensive work done on trust by researchers such as Deutsch (1962), Zand (1972), Blau (1964) and Sitkin and Roth (1993) and suggests that just as trust creates an upward spiral of increasing trust, so, too, does distrust have a spiral effect. He correlates the use of contracts with the perception of distrust, and

therefore believes that rather than reducing self-interested behaviour, contracts promote an upward spiral of increasing harmful behaviour and distrust. Larson's (1992) ethnographic study of alliances showed that alliance partners found the development of a trusting relationship a stronger deterrent to opportunistic behaviour than formal contracts. In addition, the need to maintain the status of being a trustworthy partner was also found to deter opportunism. Larson's (1992) findings are further supported by Deeds and Hill (1998), who found the strength of the relationship between firms to be a stronger deterrent to self-interested behaviour than contractual safeguards.

"Strong form" trust (Barney and Hansen, 1994) or the corresponding "goodwill trust" (Sako, 1998) and reputation (Larson, 1992) are argued to be more effective and less costly than contractual safeguards (Dyer and Singh, 1998; Sako, 1998). In discussing exchange relationships, Thibaut and Kelley (1959) suggest that the development of norms promote desirable behaviour; while the fear of social sanctions deter parties from harmful behaviours. Das and Teng (1998) amplify how the presence of trust and norms increase partners' confidence in one another, and raise the predictability of their behaviour, thereby effectively reducing concerns regarding losses through opportunism. It can therefore be expected that higher levels of relational governance will be associated with lower levels of knowledge loss.

Hypothesis 9: **Knowledge loss in new product development projects is negatively associated with higher levels relational governance.**

3.3 GOVERNANCE, COLLABORATION COSTS AND NEW PRODUCT DEVELOPMENT PERFORMANCE RELATIONSHIPS

3.3.1 Governance and the Costs Associated with the Collaborative Nature of the New Product Development

The need for co-ordination is high in independent, single firm new product development. The challenges in co-ordinating different functional areas, such as marketing and engineering and synchronizing very different activities are well recognized (Griffin, 1997; Olsen et al., 2001). However, when new product development requires the collaborative efforts of two or more separate firms, new

product development co-ordination challenges are significantly heightened, as stressed by Yoshino and Rangan (1995:137).

In alliance contexts, the costs associated with coordination can become considerable (Spekman et al., 1998). Despite the significance of co-ordination costs in alliances, Gulati and Singh (1998) observe that research examining co-ordination costs has been very sparse, particularly with regard to alliances involving high interdependence and co-ordination, such as new product development and new technology development alliances, where these costs are high. Gulati and Singh (1998) examine how anticipated co-ordination costs affect a firm's choice of governance. Governance choices examined are, however, limited to the choice between joint venture, minority equity investment and contractual governance, where joint venture represents the highest level of hierarchical control and contractual governance the lowest level. They find that higher anticipated co-ordination costs are associated with governance choices representing a greater degree of hierarchical control. Gulati and Singh (1998) examine how anticipated co-ordination costs affect governance choices. This study, however, aims to examine how governance choice has affected co-ordination costs incurred through the alliance.

Both theoretical discussions and empirical studies have often shown divergent support for the influence of formal and relational controls on co-ordination costs. Researchers drawing on transaction cost theory (Williamson, 1975; 1985) and those drawing on organisational theory (Barnard, 1938; Thompson, 1967) have emphasised the use of formal controls to address co-ordination costs. In contrast, researchers drawing on social exchange theory have emphasized the development of trust and relational norms and mutual interdependence to alleviate co-ordination concerns (Thibaut and Kelley, 1959; Das and Teng, 2002).

The early work of Galbraith (1977) and Thompson (1967) draw on Barnard's (1938) *The functions of the executive,* and examined control and task co-ordination. Although coordination was examined within the context of the hierarchical organisation, it can also contribute to understanding co-ordination in alliance contexts (Gulati and Singh, 1998). Their discussion suggests that formal controls facilitate information exchange and role and task clarification. Mabert, Muth and Schmenner (1992) provide evidence of how co-ordination is made more efficient with formal contracts. They

found that the presence of formal contracts minimised time loss and encouraged expedient development. They found that when there was no formal contract between the firm and a collaborative partner, development progressed in a slower, sequential manner rather than in a faster concurrent way, where a contract existed. They noted that this time loss occurred despite the fact that some of the firms and their collaborative partners had long-term relationships and informal interaction did occur. They further found that development teams that followed schedules did better than those that did not. They suggested that teams that did not have a schedule "met more irregularly and that dragged out the process" (Mabert et al., 1992:208). Although creating formal contractual governance controls takes time and the maintenance of these controls through meetings also takes time, it has been argued that new product development activities progress in a more time efficient way in the presence of these controls (Eisenhart and Tabrizi, 1995). Controls, including schedules and milestones, force teams to discuss progress, thus improving communication and enhancing co-ordination (Eisenhart and Tabrizi, 1995). Littler et al.'s study substantiated the need for formal controls in order to "establish clear ground rules" (1995:20). In summary, it can be expected that increased comprehensiveness in the formal contractual governance structure will be associated with lower levels of collaboration costs incurred.

Hypothesis 10: **Collaboration costs in new product development projects are negatively associated with increasing comprehensiveness in formal contractual governance.**

Arguments against the use of formal controls have pointed out that the creation and monitoring of formal controls expends a great deal of time and effort, and that the use of relational controls is more time efficient. Arguments in favour of relational controls note that collaborative new product development is associated with high levels of uncertainty, which requires collaborative parties to be very flexible (rather than constrained by a contract) and to adapt to the various unforeseen situations in a way which is mutually beneficial to all. Efficient co-ordination of activities so that they are mutually beneficial to both partners can only occur if partners trust one another and value their relationship.

Uzzi (1997) suggests that co-ordination in the presence of relational governance controls is superior to using formal controls and that co-ordination costs are lowered in the presence of relational controls.

Dyer and Singh (1998) support this assertion and further suggest that the following four reasons enable "self enforcing safeguards" such as relational controls to result in lower transaction costs than the use of formal controls:

1. Costs of creating a contract are eliminated.

2. Monitoring costs are lower, as partners do not need to expend resources to monitor contract adherence.

3. When unforeseen situations arise, parties are free to make changes as needed and do not need to incur costs adjusting the contract.

4. Alliances may endure for a very long time, while contracts are written for a specific duration. Hence, once the contract expires, costs are incurred in writing a fresh contract, while when relational controls such as trust are used to govern the alliance, it does not expire, and, on the contrary, trust has been seen to increase with time.

In addition to lowering transaction costs, Dyer and Singh (1998) suggest that relational controls facilitate more efficient co-ordination. They suggest that when creative solutions to unplanned circumstances are called for, firms that trust one another are more likely to volunteer such creative solutions.

The development of trust through increased interaction allows firms to become familiar with "routines" in one another's firms, which facilitates co-ordination of activities, reducing transaction and co-ordination costs (Gulati and Singh, 1998). Gulati and Singh (1998:786) further suggest that "inter-firm trust can be an extraordinary lubricant for alliances that involve considerable interdependence and task co-ordination between partners." Drawing on these views, it can be postulated that higher levels of relational governance will be associated with lower levels of collaborations costs incurred.

Hypothesis 11: **Collaboration costs in new product development projects are negatively associated with higher levels relational governance.**

3.3.2 Collaboration Costs and New Product Development Performance

In new product development, time is critical. Speed in developing new products is an imperative for firms trying to achieve a competitive advantage (Griffin, 1997). It is recognised that collaborative new product development is more complex than single firm, in-house new product development (Yoshino and Rangan, 1995), and that this additional complexity can result in higher co-ordination costs. Gulati and Singh (1998) highlight that the association between co-ordination costs and alliance governance has been relatively neglected. Likewise, in new product development focused alliances where co-ordination challenges are exacerbated, costs associated with collaboration have similarly remained under-explored.

Many previous studies on new product development alliances have used the firm as the unit of analysis (Yli-Renko, 2001; Deeds and Hill, 1996). In these studies, new product development performance was measured as the number of products developed. Unfortunately, at this level of analysis it is difficult to capture the detail of how the transaction and co-ordination costs associated with an individual new product development alliance affects the products' development time and profitability. In this study the unit of analysis is the individual new product development alliance. This provides the opportunity to analyse how co-ordination and transaction costs arising from the governance mechanism used for the alliance affects new product development performance (determined by the extent to which the new product development met development cycle time and profitability expectations).

Reducing sources of delays makes the new product development process more efficient and increases a firm's ability of realising first-mover advantages, which is associated with greater profitability (Robinson and Min, 2002). It is hence proposed that increased collaboration costs in the form of time losses incurred will be associated with lower levels of new product development performance.

Hypothesis 12: **New product development performance is negatively associated with increased collaboration costs.**

3.4 OVERALL CONCEPTUAL FRAMEWORK AND SUMMARY OF HYPOTHESES

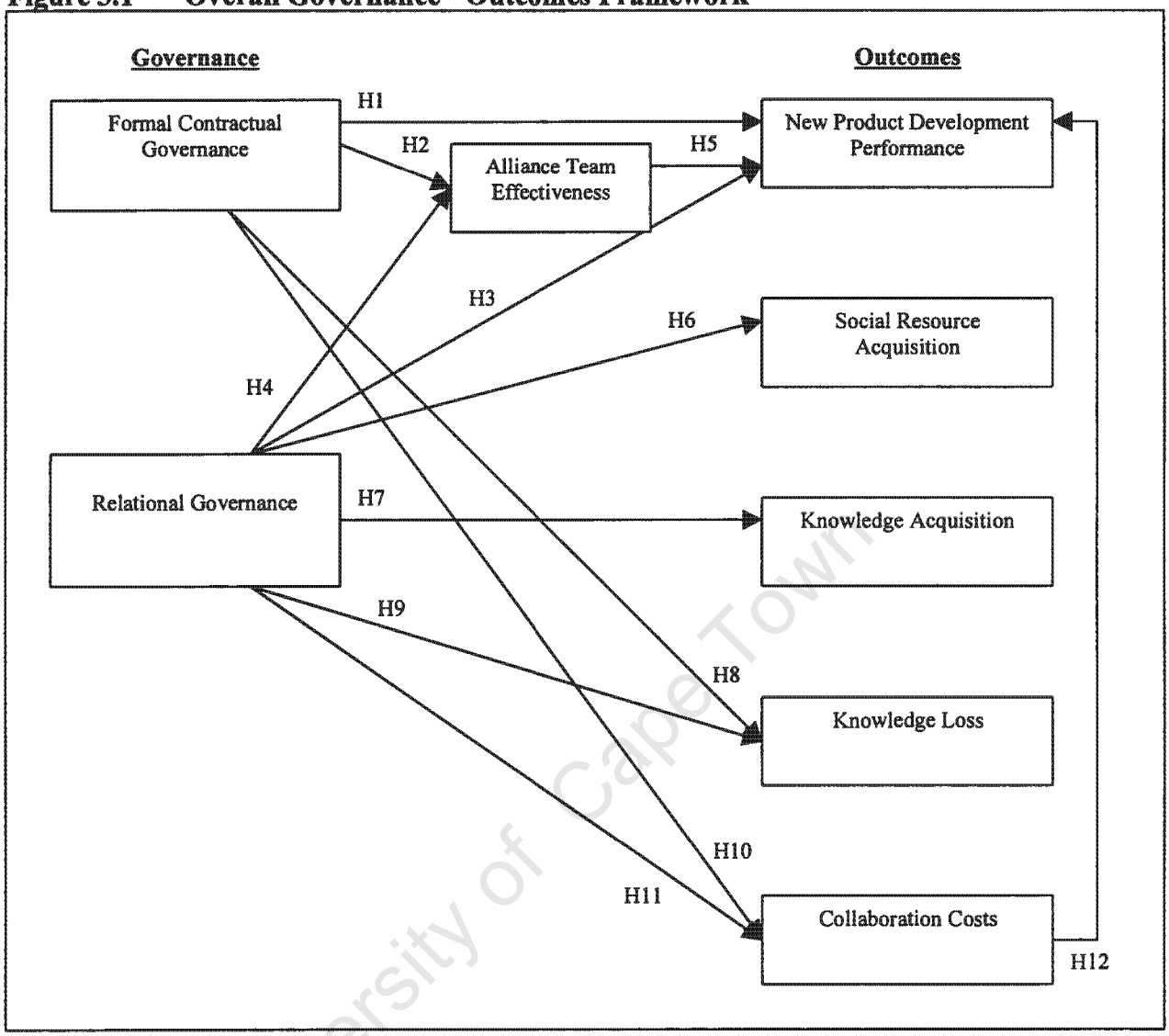
In this chapter, hypotheses regarding the effect of alliance governance structure on new product development alliance outcomes were proposed. A summary of the hypotheses appears in the following table and the overall relationships posited are shown in Figure 3.1. Formal contractual governance and relational governance are proposed to be positively associated with new product development performance and alliance team effectiveness. The relationship between governance and new product development performance is expected to be mediated by alliance team effectiveness. The acquisition of valuable social resources and knowledge-based resources is expected to be realised through the inter-firm relationship developed. Resource acquisition is therefore proposed to be positively associated with relational governance. Formal contractual governance and relational governance are both posited to have a negative association with the loss of valuable knowledge, and collaboration costs, which are manifested as the time losses that are incurred due to the inter-firm, collaborative nature of the project. Finally, collaboration costs are expected to be negatively associated with new product development performance.

It is probable that the positive collaboration outcomes (knowledge acquisition and social resource acquisition) and the negative collaboration outcomes (knowledge loss and collaboration costs) will influence new product development performance. Yli-Renko et al. (2001) found that knowledge acquisition and social resource acquisition enhanced new product development performance. However, with the exception of the collaboration costs – new product development performance relation, these relationships are not examined here.

Table 3.1 List of Hypotheses

Hypothesis	
H1	New product development performance is positively associated with increasing comprehensiveness in formal contractual governance
H2	Alliance team effectiveness in new product development projects is positively associated with increasing comprehensiveness in formal contractual governance
H3	New product development performance is positively associated with higher levels of relational governance
H4	Alliance team effectiveness in new product development projects is positively associated with higher levels of relational governance
H5	Alliance team effectiveness in new product development projects mediates the relationship between governance and new product development performance
H6	Social resource acquisition in new product development projects is positively associated with higher levels of relational governance
H7	The acquisition of knowledge-based resources in new product development projects is positively associated with higher levels of relational governance
H8	Knowledge loss in new product development projects is negatively associated with increasing comprehensiveness in formal contractual governance
H9	Knowledge loss in new product development projects is negatively associated with higher levels of relational governance
H10	Collaboration costs in new product development projects are negatively associated with increasing comprehensiveness in formal contractual governance
H11	Collaboration costs in new product development projects are negatively associated with higher levels of relational governance
H12	New product development performance is negatively associated with increased collaboration costs

Figure 3.1 Overall Governance - Outcomes Framework



components with VARIMAX rotation) and confirmatory factor analysis was done to examine whether two distinct factors would emerge. The items, however, loaded onto a single factor after running exploratory factor analysis, thus indicating the uni-dimensionality of the construct. This was further supported by confirmatory factor analysis, the results of which are shown in the table above. The Cronbach alpha for this construct is 0.77.

Relational Governance

In developing a scale to measure the relational governance construct, this study drew from previous empirical studies examining the development of trust and norms between organisations and between different functional groups (Anderson and Narus, 1990; Sethi, 2000; Cannon and Perreault, 1999; Ayers et al, 1997), as well as from the conceptual discussion by Macneil (1980).

Table 4.5 Relational Governance Factor

Items, Cronbach's Alpha, Descriptive Statistics and, Confirmatory Factor Analysis Results: Factor Loadings, Standard Errors and T-statistics

Items	Factor Loading	Standard Error	T-Statistic
To what extent do you trust the alliance partner?	0.64	0.08	4.5
We have developed personal as well as business relationships with this partner	0.61	0.09	4.1
We have been willing to make changes for the benefit of the alliance	0.72	0.08	6.1
They have been willing to make changes for the benefit of the alliance	0.65	0.08	4.6
When conflicts arise, we (our firm and the alliance partner) openly share concerns and issues	0.67	0.08	4.7
Cronbach alpha coefficient = 0.69			

Variable	Mean	Median	Minimum	Maximum	Std. Dev.
Relational Governance	5.19	5.20	2.80	7.00	0.92

Social norms are expectations regarding the behaviour of parties working together. In working together over time, a relationship develops between working parties and rules regarding expected behaviour are developed (Blau, 1964; Homans, 1958; Thibaut and Kelley, 1959). This relationship provides a governance structure in which firms work cooperatively and adhere to the norms which have developed (Dwyer, Schurr and Oh, 1987; Heide and John, 1992; Wilson, 1995).

Macneil (1980) has suggested an extensive set of norms which are present in a functional, cooperative relationship. Following the example of Ayers et al (1997), this extensive set has been reduced to a core of three elements believed to be critical in inter-group relationships. They are as follows:

1. **Flexibility** - the willingness of parties to make changes from the original agreement.
2. **Solidarity** - the willingness of parties to support one another and act jointly for the benefit of the alliance.
3. **Conflict harmonisation** – the ability of parties to deal constructively with conflict in the relationship.

(definitions drawn from Cannon et al., 2000:183).

In addition to capturing the above dimensions, the construct aims to capture the extent to which interpersonal relationships and trust had developed between parties. Interpersonal relationships have been strongly associated with the development of relational norms (Lambe, 2001). Trust, also, has been shown to be very closely associated with the development of relational norms (Zaheer and Venkatraman, 1995; Heide and John, 1990; Zaheer, McEvily and Perrone, 1998) and has been argued to be crucial for well-functioning cooperative relationships (Macneil, 1978; Parkhe, 1993). The inclusion of trust as an element of relational governance is in alignment with recent empirical studies, such as Poppo and Zenger's (2002). The contribution of all of these elements to a uni-dimensional construct was supported by the confirmatory factor analysis, as shown in table 4.4, and the Cronbach's alpha of 0.69.

Alliance Team Effectiveness

Ayers et al (1997:111) define "perceived effectiveness" as the perception that the engagement between two groups is "worthwhile, productive and satisfying". Song and Parry (1997:15) further suggest that integration is the "process of achieving effective unity of efforts in the accomplishment of new product development success." Kale, Dyer and Singh (2001) observe that a component of alliance effectiveness is the degree to which alliance partners behave in a harmonious, well-integrated way. Meyer and Alvarez (1998) operationalise effectiveness and satisfaction within the

alliance team as the degree to which expectations have been met and the degree to which partners would be willing to engage with one another in the future.

Integration between various functional groups in single firm new product development (Griffin and Hauser, 2001; Jassawalla and Sashittal, 1998) and between collaborating firms (Olsen et al., 2001) has been strongly associated with the effectiveness of the team responsible for new product development. Team effectiveness has been operationalised in numerous different ways, the concept of 'integration between groups' has emerged as an important element of team effectiveness in new product development contexts (Kahn, 2001). Also, the groups' willingness to continue working together has been found to be a good reflection of whether groups feel that they are effective in working as a team (Anderson and Narus, 1990). This study broadly conceived of effectiveness as a construct comprising the following underlying dimensions: that the new product development personnel of the two firms are well integrated; that the team is effective in meeting objectives, and that they would be willing to engage with each other in the future. This operationalisation of alliance team effectiveness draws on the work of Meyer and Alvarez (1998) and the work of Anderson and Narus (1990) and their discussion regarding the close linkage between a firm's satisfaction in working with another firm, the perceived effectiveness of their team efforts and willingness to continue the relationship. The results of confirmatory factor analysis done on the items are shown in Table 4.6 and the Cronbach's alpha for the construct is 0.75.

Table 4.6 Alliance Team Effectiveness Factor

Items, Cronbach's Alpha, Descriptive Statistics and, Confirmatory Factor Analysis Results: Factor Loadings, Standard Errors and T-statistics

Items	Factor Loading	Standard Error	T-Statistic
We would easily engage in another alliance with this partner	0.75	0.06	12.1
To what extent did this alliance meet the performance objectives set	0.67	0.07	10.0
The integration between our two firms was very good for this project.	0.72	0.06	11.9

Cronbach alpha coefficient = 0.75

Variable	Mean	Median	Minimum	Maximum	Std. Dev.
Alliance Team Effectiveness	5.41	5.67	2.67	7.00	1.12

New Product Development Performance

Measuring new product development success is difficult, as observed by Griffin and Page (1996:478), "success is not just elusive; it is also multifaceted and difficult to measure." In a study aimed at finding appropriate measures for new product development success, Griffin and Page (1996) found that no one measure can adequately reflect the success of every product development project, but rather that the most appropriate measures of success are dependant on a particular firms project focus. New product development researchers have found that using multidimensional sets of measures provide a richer picture of new product development success. Typical dimensions measured are a new product's commercial performance, the relative advantage of a product, the radicalness of a product, the relative cost of the product, the degree of similarity with competitors products (Gatignon and Xuereb, 1997) and the development cycle time (Griffin, 1997). Previous measures of new product development performance are varied and range from complex and large sets of scales (for example, Cooper and Kleinschmidt, 1987) to the use of a simple, single item which measures a new product development's commercial success via a dichotomous variable, where (0) represents unsuccessful, and (1) represents successful (Ayers et al., 1997).

Researchers such as Rochford and Rudelius (1992) found that using a unidimensional scale comprising items measuring the new products profitability, the extent to which it met budget and schedule deadlines and the extent to which it exposed the firm to new market opportunities, was adequate in measuring new product development performance. Martinez Sanchez and Perez Perez (2003) recently also reported using a single unidimensional construct comprising items measuring relative development time and cost, as an appropriate measure of new product development performance. This study similarly measures new product development performance using a unidimensional construct with items measuring the extent to which the new product development met schedule and the extent to which it met profit objectives.

For this study, a new product development performance scale was developed as shown in the following table. The use of a perceptual scale follows the lead of recent relevant studies (Ayers et al., 1997; Song and Parry, 1997). Although a number of previous studies have focused on financial measures of new product development

success (for example, Cooper and Kleinschmidt, 1987; Sethi 2000), this study operationalises new product development performance as a construct which assesses both the project's profitability and development time. The development of a scale, which captures both financial and temporal dimensions of the new product development project is supported by the recent work of Olson, Walker, Ruekert and Bonner (2001:264) and Martinez Sanchez and Perez Perez (2003:64).

Drawing on the work of Rochford and Rudelius (1992) an item measuring the extent to which the new product opened new market opportunities for the firm was included on the questionnaire. However, unlike in Rochford and Rudelius' (1992) study this item did not load onto the new product development performance factor along with schedule and profitability measurement items. This is evident in Appendix 2,Table 2, and this item was therefore not included in the measure of new product development performance.

Table 4.7 shows the results of confirmatory factor analysis done on the items. The Cronbach alpha for this scale was 0.70. The mean for this construct was 4.68, indicating that respondents perceived relatively positive new product development performance in the new product development alliance reported on.

Table 4.7 New Product Development Performance Factor

Items, Cronbach's Alpha, Descriptive Statistics and, Confirmatory Factor Analysis Results: Factor Loadings, Standard Errors and T-statistics

Item	Factor Loading	Standard Error	T-Statistic
To what extent has this product met profit objectives?	0.73	0.08	8.7
To what extent was this product developed within the scheduled time?	0.79	0.09	9.3

Cronbach's alpha coefficient = 0.70

Variable	Mean	Median	Minimum	Maximum	Std. Dev.
New Product Development Performance	4.68	4.75	1.00	7.00	1.28

Resource Acquisition

Firms engaging in collaborative new product development may realise benefits beyond those associated with joint development, Deeds and Hill (1998) refer to these additional benefits as "positive spillover". Deeds and Hill (1998) measure spillover effects through a single item which ask respondents to indicate on a 5-point scale, from strongly positive to negligible, to strongly negative – how they would rate the spillover effects from their alliance.

The items in this study aimed to assess more precisely the extent to which the firm has experienced a positive spillover in terms of the acquisition of social and knowledge-based resources. The importance of social and knowledge-based resources to entrepreneurial firms has been highlighted by a number of researchers (Zahra et al., 2000; Yli-Renko et al., 2001; Eisenhart and Schoonhoven, 1996; Burt, 2000). Therefore, to investigate these two important dimensions of resource acquisition, it was conceptualised as two distinct constructs - social resource acquisition and knowledge acquisition.

Social Resource Acquisition

In operationalising the social resource acquisition construct, this study drew on the work of Eisenhart and Schoonhoven (1996) and D'Aveni (1990). Eisenhart and Schoonhoven (1996) highlight the importance of credibility, social position and a network of business contacts, also referred to as "contacts and credibility" (D'Aveni, 1990). They show how firms who lack social resources are denied the opportunity to grow through new product development alliances. Firms can enhance their social resources, in particular their credibility and reputation, in two ways - either internally, by focusing on the characteristics of their management team (Chaganti et al, 1996), or by seeking "external sources of endorsement" (Coombs and Bierly, 2001:383).

While social resources have often been referred to as 'social capital', a uniformly accepted definition for social capital remains elusive (Nahapiet and Ghoshal, 1998). Many researchers have separated 'contacts' and 'credibility' as two distinct concepts (for example, Yli-Renko et al., 2001; Nahapiet and Ghoshal, 1998) in explaining social capital. Nahapiet and Ghoshal (1998:243), however also propose that they are very closely linked concepts and that the one may be a source of the other, 'social

status or reputation can be derived from membership in specific networks.' In suggesting this, they cited the work of Bordieu, 1986; Burt, 1992; D'Aveni and Kesner, 1993). Drawing on this perspective, social resources comprising of 'contacts and credibility' (D'Aveni, 1990) were conceptualized as a single construct. The results of confirmatory factor analysis are shown in Table 4.8. The Cronbach's alpha coefficient was 0.87, supporting the use of a single measure. Further, the mean for this construct is 4.75, indicating that firms to a large extent did acquire social resources through their engagement in the collaborative new product development.

Table 4.8 Social Resource Acquisition Factor

Items, Cronbach's Alpha, Descriptive Statistics and, Confirmatory Factor Analysis Results: Factor Loadings, Standard Errors and T-statistics

Item	Factor Loading	Standard Error	T-Statistic
To what extent did your firm realize the following positives from this alliance:			
▪ Increased network of business contacts?	0.89	0.03	26.9
▪ Increased market place credibility?	0.87	0.04	21.7

Cronbach's alpha coefficient = 0.87

Variable	Mean	Median	Minimum	Maximum	Std. Dev.
Social Resource Acquisition	4.75	5.00	1.00	7.00	1.63

Knowledge Acquisition

George, Zahra, Wheatley and Khan (2001) highlight that inter-firm linkages facilitate learning. In this study, the operationalisation of the knowledge acquisition construct draws on the work of Yli-Renko et al., 2001, and the measure represents the degree to which market and technical knowledge has been acquired.

Table 4.9 Knowledge Acquisition Factor

Items, Cronbach's Alpha, Descriptive Statistics and, Confirmatory Factor Analysis Results: Factor Loadings, Standard Errors and T-statistics

Item	Factor Loading	Standard Error	T-Statistic
To what extent did your firm realize the following positives from this alliance:			
▪ Gained market and user knowledge?	0.77	0.06	8.7
▪ Gained technical knowledge?	0.65	0.07	6.7

Cronbach's alpha coefficient = 0.68

Variable	Mean	Median	Minimum	Maximum	Std. Dev.
Knowledge Acquisition	4.88	5.00	1.00	7.00	1.36

The correlation between this "knowledge acquisition" construct and the preceding "social resource acquisition" construct was very strong ($r=0.60$, $p<0.001$) indicating that they are closely linked concepts.

Knowledge Loss

In developing the measure for knowledge loss, this study draws on the work of Deeds and Hill (1998), Hamel (1991), and Lei and Slocum (1991). The risk of incurring knowledge loss from alliances has been shown to be particularly detrimental to entrepreneurial technology-based firms (Alvarez and Barney, 2001). Knowledge is often an entrepreneurial technology-based firm's most valuable asset and is an important motivator for large firms to engage with a smaller, less established firm (Meyer and Alvarez, 1998).

Respondents were asked to which extent their firm was exposed to the loss of valuable information and to the fear that the alliance partner would use their proprietary information for their own interests. A 7-point Likert scale, anchored by 1 ('not at all') and 7 ('to a great extent') was used. The mean for this construct was 2.59, indicating that respondents felt relatively protected from knowledge loss and viewed their alliance partners relatively positively. The factor loadings for the items are shown in Table 4.10 and, the Cronbach's alpha for this construct was 0.87.

Table 4.10 Knowledge Loss Factor

Items, Cronbach's Alpha, Descriptive Statistics and, Confirmatory Factor Analysis Results: Factor Loadings, Standard Errors and T-statistics

Item	Factor Loading	Standard Error	T-Statistic
To what extent was your firm exposed to the following negatives from this alliance:			
▪ Loss of valuable information?	0.87	0.05	18.9
▪ Fear that partner uses your proprietary information for their own interests?	0.88	0.05	19.0

Cronbach's alpha coefficient = 0.87

Variable	Mean	Median	Minimum	Maximum	Std. Dev.
Knowledge Loss	2.59	2.00	1.00	7.00	1.54

Collaboration Costs

This construct aimed to assess the degree to which transaction costs, manifested as time losses, have been incurred as a result of the inter-firm, collaborative nature of the new product development. Williamson draws an analogy between the transaction costs incurred and the losses incurred in a mechanical system due to friction. He further defines transaction costs as the "comparative costs of planning, adapting, and monitoring task completion under alternative governance structures" (Williamson, 1985:2).

The measure for collaboration costs was developed by drawing on the discussion by Artz (1999), and on the work of Farr and Fischer (1992), who highlight the additional time and monetary costs incurred in managing an alliance. The factor loadings for the items are shown in Table 4.11, and the Cronbach's alpha was 0.83. Similar to the previously described construct, the mean for this construct was quite low at 2.77, further indicating that respondents in general feel positively about the alliance reported on.

The correlation between this construct and the preceding 'knowledge loss' construct was strong ($r = 0.53$, $p<0.001$), indicating a degree of inter-relatedness between the two constructs.

Table 4.11 Collaboration Costs Factor

Items, Cronbach's Alpha, Descriptive Statistics and, Confirmatory Factor Analysis Results: Factor Loadings, Standard Errors and T-statistics

Item	Factor Loading	Standard Error	T-Statistic
To what extent was your firm exposed to the following negatives from this alliance:			
▪ Loss of time through alliance negotiations and discussions?	0.83	0.06	14.7
▪ Loss of time through confusion regarding responsibilities?	0.86	0.06	15.5

Cronbach's alpha coefficient = 0.83

Variable	Mean	Median	Minimum	Maximum	Std. Dev.
Collaboration Costs	2.77	2.00	1.00	6.50	1.49

The low means for negative outcomes compared to the high means reported for positive outcomes indicates that respondents have tended to report on a relatively positive collaboration experience.

Measurement Properties of the Constructs

Examination of tables 4.4 to 4.11 shows that the factor loadings are all above the minimum loading of 0.5 suggested by Hair et al. (1998) and above the loading of 0.6 recommended by Bagozzi and Yi (1988). The standard errors are small and less than 0.4, and provide a positive indication of the measurement properties of the constructs. The t-statistics associated with the factor loadings are all above two, which provides evidence for the convergent validity of the constructs (Bagozzi and Yi, 1988). In addition, all the factor loading estimates were significant at $p<0.001$. The measurement properties of the constructs can be further assessed by inspecting the overall fit statistics shown in Table 4.12.

Table 4.12 Confirmatory Factor Analysis: Fit Statistics

Goodness of Fit Criterion	Fit Statistics
Goodness of Fit Index (GFI)	0.92
Comparative Fit Index (CFI)	0.98
Root mean square residual (RMSR)	0.044
Normed Chi-squared	1.3

Schumaker and Lomax (1996:121) suggest that GFI values and CFI values close to 0.9 are an indication of good measurement model fit. GFI and CFI values can range from 0 (indicating no fit) to 1 (indicating perfect fit). For the data in this study GFI = 0.92 and CFI = 0.98, which suggests that the factors fit the data well. The normed chi-squared (ratio of chi-squared to the degrees of freedom) should be between 1.0 and 5.0 to indicate good model fit (Schumaker and Lomax, 1996:121). Chau (1997) additionally recommends that the value for RMSR be less than 0.10. An inspection of the fit statistics in Table 4.12 suggests that the proposed factor structure does fit the data well and that the proposed items do define valid constructs. The validity of the constructs is further discussed in Section 4.8.

Control Variables

The descriptive statistics and details regarding the control variables, namely, firm age, firm size, alliance partner size, and industry sector, are reported in Chapter 5. The descriptive statistical analysis revealed these variables to have highly skewed distributions. Taking the natural logarithm of the values remedied this problem (Hair et al., 1998). The natural logarithm of firm age, firm size, and alliance partner size was therefore used in the subsequent regression analysis. The three industry sectors were represented by two 'dummy variables' in the regression analysis (Hair et al., 1998:143).

4.8 EVALUATION OF RELIABILITY AND VALIDITY

The major criteria for evaluating a study are its degree of reliability, validity and generalizability (Babbie and Mouton, 2001). Zikmund (1997) defines reliability as the extent to which results are repeatable and free from error. He further defines validity as the ability of a study to measure what is intended to be measured (as opposed to measuring anything else). Generalizability, often referred to as external validity, refers to the extent to which the research results from the study sample can be extended to the entire population and other contexts, and is examined in Section 7.3, where the limitations of this study are discussed.

This section draws upon work by Babbie and Mouton (2001), Bagozzi (1994), and Venkatraman and Grant (1986) to assess the reliability and validity of the findings.

4.8.1. Reliability

Reliability is necessary for validity, but is not in itself a sufficient check of validity (Zikmund, 1997:345). A measure may be reliable and deliver consistent results, yet be invalid and not measure the intended concept.

To assess the reliability of this study, first, the reliability of the **sources of data** on which the study is based is discussed, and second, the reliability of the **measurement scales** assessed by the homogeneity or 'internal consistency' of the construct measurement scale is discussed.

Assessment of Data Collected

Aspects of the study that may affect the reliability of the empirical data used for this study are the following: a single survey respondent was used, and a number of self-assessment measures were used. The reasons behind these choices are discussed below.

A single survey respondent was used, as discussed earlier, because it was necessary that the person completing the questionnaire be knowledgeable about the firm's new product development activities and about the new product development alliance reported on. Because this study focuses on new, small firms rather than large established firms, the number of managers in the firm who are knowledgeable enough to complete the questionnaire is limited. Further, as discussed in Section 4.3 (Data Collection), the questionnaire administration process entailed the initial identification of the person with the most knowledge of the firm's new product development alliance activities. In most cases, only one person was identified as having the requisite expertise. Where two people were identified, it was evident that firms were very reluctant to expend additional resources and have more than one person from the firm participate in the study. Hence, in order to encourage participation, only one informant per firm was sought.

Self-Assessment Measures

A number of constructs required the key informant to make an assessment regarding aspects of the new product development alliance such as alliance team effectiveness and new product development performance. Although financial measures can be used to evaluate new product development performance, it is difficult to access data on a specific product level because such information is usually only available at an aggregate level (Gatignon and Xuereb, 1997). Also, financial data that is available may not be 'objective' as it has been prepared for specific alternative motives (such as the calculation of taxation due, or shareholder reports).

An attempt was made to verify the accuracy of the self-reported data by asking two questions on the questionnaire which could be compared to data accessible on the FAME database. The first was firm founding date and the second was firm size as

measured by number of employees. For both of these the correlation between the self-reported data and the database exceeded 0.9 ($p < 0.001$). This strong degree of correlation between the self-reported primary data and the database information helps to verify the accuracy of the self-reported data. If information on a product level was available via secondary sources, it would have facilitated triangulation. This information was, however, not available, and accessing detailed information on new firms is difficult. Difficulties encountered in accessing information on small, new firms are evidenced by the very low percentage of studies in the leading entrepreneurship literature which have been able to access multiple sources of data (Chandler and Lyon, 2001). Hence, although the use of multiple respondents and multiple sources of data would have improved the reliability of the data (Neuman, 1997), the practical issues discussed precluded their use.

Reliability of Measures

Difficulties inherent in conducting research in the management field (as opposed to the science field) make it impossible to achieve perfect reliability. However, the following guidelines recommended by Neuman (1997:40) have been followed to increase the reliability of this study.

1. Use of clearly conceptualised constructs
2. Use of pilot tests.
3. Use of multiple indicators for measuring constructs
4. Use of a precise level of measurement

Further, the internal consistency of the constructs as measured by Cronbach's alpha was assessed.

Clearly conceptualised Constructs and Pilot Tests

Reliability increases when a construct is unambiguous and clear (Neuman, 1997:140). The constructs for this study have been developed by reviewing the relevant literature to utilise previous operationalisations of certain constructs and by exploratory interviews with entrepreneurs in order to gain an insight into their understanding of key constructs. Five of the interviewed entrepreneurs participated in the first pilot

survey, with the result that certain questions were reworded or replaced to eliminate ambiguities and to improve understanding. A second pilot was then administered to a batch of 'naïve' entrepreneurs drawn from the sample frame. The entrepreneurs were interviewed again after completing the questionnaire to confirm that the questions clearly measured what was intended to be measured.

Multiple Indicators

As is evident from the preceding construct tables, multiple indicators (that is two or more items) were used to measure constructs in the study. Multiple indicators improve reliability for two reasons. Firstly, they allow the researcher to "take measurements from a wider range of the content of a conceptual definition" (Neuman, 1997:141). Secondly, a single question may be poorly worded and cause respondents to answer in an unintended way – this would introduce systematic error into the measurement of the construct. The use of multiple indicators for a construct is therefore preferable to using a single indicator as it allows the researcher to ask more than one question to measure the construct and allows the construct to be viewed from different "angles" and, therefore, constructs measured by multiple items are more stable than single item constructs (Neuman, 1997:141).

Use of precise levels of Measurement

The level of measurement refers to the way a construct is measured, that is whether it is measured in a crude, imprecise way or in a more refined manner. Ayers *et al.* (1997), for example, use a lower level of precision to measure new product development performance. They define new product development success as the extent to which a project has met its commercial objectives, and they use a single item that asks respondents to select either (0) unsuccessful or (1) successful (Ayers et al., 1997:111). Their construct operationalisation demonstrates the use of a lower level of precision in measuring the construct, in that the dichotomous response choice does not allow the respondent to express the degree of success (or failure) and is, therefore, less sensitive. In the current study, new product development performance is measured using two items and each item is measured on a 7-point Likert scale, providing more sensitivity to detecting variation.

All the constructs in this study are measured using a 7-point Likert scale, except for questions requiring an objective response, for example, number of years or number of employees, which are measured on the ratio level, with the exact number. This follows recommended guidelines regarding precision in levels of measurement scales (Johnson and Creech, 1983).

Internal Consistency and Constructs

All measures were subjected to exploratory factor analysis and items that loaded on more than one dimension were eliminated. That the retained items represented a single underlying construct was verified by confirmatory factor analysis.

The most commonly used measure of the internal consistency of a construct is the Cronbach alpha coefficient (Bagozzi, 1994:18). Cronbach's alpha coefficient can range from 0 to 1, with the larger values indicating greater degrees of reliability. For exploratory research, values of 0.6 and above are considered acceptable. However, in general, Cronbach's alpha values of 0.7 and above are recommended (Bagozzi, 1994:18). As shown in the tables in section 4.7 most of the constructs have Cronbach's alpha coefficients which approximate 0.7 and higher, indicating a good degree of construct reliability.

4.8.2. Validity

An assessment of validity requires that the following components of validity be evaluated: face and content validity, criterion validity; which is comprised of concurrent and predictive validity; construct validity, which is comprised of convergent validity and discriminant validity; and external validity, also referred to as generalizability (Bagozzi, 1994; Venkatraman and Grant, 1986; Neuman, 1997). All these components of validity are discussed in this section, with the exception of external validity (generalizability), which is discussed in Section 7.3, where the limitations of this study are examined.

A key aspect of assessing validity is ascertaining the extent to which measures and scales used actually measure what they intend to measure (Bagozzi, 1994:18) and the extent to which conceptual and operational definitions fit with one another. Bagozzi (1994) therefore emphasises that concepts used must have both theoretical and observational meaningfulness. Theory often comprises abstract concepts, assumptions, relationships and definitions, while empirical measures describe how variables are tangibly measured. The nature of the linkage between theory and empirical concepts is referred to as observational meaningfulness of concepts (Bagozzi, 1994). That there is a clear and logical link between the construct (which is theoretically derived) and the indicator (the empirical measure) is important, and has been tested in a number of ways for this study. Literature and previous studies using the concept or similar concepts have been reviewed and consulted in order to draw on how researchers have linked an indicator to a specific construct.

Theoretical meaningfulness of concepts refers to "the nature and internal consistency of the language used to represent the concept" (Bagozzi, 1994:19). It also refers to how the concept relates to other concepts in the theoretical framework of which it is part.

Face and Content Validity

Related to the theoretical and observational meaningfulness of concepts are two more commonly assessed types of validity, namely face validity and content validity. Face validity is a judgement that an indicator is a plausible measure of the construct (Zikmund, 1997:343). Content validity extends the concept of face validity and further assesses not only whether the indicator logically measures the construct, but whether all facets of the construct are measured by the single or multiple indicator(s). That is, content validity seeks to address whether the "full content" (Neuman, 1997:142) of a concept is represented. Neuman (1997) explains that establishing content validity involves three basic steps. First, there is a need to understand a construct's definition and which content represents this definition. Second, the content needs to be separated into its underlying dimensions. Third, indicator(s) should be developed that measure all these dimensions.

These three steps have been followed in developing the constructs for this study. Further, as mentioned, relevant previous work was reviewed and indicators were drawn from these established studies to enhance the face validity and content validity of the measures used. As demonstrated in the tables in Section 4.7, multiple indicators for constructs were used in order to capture the content of the constructs. Further, the exploratory interviews with entrepreneurs facilitated the adaptation of previously used items and measures for the specific context of this study.

Criterion Validity

Criterion validity assesses the degree to which a measure used in the present study correlates with another similar measure (Zikmund, 1997:343). Criterion validity can be classified as either concurrent validity or predictive validity, depending on the time sequence of associating the focal measure and the criterion measure (Zikmund, 1997:343).

Bagozzi (1994:19) explains that **concurrent criterion validity** entails establishing that "a measure or scale for one concept is contemporaneously correlated with another measure or scale of another concept, when such an association can be justified by logic or theory". Concurrent validity can be assessed by comparing the focal measure to another similar measure that has been taken at the same time or been previously validated.

The correlation matrix for the constructs used in this study (shown in Table 5.10) was examined to check the concurrent validity of constructs; that is, to check whether constructs which are rooted in a specific theory are related. As mentioned in the literature review chapter, theory development on the knowledge-based view suggests a strong correlation between the social resources construct and the knowledge-based resources construct (Nahapiet and Ghoshal, 1998). Although this relationship is not formally tested as a hypothesis, it is clear from the correlation matrix that the two constructs are significantly correlated ($r=0.60$, $p<0.001$), indicating concurrent validity.

Predictive criterion validity refers to the extent that a focal construct measure has a relationship with other concepts in a way predicted by established theory (Bagozzi, 1994:20). A discussion of the extent to which 'predicted' relationships between constructs do exist is done in the following results chapter.

As a further check of the criterion validity of the measures, an attempt was made to compare constructs in this study with other measures external to the study. Data on comparable constructs is scarce, as certain constructs were developed specifically for this study in order to examine under-explored issues.

The survey instrument used for this study contained items that measured information exchange. The following adapted items were drawn from Dahlstrom and Nygaard (1999)[6], and utilised the same 7-point Likert scale described previously.

1. "Information from our alliance partner is often difficult to understand" (reverse scored)
2. "Information from our alliance partner is complete and on time."

Drawing on the relational exchange perspective (Macneil, 1980) and empirical work by Mohr and Spekman (1994), it is clear that the information exchange construct is very closely linked to the relational governance construct. The relational governance construct in this study exhibits criterion validity in correlating significantly with the information exchange measure described ($r=0.31$, $p<0.001$).

Construct Validity

Construct validity has been conceptualised as comprising convergent and discriminant validity.

Convergent validity is the degree to which multiple attempts to measure a construct yield consistent results (Venkatraman and Grant, 1986:79). Neuman (1997:144) refers to convergent validity as the extent to which "multiple indicators converge or are associated with one another." Convergent validity was evaluated using the guidelines described by Churchill (1979) and the confirmatory factor analysis approach outlined

[6] They appeared on the questionnaire but were not used in the present study.

by Bagozzi and Yi (1988). The preceding tables in section 4.7 showing the results of confirmatory factor analysis, indicate that t-statistics associated with the factor loadings are all above two, which provides evidence for the convergent validity of the constructs (Bagozzi and Yi (1988).

On the whole, **discriminant validity** is demonstrated, as dissimilar concepts do not correlate with each other. For example, the correlation between the construct social resource acquisition does not have a significant correlation with the collaboration costs construct (p= 0.338), and it also does not correlate with the knowledge loss construct (p=0.319).

Summary

This section presented an assessment of the reliability and validity of the measures used for the empirical research. It provides evidence that the measures used measure the constructs they are intended to measure, and that the constructs demonstrate reliability and validity to a degree great enough to allow the next important step in the analysis to be undertaken; that is, estimating the relationships between relevant constructs. This analysis is presented in the following chapter.

CHAPTER 5

RESULTS

This chapter firstly presents statistics describing the new technology-based firms in the sample. It also presents descriptive statistics of the focal firms' alliance partners in order to provide an overview of the nature of the alliance relationships reported on.

Secondly, an initial assessment of the correlation between the research constructs is presented. Thirdly, formal tests of the research hypotheses using regression analyses are reported. The hypotheses tests are arranged into 3 sets, namely:

1. governance and new product development performance relationships
2. governance and resource acquisition and loss relationships
3. governance, collaboration costs and new product development performance relationships

The chapter concludes with a summary of the results of the hypotheses tests.

5.1. DESCRIPTIVE STATISTICS OF SAMPLE FIRMS

5.1.1 Size of Sample Firms

Firm size was measured as the number of employees in 2001 and is shown table 5.1. Fifty percent of the responding firms had fewer than 20 employees, with the mean number for the sample being 27 employees. Only 18 firms of the 110 respondent firms had more than 50 employees. The distribution is skewed towards smaller firms. Poppo and Zenger (2002) suggested that this may be indicative of the bureaucracy present in larger firms making it more difficult to get larger firms' approval for completing a questionnaire.

Table 5.1 Size of Sample Firms

N	Mean	Median	Std. Dev.	Min.	Max.	Skewness	Kurtosis
110	27.4	20	23.4	2.0	100	1.17	1.02

5.1.2 Firm Age

The respondent firms' ages since founding ranged from two (2) years to ten (10) years. The age distribution is skewed toward firms on the older side of the distribution, with a mean age of 6.8 years and median age of 7.0 years. Possible reasons for this are that, due to their being established and having developed a reputation, firms on the older side of the distribution may be more likely to engage in new product development alliances because they make more attractive alliance partners (Eisenhart and Schoonhaven, 1996). Further, older firms may be more likely to have engaged in multiple new product development alliances and would therefore be more likely to respond to a questionnaire on this topic than younger firms with little or no such experience (Littler et al., 1995).

Table 5.2 Age of Sample Firms

N	Mean	Median	Std. Dev.	Min	Max	Skewness	Kurtosis
110	6.8	7.0	2.5	2	10	-0.38	-1.18

5.1.3. Industry Representation of Firms

The firms were spread across the three industry sectors selected for the study, namely: computer and information processing equipment; communication technology, and electronic instrumentation sectors. It can be seen that the electronic instrumentation sector had a somewhat higher representation than the other two sectors in the respondent group.

Table 5.3 Number of Firms in each Industry Sector

Industry Sector	Number of firms	Percentage of response sample
Computers and other information processing equipment	37	33.6%
Communication technology	30	27.3%
Electronic instrumentation	43	39.1%
TOTAL	**110**	**100**

5.1.4 New Product Development Activity of the Respondent New Technology-Based Firms

In order to ascertain the firm's level of new product development activity, they were asked: "What percentage of total sales in the last year was from products developed in the last three years?"

Table 5.4 Extent to which Current Sales are from New Products Developed

Percentage of current sales from new products	Number of firms	Percentage of firms
1 – 10%	23	20.9
10 – 30%	29	26.4
More than 30%	53	48.2
Missing	5	4.5
TOTAL	**110**	**100**

Almost half of the sample firms had more than 30% of their sales in the last year come from products developed in the last three (3) years. The distribution is skewed towards more innovative firms, that is, firms engaging in relatively high levels of new product development.

5.2 THE NATURE OF THE RELATIONSHIP BETWEEN THE FOCAL FIRM AND ITS ALLIANCE PARTNER

In order to ascertain the nature of the relationship between the new technology-based firm and its new product development alliance partner, various aspects of the relationship were characterised.

5.2.1 Length of the Inter-Firm Relationship

The length of the relationship between the focal firm and its alliance partner was ascertained by asking: "When did your firm begin its relationship with this partner?"

Table 5.5 Number of years passed since the two firms became acquainted

N	Mean	Median	Std.Dev.	Min	Max	Skewness	Kurtosis
106	4	3	3.03	0.5	10	-0.84	-0.25

The descriptive statistics show that fifty percent of the firms became acquainted with each other less than three (3) years before the questionnaire survey, and on average, the two collaborating firms became acquainted with one another four (4) years before this study was done.

5.2.2 Relationship of Alliance Partner to New Technology-Based Firm

In order to ascertain the relationship of the alliance partner to the new technology-based firm, they were asked whether they would describe their alliance partner as one of the following: "customer, supplier, competitor, complementor , other (please specify)." The response distribution is shown in Table 5.6 on the next page.

Table 5.6 Relationship of Alliance Partner to New Technology-Based Firm

	Number of firms	Percentage of firms
Customer	35	31.8
Supplier	26	23.6
Competitor	5	4.5
Complementor	38	34.5
Other	2	1.8
Missing	4	3.6
TOTAL	**110**	**100**

The questionnaire defined a complementor to be neither a direct customer nor a supplier, but another firm whose service, skills or products are important in the new product development. Alliance partner firms were distributed amongst the customer, supplier and complementor categories. Only five (5) firms had a competitor as an alliance partner. This supports the sentiment of the firms interviewed that they were

very reluctant to form alliances with competitors due to increased risks they felt they would be exposed to. In narrating nine case studies involving firms and their alliances with competitors, Hamel (1991) reports on a number of these risks.

5.2.3 Familiarity

The degree of familiarity between the two firms was ascertained through the following question: "How well did you know your alliance partner prior to forming this alliance?"

Table 5.7 Level of Familiarity between Firms

Level of Familiarity	Number of firms	Percentage of firms
Very well	38	34.5
Quite well	41	37.3
Hardly at all	27	24.5
Missing	4	3.6
TOTAL	**110**	**100**

Of the respondent sample, a quarter of the firms were not familiar with one another, and hardly knew the alliance partner they were collaborating with. However, the majority, 74.5%, had at least a degree of familiarity with the alliance partner, with one third knowing the partner very well. This result is expected, given that researchers such as Gulati (1995) have found evidence to suggest that firms tend to collaborate with other firms they have transacted with in some way rather than with firms of which they have no prior knowledge.

5.2.4 Type of Alliance Agreement

Whether the agreement used was a written or verbal agreement was assessed by asking: "What type of alliance agreement was used for this new product development alliance?"

Of the 110 respondent firms, 75 firms used both formal contractual governance and relational governance mechanisms, whilst the remaining 35 firms used no formal contractual governance mechanisms, that is, no written agreement was used.

5.2.5 Duration of New Product Development Alliance

On average, the new product development alliance was found to have lasted 15 months (or 1.25 years), which the literature suggests is fairly short-term in nature. Spekman, Forbes, Issabella and Macavoy (1998) consider three (3) years to be the minimum length of time in which a strong relationship could develop between two firms. Lambe *et al.* (2001) suggest that in order for exchange partners to adequately develop working norms, at least four 4 years is needed. In their relationship marketing study, Morris, Brunyee and Page (1998) found that on average, marketing executives felt that it took 2.18 years (26 months) to develop an inter-organisational relationship.

Table 5.8 Duration of New Product Development Alliance (months)

N	Mean	Median	Std.Dev.	Min	Max	Skewness	Kurtosis
106	15.0	15.9	11.43	1.0	36	1.49	2.54

5.2.6 Alliance Partner Size

The size of the alliance partner was assessed by asking the respondent how many employees their alliance partner firm had. The size of the partner firm that had formed a new product development alliance with the new technology-based firms ranged from 2 to 12000 employees, with a mean size of 843 employees.

Table 5.9 Size of Alliance Partner

N	Mean	Median	Min	Max	Std. Dev.	Skewness	Kurtosis
110	843	50	2	12000	2212.9	3.62	12.91

This section described the characteristics of the new technology-based firms in the sample, their alliance partners, and the nature of their relationships. The next section describes an initial assessment of the association between variables in this study.

5.3 CORRELATION ANALYSIS

Pearson correlation analysis was conducted in order to obtain a preliminary insight into the nature of the correlations between the variables in this study, and the results

of this appear in table 5.10. The correlations which are emboldened are significant at the $p<0.05$ level ("p-values" are shown below the correlation coefficient "r-values" in the table). Many of the expected correlations between the independent and dependant variables were found to be significant ($p<0.05$). Additionally, relational governance and formal contractual governance were found to have a significant positive relationship ($r=0.24$, $p<0.05$). This suggests that formal and relational governance mechanisms support one another rather than undermine one another, as has been suggested by other alliance researchers who have proposed that formal controls negatively influence the development of relational governance (Ghoshal and Moran, 1996; De Laat, 1997; Das and Teng, 1998).

The formal contractual governance construct was found to have significant positive associations with positive alliance outcomes and negative associations with negative alliance outcomes, as hypothesised. It however had no significant association with any of the resource acquisition constructs. Relational governance on the other hand was found to have significantly positive associations with the resource acquisition constructs. The hypothesised associations between relational governance and negative alliance outcomes were, however, not significant at the $p<0.05$ level.

A significant negative correlation between collaboration costs and new product development performance ($r = -0.24$, $p<0.05$) was also revealed. This reinforces the need to understand collaboration costs in new product development alliances, because it suggests that time lost via the alliance arrangement will affect the success of the new product development.

The control variables of firm size, firm age, and alliance partner size did not evidence significant correlations with any of the key constructs in the study (at the $p<0.05$ level), with one exception. This is the negative correlation between alliance partner size and collaboration costs ($r = 0.29$, $p<0.05$), which suggests that as the alliance partner increased in size, so the new technology-based firm experienced greater collaboration costs.

Table 5.10 Pearson Correlation Table for variables in the Overall Governance-Outcomes Framework

	Emboldened correlations are significant at p<0.05										
Variable	**Formal contractual governance**	**Relational Governance**	**New Product Development Performance**	**Alliance Team Effectiveness**	**Social Resource Acquisition**	**Knowledge Acquisition**	**Knowledge Loss**	**Collaboration Costs**	**Firm Age (Log)**	**Firm Size (Log)**	**Alliance Partner Size (Log)**
Formal Contractual Governance	1.00										
Relational Governance	**0.24** p=0.038	1.00									
New Product Development Performance	**0.43** p=0.000	**0.32** p=0.005	1.00								
Alliance Team Effectiveness	**0.30** p=0.008	**0.63** p=0.000	**0.50** p=0.000	1.00							
Social Resource Acquisition	0.07 p=0.572	**0.33** p=0.004	**0.23** p=0.045	**0.24** p=0.039	1.00						
Knowledge Acquisition	0.01 p=0.906	**0.39** p=0.001	0.16 p=0.168	**0.24** p=0.039	**0.60** p=0.000	1.00					
Knowledge Loss	**-0.28** p=0.017	-0.21 p=0.067	-0.14 p=0.227	**-0.40** p=0.000	0.12 p=0.319	0.21 p=0.080	1.00				
Collaboration Costs	**-0.28** p=0.014	-0.08 p=0.480	**-0.24** p=0.041	**-0.42** p=0.000	0.11 p=0.338	0.06 p=0.602	**0.53** p=0.000	1.00			
Firm Age (Log)	-0.02 p=0.891	0.01 p=0.942	0.05 p=0.674	0.14 p=0.239	0.11 p=0.354	0.09 p=0.426	-0.06 p=0.628	-0.18 p=0.115	1.00		
Firm Size (Log)	-0.14 p=0.240	-0.14 p=0.247	0.09 p=0.439	-0.04 p=0.734	-0.01 p=0.456	0.01 p=0.907	0.06 p=0.619	-0.08 p=0.503	0.09 p=0.430	1.00	
Alliance Partner Size (Log)	-0.05 p=0.674	0.07 p=0.559	0.00 p=0.991	0.01 p=0.904	-0.01 p=0.918	0.03 p=0.783	0.06 p=0.628	**0.29** p=0.013	0.10 p=0.410	0.07 p=0.554	1.00

The p-values reflect two-tailed tests

Check for Multicollinearity

Multicollinearity is a condition where there is excessive "overlap" between independent variables (Agresti and Finlay, 1997:541). This condition creates problems in regression analysis as it "causes inflated standard errors for estimates of regression parameters" (Agresti and Finlay, 1997:541).

The correlation coefficients in Table 5.10 were examined and, the correlation coefficients between the independent governance variables were found to be well below the threshold correlation coefficient of 0.8; Kennedy (1992) suggests that when the correlation coefficient between independent variables exceeds 0.8, multicollinearity could become a problem.

It has been suggested that examining the correlation matrix is not sufficient to conclude the non-existence of multicollinearity, and Hair *et al.* (1998) recommend that researchers examine the tolerance value and the variance inflation factor (which is the inverse of the tolerance value). In this study, tolerance values were well above 0.1 and the variance inflation factors were well below 10, which indicated that multicollinearity should not cause a problem (Hair et al., 1998). In this study, the use of a stepwise regression analysis procedure, which is discussed in section 5.4, further minimises the risk of multicollinearity between variables, which can cause numerous problems in regression analysis (Agresti and Finlay, 1997; Hair et al., 1998).

5.4. REGRESSION ANALYSIS

In order to test the hypotheses, multiple linear regression analysis was employed and the **forward stepwise regression technique** was used. The Statistica version 6.0 software programme was used for this analysis.

Agresti and Finlay (1997:528) provide two guidelines for selecting independent variables (predictor variables) for a regression model. First, enough independent variables must be included to allow the model to be useful for theoretical and predictive reasons, and second, there must be an attempt to keep the model simple. "The presence of unnecessary or redundant variables makes the model more difficult

to interpret, presents more parameters to be estimated, may result in inflated standard errors of the estimates of these parameters, and may make it impossible to assess the partial contributions of variables that are important theoretically" (Agresti and Finlay, 1997:528).

The second objective, which is to keep the model simple, is particularly important when sample sizes are small to moderate, that is, when sample sizes are around 100 or less (Agresti and Finlay, 1997:528), as in this study. Stepwise regression is one of the methods often used, as it meets the objective of selecting variables to maximise the predictive power of the model whilst using the fewest number of independent variables (Hair et al., 1998:178).

In order to assess the incremental contribution made by each independent variable to explaining the dependant variable, the partial correlation of each independent variable with the dependant variable (controlling for all other independent variables) is computed. This computation was discussed in section 4.6.3. Forward stepwise regression starts by selecting the variable "which makes the greatest significant contribution to predicting the dependant variable" (Hair et al., 1998:147). It adds one variable at a time to the regression model and at each step the variable included is the one that adds the greatest explanatory power to the regression model. Those variables which are redundant and do not contribute in any statistically significant way to explaining the dependant variable, are not included in the regression model.

The regression analyses are arranged into three sets. First, the analyses pertaining to the proposed governance and new product development performance relationships are reported. Second, those pertaining to the governance, resource acquisition and loss relationships are described, and third, those relevant to the governance and collaboration costs relationships are reported. The details of the forward step-wise regression results are shown in Appendix 5.

5.4.1 Governance and New Product Development Performance and the Mediating Role of Alliance Team Effectiveness (Tests of Hypotheses 1 to Hypotheses 5)

Hypotheses 1 and 3 postulated a positive relationship between the governance constructs and new product development performance. Hypotheses 2 and 4 similarly postulated a positive relationship between the governance constructs and alliance team effectiveness, while hypothesis 5 proposed that alliance team effectiveness mediates the relationship between governance and new product development performance.

In order to test hypotheses 1 and 3 the dependant variable (new product development performance) was regressed on the two independent variables (formal contractual governance and relational governance) and the control variables (firm size, firm age, alliance partner size and the dummy variables representing the three industry sectors studied). In the execution of the forward stepwise procedure, only the two independent variables and firm size were found to make a statistically significant contribution to explaining the dependant variable - new product development performance. The rest of the control variables were found to be redundant and were not retained in the model.

Table 5.11 shows the results of forward stepwise regression analyses. The overall model was significant (F-statistic = 8.59, $p<0.001$), and support was found for hypothesis 1, that formal contractual governance is positively associated with new product development performance (beta=0.40, $p<0.001$). Hypothesis 3 was also supported as relational governance was found to be positively associated with new product development performance (beta=0.25, $p<0.05$). Firm size also showed a positive association with new product development performance (beta=0.24, $p<0.1$), although the association was not significant at the 95% confidence level.

Table 5.11 The Direct Relationship between Governance and New Product Development Performance

Variable	β (Beta coefficient)	p-value
Formal Contractual Governance	0.40	0.000
Relational Governance	0.25	0.011
Firm Size	0.24	0.087
Adjusted R^2	0.24	
F-Statistic	8.59	0.000

Standardised beta coefficients are reported. The p-values reflect one-tailed tests for hypothesised relationships

Hypothesis 2 and hypothesis 4 postulated that formal contractual governance and relational governance would have a positive association with alliance team effectiveness. In order to test these hypotheses, alliance team effectiveness was regressed on the two independent variables and all the control variables. The results of the forward stepwise regression analysis is shown in Table 5.12.

Table 5.12 The Relationship between Governance and Alliance Team Effectiveness

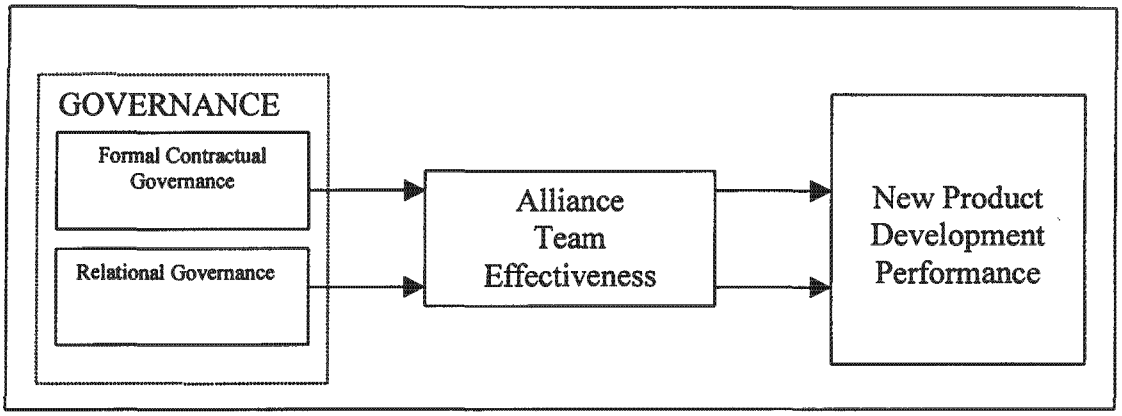
Variable	β (Beta coefficient)	p-value
Formal Contractual Governance	0.16	0.044
Relational Governance	0.59	0.000
Adjusted R^2	0.41	
F-Statistic	25.99	0.000

Standardised beta coefficients are reported. The p-values reflect one-tailed tests for hypothesised relationships

Both hypothesis 2 and 4 were supported, as formal contractual governance and relational governance were found to exhibit a positive association with alliance team effectiveness.

Hypothesis 5 postulated that alliance team effectiveness mediates the relationship between the governance - new product development performance relationships. This is shown diagrammatically in Figure 5.1.

Figure 5.1 Mediation of the Governance – New Product Development Relationship



Mediation was tested by using a staged approach as described by Baron and Kenny (1986). According to Baron and Kenny (1986), the following three conditions should be satisfied to provide evidence for mediation:

1. The independent variables (formal and relational governance) must be associated with the proposed mediator (alliance team effectiveness)
2. The mediator must be associated with the focal dependant variable (new product development performance)
3. The significant relationship between the independent variables and the dependant variable must be rendered non-significant for full mediation to be demonstrated.

Condition 1 has been satisfied, as shown in the Table 5.12 where both governance constructs have a significant positive relationship with alliance team effectiveness. In order to test Condition 2, new product development performance was regressed on alliance team effectiveness and the control variables; the results of this analysis are shown in Table 5.13. From Table 5.13, alliance team effectiveness can be seen to exhibit a significant positive association with new product development performance (beta= 0.47, $p<0.001$), thus Condition 2 has been satisfied.

Table 5.13 The Relationship between Alliance Team Effectiveness and New Product Development Performance

Variable	β (Beta coefficient)	p-value
Alliance Team Effectiveness	0.47	0.000
Sector 2	0.15	0.074
Adjusted R^2	0.23	
F-Statistic	17.26	0.000

Standardised beta coefficients are reported. The p-values reflect one-tailed tests for hypothesised relationships

Condition 3 requires that the significant relationships between the governance constructs and new product development performance be eliminated or substantially reduced when the mediator (alliance team effectiveness) is included in the model (Baron and Kenny, 1986). Condition 3 was examined in table 5.14. Model 1 shows the forward stepwise regression results where new product development performance has been regressed on formal contractual governance, relational governance, and the control variables. Model 2 shows the forward stepwise regression results where alliance team effectiveness has been added in as an additional independent variable.

Table 5.14 Test of Mediation, Dependent Variable New Product Development Performance

Variable	Model 1 (Independent Variables are Formal and Relational Governance)		Model 2 (Independent Variables are Formal and Relational Governance and Alliance Team Effectiveness)	
	Beta Coefficient	P-value	Beta Coefficient	P-value
Formal contractual governance	0.40	0.000	0.33	0.002
Relational Governance	0.25	0.011		Not significant
Alliance Team Effectiveness			0.40	0.000
Firm Size (log)	0.24	0.087	0.15	0.116
Adjusted R^2	0.24		0.33	
F-Statistic	8.59	0.000	13.09	0.000

Standardised beta coefficients are reported. The p-values reflect one-tailed tests for hypothesised relationships

Model 1 showed that formal contractual governance had a significant positive direct relationship (beta = 0.40, $p < 0.001$) with new product development performance; similarly relational governance had a significant positive direct association with new product development performance (beta = 0.25, $p < 0.05$). In Model 2, alliance team effectiveness was added in as an additional independent variable and it was found to have a positive association with new product development performance (beta = 0.40, $p < 0.001$). Mediation was tested by comparing the effects of the governance mechanisms in Model 1 and Model 2. In Model 2 (where alliance team effectiveness was added in), the association of formal contractual governance with new product development performance was found to have decreased, although it remained statistically significant. Hence, alliance team effectiveness only **partially mediated the relationship between formal contractual governance** and **new product development performance**. In examining relational governance, it is clear that while relational governance had a significant direct association with new product development performance in Model 1, it no longer had a significant association with new product development performance in Model 2. Alliance team effectiveness can therefore be seen to have **fully mediated the relationship between relational governance** and **new product development performance**. As alliance team effectiveness only partially mediated the effect of formal contractual governance and fully mediated the effect of relational governance, partial support for Hypothesis 5 has been found. The mediated model can been seen to provide a better model fit, as evidenced by the 37.5% increase in the adjusted R^2.

5.4.2 Governance, Resource Acquisition and Resource Loss (Tests of Hypothesis 6 to Hypothesis 9)

Hypothesis 6 stated that relational governance would be positively associated with social resource acquisition. To test this hypothesis, social resource acquisition was regressed on the two independent variables (formal and relational governance) and on all the control variables. Although only a relationship between relational governance and the dependant variable social resource acquisition was hypothesised, both governance variables were included in the regression analyses in order to fully examine the effect of governance.

The results of the forward stepwise regression analysis are shown in Table 5.15. This analysis has identified relational governance as the only independent variable that contributes to predicting social resource acquisition. Formal contractual governance and the control variables were found to be redundant in the model and were eliminated in the stepwise procedure. Table 5.15 shows that relational governance had a significant positive association with social resource acquisition (beta=0.33, $p<0.01$).

Table 5.15 The Relationship between Governance and Social Resource Acquisition

Variable	β (Beta coefficient)	p-value
Relational Governance	0.33	0.002
Adjusted R^2	0.10	
F-Statistic	8.84	0.002

Standardised beta coefficients are reported. The p-values reflect one-tailed tests for hypothesised relationships

Hypothesis 7 predicted that relational governance would be positively associated with knowledge acquisition. In order to examine the effect of governance, the dependant variable (knowledge acquisition) was regressed on both independent variables (formal and relational governance) and all the control variables. The forward stepwise regression analysis identified formal contractual governance as being redundant in the model, while relational governance was found to make a statistically significant contribution to the model. The results of the regression analysis are shown in Table 5.16. The evidenced positive association between relational governance and knowledge acquisition provided support for Hypothesis 7.

Table 5.16 The Relationship between Governance and the Acquisition of Knowledge-Based Resources

Variable	β (Beta coefficient)	p-value
Relational Governance	0.39	0.000
Adjusted R^2	0.14	
F-Statistic	13.23	0.000

Standardised beta coefficients are reported. The p-values reflect one-tailed tests for hypothesised relationships

Hypothesis 8 postulated that formal contractual governance would be negatively associated with knowledge loss, and Hypothesis 9 similarly predicted that relational governance would be negatively associated with knowledge loss. In order to test these hypotheses, forward stepwise regression analysis was performed, with knowledge loss as the dependent variable, formal and relational governance as the two independent variables, and firm size, firm age, alliance partner size and industry sector indicators included in the analysis as control variables. The results of the regression analysis are shown in Table 5.17. Formal contractual governance was found to have a significant negative association with knowledge loss (beta= -0.28, $p<0.01$), providing support for Hypothesis 8. Relational governance was identified as a redundant variable which did not contribute to predicting knowledge loss, and Hypothesis 9 was therefore not supported.

Table 5.17 The Relationship between Governance and Knowledge Loss

Variable	β (Beta coefficient)	p-value
Formal Contractual Governance	-0.28	0.009
Adjusted R^2	0.06	
F-Statistic	5.93	0.009

Standardised beta coefficients are reported. The p-values reflect one-tailed tests for hypothesised relationships

5.4.3 Governance, Collaboration Costs and New Product Development Performance (Tests of Hypothesis 10 to Hypothesis 12)

Hypothesis 10 postulated that formal contractual governance would have a negative relationship with collaboration costs. Hypothesis 11 similarly predicted that relational governance would be negatively associated with collaboration costs.

In order to test these hypotheses, forward stepwise regression analysis was performed where collaboration costs was the dependant variable, formal contractual governance and relational governance were the two independent variables, and firm age, firm size, alliance partner size and industry sector indicators were included as control variables. The results of the analysis are shown in Table 5.18.

Table 5.18 The Relationship between Governance and Collaboration Costs

Variable	β (Beta coefficient)	p-value
Formal Contractual Governance	-0.27	0.006
Firm Age	-0.22	0.046
Alliance Partner Size	0.29	0.008
Adjusted R^2	0.17	
F-Statistic	5.92	0.001

Standardised beta coefficients are reported. The p-values reflect one-tailed tests for hypothesised relationships

The regression results showed that formal contractual governance has a significant negative effect on collaboration costs (beta = -0.27, $p < 0.01$), and Hypothesis 10 is therefore supported. Relational governance was, however, identified as a redundant variable which did not contribute to predicting collaboration costs. Hypothesis 11, which predicted a negative association between relational governance and collaboration costs, was therefore not supported. The regression results further showed that alliance partner size had a significant positive effect on collaboration costs (beta = 0.29, $p < 0.01$). This indicates that the larger the alliance partner is, the more time is lost for the focal new technology-based firm in collaborating with the partner. In addition, a negative association between firm age and collaboration costs was found, which suggests that older new technology-based firms may experience lower levels of time loss in new product development alliances than younger firms.

Hypothesis 12 suggested that a negative relationship would exist between collaboration costs and new product development performance. Forward stepwise regression analysis was used to test this hypothesis, with new product development performance the dependant variable and collaboration costs as the independent variable, and the control variables of firm age, firm size, alliance partner size, and the industry sectors indicators included in the analysis. The results presented in table 5.19 showed that collaboration costs had a significant negative relationship with new product development performance (beta = -0.21, $p< 0.05$), and support for Hypothesis 12 is therefore indicated.

Table 5.19 The Relationship between Collaboration Costs and New Product Development Performance

Variable	β (Beta coefficient)	p-value
Collaboration Costs	-0.21	0.015
Adjusted R^2	0.03	
F-Statistic	4.88	0.015

Standardised beta coefficients are reported. The p-values reflect one-tailed tests for hypothesised relationships

A summary of the overall results is shown in Table 5.20. The implications of these findings are discussed in the next chapter.

Table 5.20 Table of Hypotheses Tests Results

Hypothesis		Result
H1	New product development performance is positively associated with increasing comprehensiveness in formal contractual governance	Supported $\beta = 0.40$ $p < 0.001$ (direct relationship)
H2	Alliance team effectiveness in new product development projects is positively associated with increasing comprehensiveness in formal contractual governance	Supported $\beta = 0.16$ $p < 0.05$
H3	New product development performance is positively associated with higher levels of relational governance	Supported $\beta = 0.25$ $p < 0.05$ (direct relationship)
H4	Alliance team effectiveness in new product development projects is positively associated with higher levels of relational governance	Supported $\beta = 0.59$ $p < 0.001$
H5	Alliance team effectiveness in new product development projects mediates the relationship between governance and new product development performance	Partially supported Full mediation for relational governance Partial mediation for formal contractual governance
H6	Social resource acquisition in new product development projects is positively associated with higher levels of relational governance	Supported $\beta = 0.33$ $p < 0.01$
H7	The acquisition of knowledge-based resources in new product development projects is positively associated with higher levels of relational governance	Supported $\beta = 0.39$ $p < 0.001$
H8	Knowledge loss in new product development projects is negatively associated with increasing comprehensiveness in formal contractual governance	Supported $\beta = -0.28$ $p < 0.01$
H9	Knowledge loss in new product development projects is negatively associated with higher levels of relational governance	No support β not significant
H10	Collaboration costs in new product development projects are negatively associated with increasing comprehensiveness in formal contractual governance	Supported $\beta = -0.27$ $p < 0.01$
H11	Collaboration costs in new product development projects are negatively associated with higher levels of relational governance	No support β not significant
H12	New product development performance is negatively associated with increased collaboration costs	Supported $\beta = -0.21$ $p < 0.05$

CHAPTER 6

DISCUSSION AND CONCLUSIONS

This chapter discusses the results of the hypotheses tests which were presented in the previous chapter. The chapter is organised into four sections. The first section discusses the relationship[7] between governance and new product development performance; the second examines the relationship between governance and resource acquisition and resource loss; the third discusses the relationships between governance and collaboration costs and between collaboration costs and new product development performance, and the fourth section examines factors which may influence the development of relational governance in short-term new product development collaborations.

6.1 GOVERNANCE AND NEW PRODUCT DEVELOPMENT PERFORMANCE

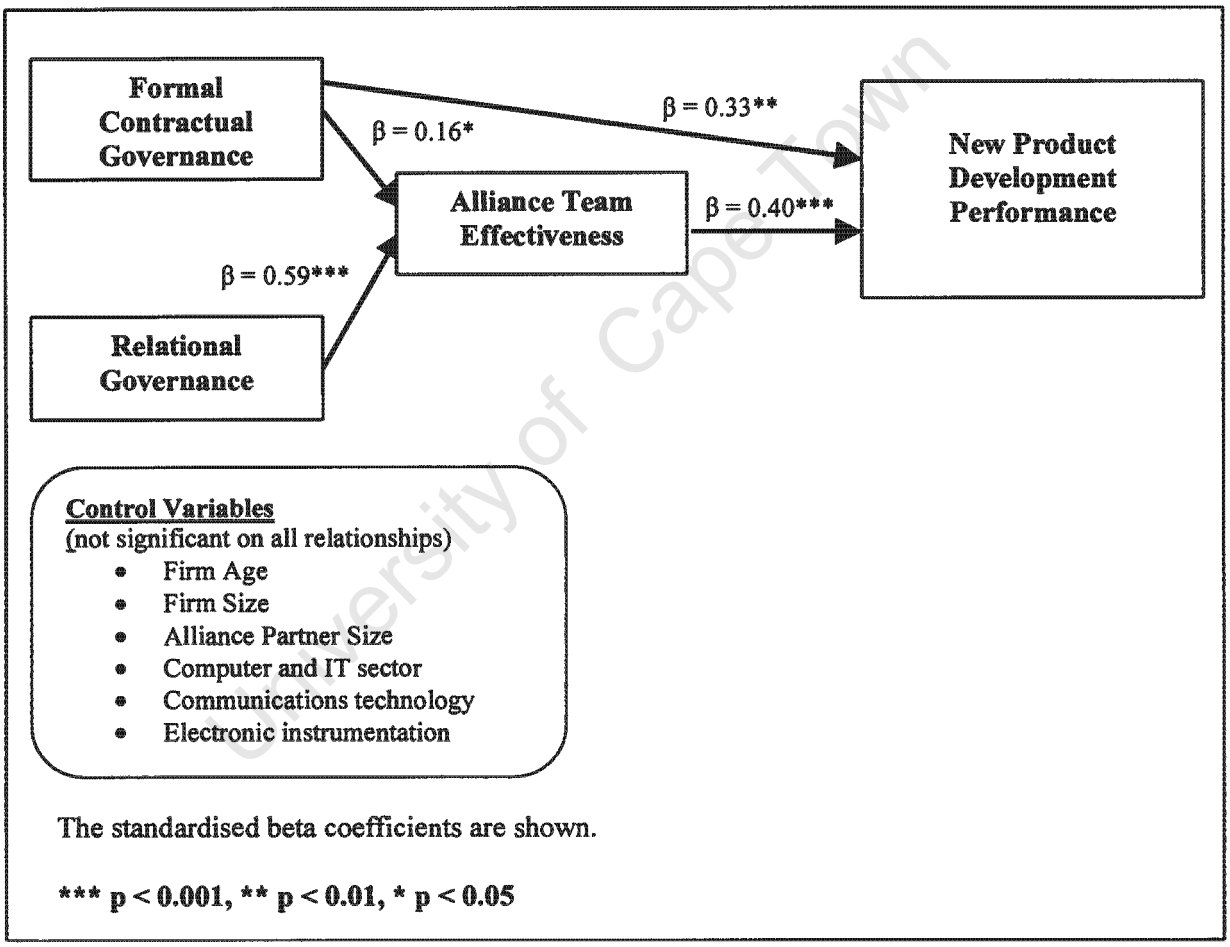
In examining how the mechanisms employed to govern the collaborative new product development, are associated with new product development performance, it was posited that both formal contractual governance and relational governance would have a positive relationship with alliance team effectiveness and a positive relationship with new product development performance. These Hypotheses (1,2,3,4) were supported and lend credence to the argument that formal and relational governance mechanisms act in a complementary way (Poppo and Zenger, 2002; Cannon et al, 2000).

In looking at the direct relationship between governance and alliance team effectiveness it is clear that relational governance has a stronger positive association with alliance team effectiveness than formal contractual governance ($Beta_{Relational}$ = 0.59, $p < 0.001$; $Beta_{Formal}$ = 0.16, $p < 0.05$). This suggests that the development of

[7] The relationships discussed and illustrated in the diagrams refer to the associations found between relevant variables. Causation cannot be established in this study as it is a cross-sectional study (Agresti and Finlay, 1997).

relational governance between new product development participants increases participants' satisfaction with the relationship, which is manifested in their willingness to work each with another again, as well as their perception that they are working effectively together. This finding supports much of the marketing channel and strategy literature which has drawn on the relational exchange perspective and which has found a strong positive link between trust, relational norms and measures of satisfaction with the inter-firm exchange relationship and effectiveness of the inter-firm relationship (For example, Zaheer and Venkatraman, 1995).

Figure 6.1 Governance and New Product Development Relationships



While relational governance was found to have a stronger association with alliance team effectiveness, formal contractual governance was found to have a stronger positive direct association with new product development performance. For the direct relationship between governance and new product development performance $Beta_{formal} = 0.40$, $p < 0.001$ while, $Beta_{relational} = 0.25$, $p < 0.05$. The strong positive

association of formal controls with new product development performance is somewhat surprising, as previous studies examining the linkage between performance and alliance governance have emphasized the need to employ relational rather than formal contractual governance mechanisms (Yli-Renko et al., 2001). Certain formal controls, such as the presence of schedules and milestones (Eisenhart and Tabrizi, 1995) and certain formal processes defining roles, responsibilities and task coordination (Griffin, 1997) have been reported to improve new product development in single firm, in-house contexts; the influence of these kinds of formal controls have, however, not been explicitly examined in the inter-firm new product development alliance context.

There are three possible reasons for finding that formal controls has a positive relationship with new product development performance in the context of this study (short-term, new product development focused alliances), whereas they have largely not been found to improve performance in long-term inter-firm linkages (Jap and Ganesan, 2000). First, new product development focused alliances are characterized by extreme **time pressures**. Second, new product development alliances are often plagued by **uncertainty** and third, when new product development spans traditional firm boundaries, **coordination** challenges become significant (Yoshino and Rangan, 1995).

Time Pressures

In long-term, relatively enduring inter-firm linkages (such as buyer-supplier linkages) time pressures, uncertainty and coordination challenges are not present to the same degree that they are present in short-term, new product development focused alliances. Time pressures, which are characteristic of short-term new product development focused alliances, create a situation where there may not be enough time for alliance partners to develop relational norms and to engage in the kind of relational exchange described by many marketing channel researchers (for example, Dwyer et al., 1987; Gundlach and Murphy, 1993; Morgan and Hunt, 1994).

Lambe, Spekman and Hunt (2000) theorise that the time pressures in short-term alliances make it difficult for relational norms and trust to develop to a high degree and that it would therefore be necessary to support relational controls with other

forms of control. They further propose that in short-term relationships partners are more likely to rely on "substitutes for trust" (Lambe et al., 2000:218) namely, environmental incentives, reputation, and relation-specific investments. Although they do not develop any specific propositions regarding formal contractual governance, they suggest that social exchange theory is limited in its ability to explain exchange in short-term alliance relationships and that transaction cost theory may complement social exchange theory as it is more focused on "non-relational governance" (Lambe et al., 2000:216). In a time-pressured environment, formal contractual governance may be providing an effective means to structure the development process. Furthermore, while it has been argued that contractual safeguards have a negative effect on performance in new product development focused alliances (De Laat, 1997), entrepreneurs interviewed emphasised how concerns regarding opportunism (particularly with regards to the wrongful use of proprietary knowledge) caused them to communicate with their alliance partner in a hesitant, reserved way. These entrepreneurs contended that by addressing their fears via contractual safeguards they were creating some protection around their intellectual assets. Although aware of the fact that contractual safeguards did not eliminate possible knowledge loss, they expressed the opinion that, a context was created which was more conductive to allowing effective dialogue. The contention is that when alliance partners have serious concerns regarding knowledge loss due to partner opportunism, knowledge is reluctantly shared, which delays the new product development process. The use of contractual safeguards serves to mitigate these concerns and facilitates the effective flow of knowledge between partners in a constructive way.

Uncertainty

New product development in technology-intensive industries is "inherently risky" and uncertain (Littler et al, 1995:16). Contracts become increasingly difficult to write as uncertainty increases (Williamson, 1985), and hence relational governance has often been promoted as a more efficient and effective form of governance for alliances characterised by uncertainty (Dyer and Singh, 1998; Das and Teng, 2000). The findings of this study challenge this view and provide evidence which indicates that

formal contractual governance does indeed play a role in addressing the uncertainty associated with new product development.

In their study of in-house new product development, Eisenhart and Tabrizi (1995) have found that, particularly in contexts characterised by high uncertainty, the presence of formal controls in the form of schedules and milestones positively enhance new product development. They argue that these controls force managers to continuously collect and evaluate data on the product development progress and to discuss developments at scheduled meetings. Although these meetings may expend time, they force managers to evaluate progress and to take corrective action if and when difficulties arise. Without this, problems may take longer to detect and may become more difficult to rectify. Thus, the discipline induced by these controls may serves to improve the new product development process.

Coordination

Coordination challenges are also heightened in new product development focused alliances. The effect of formal contractual governance in addressing these challenges is however discussed in section 6.3 (governance, collaboration costs and new product development performance).

Alliance Team Effectiveness and New Product Development Performance

It was hypothesised that alliance team effectiveness mediates the relationship between governance and new product development performance. Alliance team effectiveness was found to have a positive association with new product development performance. It fully mediated the relationship between relational governance and new product development performance. It however only partially mediated the relationship between formal contractual governance and new product development performance. That is, although the strength and significance of the association between formal contractual governance and new product development performance was decreased when alliance team effectiveness was included in the model as a mediator, formal contractual governance continued to have a significant positive direct association with new product development performance.

These results suggest that alliance team effectiveness is the mechanism through which relational governance has a positive relationship with new product development performance. This suggests that relational governance developed between new product development participants could increase the effectiveness of the team, which is strongly associated with improved new product development performance. (The strength and significance of the relationship between relational governance and alliance team effectiveness is: $Beta_{relational} = 0.59$, $p < 0.001$ and between alliance team effectiveness and new product development performance is $Beta_{alliance\ team\ effectiveness} = 0.40$, $p < 0.001$ as shown in figure 6.1).

The positive association of relational governance with alliance team effectiveness and its positive relationship with new product development performance suggests that when the new product development participants from the two firms are well integrated and have an effective working relationship, the development process and product performance is enhanced. Although this finding is intuitively appealing, it contrasts with the findings of research done investigating the relationship between relational norms, alliance team effectiveness, and new product development performance in an in-house cross-functional setting, notably by Ayers et al (1997). Ayers et al (1997) found that no significant relationship exists between team effectiveness and new product development performance. They also found that, contrary to the findings of this study, relational norms negatively influence new product development performance. Ayers et al (1997:112) infer from their findings that in the in-house, cross-functional, new product development context they studied, new product development participants were operating "within a group-think orientation" (Janis, 1983). Their findings suggest that the relational norms present between participants had developed to such a high degree that participants had been inclined to seek agreement and suppress different perspectives, and that this had a detrimental effect on new product development.

The findings of this study strongly contrast those of Ayers et al (1997) and indicate that new product development participants in the context of inter-firm short-term alliances have not developed relational norms to such a high degree that they suffer from group-think (the mean for relational governance is, however, 5.19 on a scale from 1 to 7). Hence, the findings of this study suggest that in this context, relational

norms have not reached a performance-inhibiting level, and that norms have a positive association with effectiveness and performance. The extent to which relational norms have developed is further examined in the Section 6.4, which discusses factors that may inhibit the development of relational governance in short-term, new product development focused alliances.

Complementary Nature of the Relationship between Formal and Relational Governance and New Product Development

Overall, the results of the hypotheses tests in the governance and new product development relationships suggest that formal and relational governance forms have a complementary relationship with new product development performance. This result is contrary to the bulk of the marketing channel and strategy literature, which view formal contractual governance and relational governance as opposing governance forms (Poppo and Zenger, 2002). It has been argued that the sharp differences in the behavioural assumptions underlying the development of relational norms as opposed to contractual agreements would make it very difficult for the two governance forms to co-exist simultaneously (Ghoshal and Moran, 1996; Macaulay, 1963; De Laat, 1997; Das and Teng, 1998). It has further been argued that formal contractual governance undermines the development of relational norms and trust, as formal contractual governance mechanisms by their very nature signal distrust (Ghoshal and Moran, 1996) and create a spiral of distrust which obstructs the building of trust and relational norms (De Laat, 1997).

The results of this study, however, were not supportive of the argument that formal and relational governance conflict with one another. Rather, the data provides evidence that they complement one another in contributing towards improving new product development performance. Further, from the correlation analysis (shown in table 5.10) formal and relational governance could be seen to be significantly and positively correlated with one another ($r=0.24$, $p< 0.05$) which is further supportive of the assertion that these governance mechanisms have a complementary relationship.

Entrepreneurs interviewed provided an insight into the reason for the positive relationship between formal and relational governance. They expressed the view that a contract allowed them to specify their concerns regarding confidentiality and to jointly decide on appropriate schedules and milestones. They also pointed out that the

process of developing a comprehensive contract forced parties from both firms to articulate their expectations and concerns. Furthermore, by articulating potential sources of conflict upfront, a climate conducive to information sharing and the development of trust was created, and potential relationship-damaging disagreements were reduced. The following view expressed by an entrepreneur interviewed illustrates this perspective:

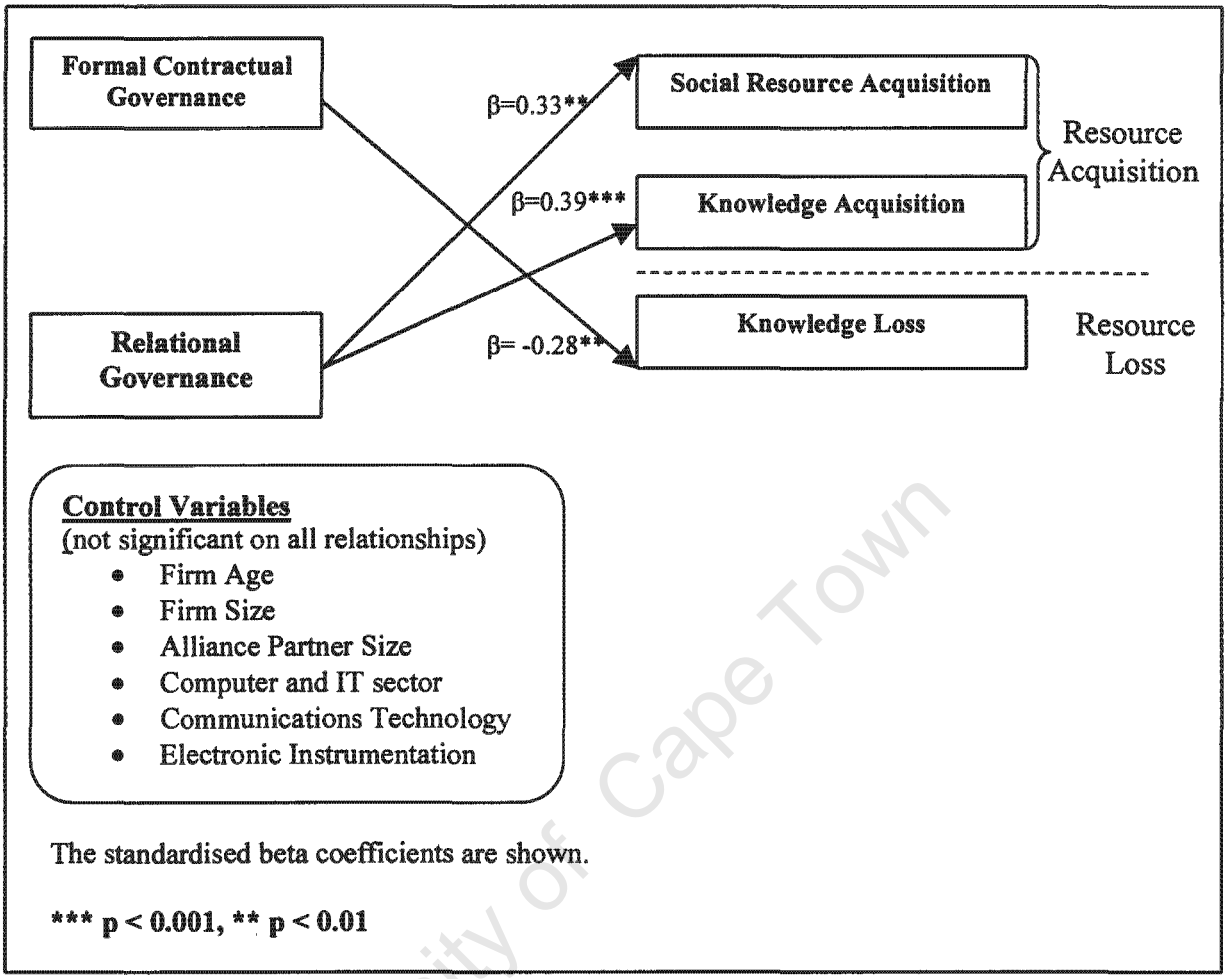
"The written, physical contract, once it is signed, becomes almost irrelevant, but the process is the important thing, it makes the relationship develop; you create the ground rules and you think in advance about any problems you might meet and how you would go about resolving them, and thereby they probably never occur. So it's a process – I see a formal contract developing the relationship."

6.2 GOVERNANCE, RESOURCE ACQUISITION AND RESOURCE LOSS

This framework serves to extend previous work on resource acquisition by examining both acquisition and loss. The results of the regression analyses (presented in Figure 6.2) found strong support for the argument that relational governance has a positive association with the acquisition of knowledge and social resources. This finding supports the conceptual work of Nahapiet and Ghoshal (1998), who have emphasized the role of the social relationship developed between alliance partners in facilitating the transfer of valuable, intangible resources between firms.

The results of this study further showed that formal contractual governance had no statistically significant effect on knowledge or social resource acquisition and provides empirical support for the argument that formal contractual governance does not play a significant role in value extracting activities such as resource acquisition (Dyer and Singh, 1998). Ghoshal and Moran (1996) argue that formal contractual governance may even reduce trust and the quality of the relationship and therefore weaken efforts at extracting value from the alliance relationship.

Figure 6.2 The Governance, Resource Acquisition and Resource Loss Relationships Model

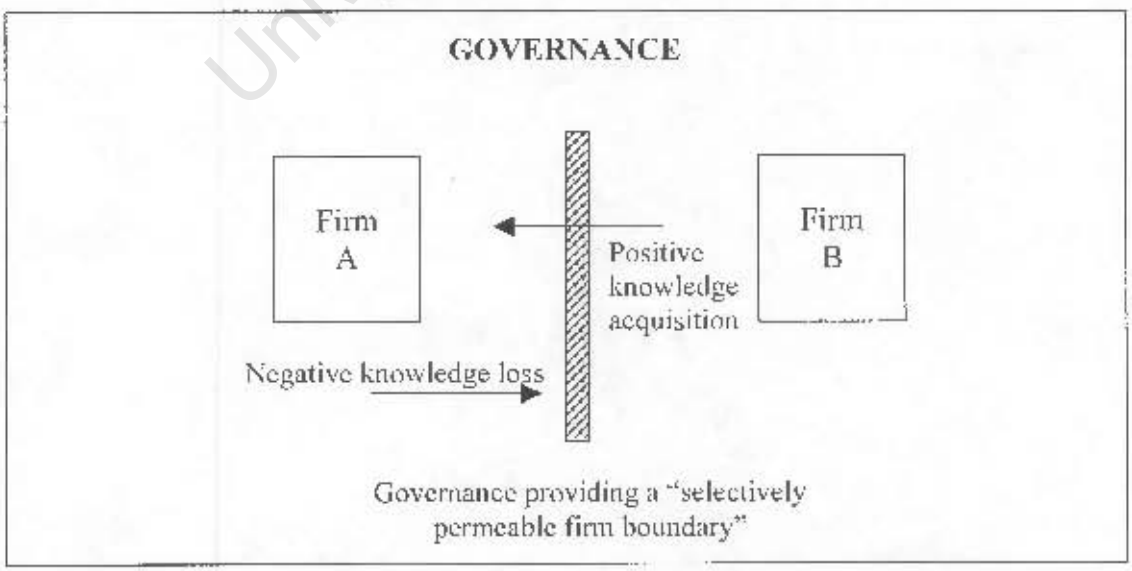


The argument that relational controls simultaneously enhance the acquisition of resources such as knowledge whilst minimising unintended loss of proprietary knowledge (Dyer and Singh, 1998; Ghoshal and Moran, 1996) was not strongly supported in this study (relational governance was found to have no significant association with knowledge loss). In focusing on only resource acquisition and the role of relational governance elements, as is done by a large portion of the entrepreneurship literature, only a partial perspective has been presented. However, by examining both resource gain as well as resource loss, a more complete picture regarding the role of governance and resource inflows and outflows emerges. Relational governance was found to be positively associated with resource gain as hypothesised. However, no statistically significant support for the hypothesised negative relationship between relational governance and knowledge loss was found, contrary to the strong relationship proposed by Dyer and Singh (1998).

The results of this study provided evidence that formal contractual governance has a negative relationship with the loss of knowledge. This finding is supportive of the prescriptions by Alvarez and Barney (2001) that entrepreneurial firms should use a contract to protect themselves from losing their intellectual property in alliances with large firms. Taken together, the findings of this study suggest that social resources (D'Aveni, 1990; Eisenhart and Schoonhaven, 1996) and knowledge-based resources (Yli-Renko et al., 2001) are acquired via social processes characterised by the development of relational governance. Detrimental knowledge outflow by the new technology-based firm is, however, negatively associated with the development of a formal contractual governance structure.

Thus, while relational governance facilitates resource in-flow, formal contractual governance can be conceptualised as a filter preventing the loss of the firm's intellectual assets. Figure 6.3 illustrates that together, formal and relational governance can be seen to work in a manner which is analogous to a selectively permeable membrane in chemical processes. A selectively permeable membrane is often used to facilitate the exchange of specific components between two fluids. The membrane will allow the flow of certain components, whilst preventing other components from flowing through the membrane.

Figure 6.3 Governance Acting as a Selectively Permeable Boundary between Collaborating Firms



Formal contractual governance forces firms to articulate the boundaries of what they are prepared to share and of what they need to retain tight ownership. It forces firms to think carefully about what they believe requires protection via intellectual property agreements, confidentiality clauses, or other types of safeguards.

Although the limitations of contractual safeguards in protecting firms from knowledge loss (and opportunistic behaviour) has been highlighted by a number of researchers (Williamson, 1975; 1985; Macneil, 1978; 1980; Macaulay, 1963; Deeds and Hill, 1998; Nonaka and Teece, 2001; Teece, 1988) the entrepreneurs who participated in the exploratory interviews provided an insight into why formal contractual governance may reduce knowledge loss. Entrepreneurs noted that the process of creating a contract and the articulation of concerns regarding confidentiality and intellectual property ownership created a climate which was conducive to the building of an open relationship. Conversely, when a purely relational contract exists, these concerns often remain tacit, leaving the new firm feeling vulnerable. This perspective is articulated by one of the entrepreneurs interviewed as follows:

"the written agreement clears up ambiguities, brings hidden agendas to the fore and most importantly, everyone is clear about what share of the money they will get if the project is a success."

Although De Laat (1997) and Ghoshal and Moran (1996) argue that formal contractual governance structures promote a spiral of rising distrust, this argument was not supported in this study. Rather, as previously discussed, the results support the argument that these two governance mechanisms are complementary in nature.

6.3 GOVERNANCE AND COLLABORATION COSTS

A unique dimension of this research study is that it examines the relationship between governance and transaction costs and the ultimate influence of transaction costs on new product development performance. In a review of studies on interorganisational relationships, Ebers and Grandori observe that an area that has remained neglected is an analysis of the costs associated with inter-firm collaboration (Ebers and Grandori, 1997:271).

complex inter-firm collaborative new product development context and finds empirical support for the role of formal controls in mitigating confusion.

Formal contractual governance was found to be negatively associated with collaboration costs. These results are surprising, because a number of reasons have been advanced that suggest that relational governance reduces collaboration costs while formal contractual governance increases collaboration costs because of the time expended in drafting an agreement and adjusting it for unexpected contingencies (Sako, 1992; Artz, 1999). It has also been argued that contracts constrain flexibility and result in increased coordination costs (Uzzi, 1997). It has therefore been postulated that particularly in uncertain innovation contexts, the use of formal contractual governance would be associated with higher transaction costs (Dyer and Singh, 1998).

In addition to illuminating the hypothesised relationships between governance and collaboration costs, the results uncovered a significant association between alliance partner size and collaboration costs. The regression results indicated that increasing alliance partner size was positively associated with collaboration costs. The exploratory interviews revealed beliefs that collaborative new product development with larger firms result in time and effort losses to the new technology-based firm for three reasons. The reasons for this are first, that larger, established firms tend to have a more complex structure with multiple organisational levels, compared to the relatively simple structure of the new firm. This presents numerous difficulties for the new firm in collaborating with the larger firm. The new firm can expend a great deal of time and effort in an attempt to overcome these difficulties. Second, larger firms often have a set of stringent requirements which potential alliance partners are forced to meet as a precursor to collaboration. (These requirements were described by the logistics and purchasing managers interviewed at a large automotive manufacturing plant based in Oxfordshire). Attempts to meet these stringent requirements place extensive demands on new firms and result in time losses. Third, new firms often find that they are in an inferior bargaining position (compared to the larger firm) and experience the large alliance partner "dictating" alliance terms to them which only serve the interests of the large firm (this was also observed by Alvarez and Barney,

2001). As the alliance terms are not in the new firm's favour, collaboration costs to the new firm are then magnified.

Altogether, the hierarchical structure of larger firms, the demands they make on new firms, and often the increased presence of "red tape" result in a heavy time and effort burden on the new firm. Millson, Raj and Wilemon (1996), in their conceptual discussion highlight the vulnerability of small firms forming alliances with larger firms. Lawton-Smith et al (1991) also draw attention to the risk of time losses that new technology-based firms may be exposed to in engaging in alliances. This study provides empirical evidence to support this view and indicates that, for new technology-based firms, collaborating with larger firms exposes them to increased collaboration costs manifested as time losses.

While alliance partner size is associated with increased collaboration costs, the results of the regression analysis showed that the age of the new technology-based firm (in years from founding) had a negative association with collaboration costs, indicating that as new firms age they incur lower collaboration costs than younger firms do. This may suggest that as new technology-based firms become older, they increase their experience with collaboration and possibly start developing routines and processes which make collaboration more efficient and which minimise time losses. Kale, Dyer and Singh (2001) propose that the development of alliance experience and the codification of this experience allows firms to structure and coordinate alliances more efficiently.

Collaboration Costs and New Product Development Performance

It was further postulated that increasing collaboration costs would be negatively associated with new product development performance. The results supported this hypothesis. While research on a conceptual level has highlighted the need for the efficient management of collaboration activities (Das and Teng, 2000), this is the first empirical study, to the researcher's knowledge, that explicitly measures how the costs associated with collaboration management (in terms of time) affects new product development performance.

The negative relationship between collaboration costs and new product development performance, and the negative relationship between formal contractual governance and collaboration costs may provide an insight into the mechanism through which formal contractual governance enhances new product development performance. Formal contractual governance may be able to streamline transactions between the two firms by providing a framework within which to work, and to improve coordination between new product development participants by clarifying roles and responsibilities. (The role of formal controls in reducing coordination complexity has been highlighted by early organisational theorists such as Barnard (1938) and Galbraith (1977), and more recently by Gulati and Singh (1998)). Thus, by reducing the sources of the time loss associated with collaboration management, formal contractual governance is positively associated with new product development performance.

6.4 POSSIBLE FACTORS INHIBITING THE DEVELOPMENT OF RELATIONAL GOVERNANCE IN SHORT-TERM NEW PRODUCT DEVELOPMENT-FOCUSED ALLIANCES

The results showed relational governance did not yield many of the benefits that the literature suggests it should yield. That is, it had no significant association with collaboration costs, or with knowledge loss. Additionally, formal contractual governance was found to have a much stronger direct positive relationship with new product development performance than relational governance.

There are four possible explanations for relational governance being less effective than expected in short-term new product development focused alliances involving new technology-based firms and larger firms. First, in an inter-firm context, participants find it difficult to develop norms to the same extent as participants from a single firm, as suggested by Lane and Bachmann (1998). Second, in inter-firm new product development alliances, the roles of partner firms may not be as clearly established as in buyer-supplier partnerships. In new product development alliances, a very real fear for a new technology-based firm is that an alliance partner becomes a competitor, since often the alliance partner is much larger, with access to a larger resource pool, and there is often a latent threat that the larger partner may commercialise the new product or technology independently of the new firm (Alvarez

and Barney, 2001). Concerns regarding this kind of opportunistic action, and fears that a large alliance partner may unfairly use the new firm's technology, create a barrier to the development of relational norms and trust. Third, in short-term, new product development alliances, product development is often done under great time pressure. Under this pressure it may be very difficult to engage in the social processes which are antecedents to developing trust and norms (Lambe et al., 2000). Fourth, new technology-based firms often need to form alliances with much larger firms in order to access complementary resources (Meyer and Alvarez, 1998). In their conceptual discussion, Das and Teng (1998) argue that as the difference in firm size between alliance partners becomes more pronounced, the harder it becomes for the firms to develop working norms. They therefore believe that it is very challenging to try and develop relational norms between small, new firms and larger established firms, as their cultures are often in sharp contrast.

In **summary**, the results discussed here confirm a number of the relationships proposed by the conceptual framework, and explanations were offered, regarding the reasons that certain relationships had not been supported by the data. The findings of this study indicate that the governance mechanisms employed have a significant relationship with new product development performance, the acquisition of social and knowledge-based resources, the leakage of knowledge from the new technology-based firms and the incursion of collaboration costs, and that collaboration costs are negatively associated with new product development performance.

These findings serve to address the research questions of this study and underscore the importance of giving careful consideration to the governance of inter-firm collaborative new product development.

CHAPTER 7

CONTRIBUTIONS, IMPLICATIONS FOR MANAGEMENT PRACTICE, LIMITATIONS AND FUTURE RESEARCH

This chapter discusses the significance of the findings and the study's conceptual and empirical contributions. Implications for managers are discussed and, in the last section, the limitations of this study are highlighted and directions for future research are identified.

7.1 CONTRIBUTIONS OF THIS RESEARCH

A key contribution of this research is that it shows that formal contractual governance and relational governance in new product development alliances have a complementary relationship with alliance outcomes. While both relational and formal contractual governance are positively associated with alliance team effectiveness and new product development performance, the development of relational governance is positively associated with the new technology-based firm's ability to acquire valuable social and knowledge-based resources. At the same time, increasing comprehensiveness in formal contractual governance is associated with minimising undesirable knowledge losses and reducing collaboration costs. Hence, by examining a larger number of alliance outcomes than previous research, a fuller, more complete picture emerges regarding the role of governance in realising collaboration benefits and minimising exposure to collaboration risks.

The results of this study challenge the theoretical work of Dyer and Singh (1998) and the empirical work of a number of strategy and marketing channel researchers such as Deeds and Hill (1998) and Jap and Ganesan (2000), who suggest that formal contractual governance is inferior to relational governance and may even negatively affect performance. On the other hand, this study contributes empirical evidence which is supportive of the emerging conceptual discussion by Lambe, Spekman and Hunt (2000), Lambe, Wittman and Spekman (2001) and Das and Teng (2002).

In particular, by empirically showing that both formal and relational governance are positively associated with new product development performance, and that formal contractual governance has a significant negative association with unintended knowledge loss from the new technology-based firm and that it plays a role in addressing co-ordination challenges posed by short-term time-pressured alliances, this study validates the contention that in alliances with a "short exchange horizon ... economic and legal sanctions play important roles" (Das and Teng, 2002:454).

Lambe et al., (2000) and Lambe et al., (2001) observe that work on inter-firm linkages in the marketing literature has focused on long-term (which they term enduring exchanges) buyer-supplier type relationships. The strategy literature also has tended to focus on relatively long-term inter-firm linkages (for example Zaheer and Venkatraman, 1995; Larson, 1992; Dickson and Weaver, 1997; Jarillo, 1988). Thus, the study of short-term, time pressurised alliances has been neglected (Lambe et al., 2000).

Lambe *et al.* (2000) suggest that in short-term alliances, developing an effective alliance governance mechanisms is challenging, because there is much less time and space to develop relational norms and trust than in long-term relationships, and they postulate that, in short-term alliances, relational governance would need to be supported by another governance mechanism(s). They suggest that in short-term inter-firm relationships, social exchange theory and the relational exchange perspective may need to be augmented by governance mechanisms derived from transaction cost theory, because transaction cost theory is primarily concerned with "non-relational" exchange. While Lambe *et al.* (2000) unfortunately do not develop propositions regarding the role of formal contractual governance, and focus their discussion on other transaction cost theory derived mechanisms such as investment in relation-specific assets, this study explicitly examines the role of formal contractual governance.

By comprehensively examining the role of governance mechanisms on the outcomes of new product development-focused alliances, this study contributes to the under-explored area of research on new product development-focused alliances (Millson, Raj and Wilemon, 1996) and short-term inter-firm relationships aimed at capitalizing on a transient opportunity. In doing this, it also contributes to the larger body of

literature on inter-firm relations which has traditionally focused on long-term relationships.

Contributions to Theory and Related Empirical Literature

On a conceptual level, this study develops hypotheses by drawing on the literature concerned with inter-firm relationships and alliances and contributes in particular to three theoretical perspectives, namely: **transaction cost theory**, the **relational exchange perspective**, and the **resource-based view**, and to related conceptual and empirical literature.

Transaction cost theory and the relational exchange perspective are concerned with the governance of alliances (Williamson, 1975; Macneil, 1978), while the resource-based view provides a perspective that allows an assessment of the outcomes; that is, how firms leverage and mobilise their existing resources and acquire complementary resources in order to achieve a competitive advantage. The resource-based view has been particularly relevant in explaining the motivation of entrepreneurial firms to form alliances in order to leverage resources (Eisenhart and Schoonhaven, 1996), and how the acquisition of complementary resources allows firms to achieve a competitive advantage.

Transaction Cost Theory-Related Contributions

Transaction cost theory has been criticised for its lack of consideration of social processes in inter-firm relationships (Gulati, 1995), which is suggested to be particularly problematic when alliances are used to access intangible resources such as knowledge-based resources (Kogut and Zander, 1992; Tsai and Ghoshal, 1998), because it is argued that knowledge transfer occurs via these social processes. The findings of this study demonstrate that relational governance, that is the degree to which norms and trust have developed between firms, has a strong positive association with knowledge acquisition. Transaction cost theory has also often been criticised for its neglect of value creating processes such as learning (Madhok and Tallman, 1998). The results of this study revealed that formal, transaction cost theory derived governance had no association with knowledge acquisition, this result provides evidence to reinforce this criticism.

The findings of this study are supportive of Bradach and Eccles' (1989) argument, that governance mechanisms can be combined in different ways to complement or supplement one another. This contrasts with the transaction cost theory argument, which suggests that different governance mechanisms are not structures that can easily be separated or combined, but rather that governance structures are arranged on a continuum, from market to hierarchy (Williamson, 1985).

This study further contributes to the conceptual discussion by numerous researchers (Williamson, 1975; 1985; Kay, 1996; Deakin and Wilkinson, 1998) regarding the role of formal contractual governance, by empirically testing the relationship between governance and the transaction costs associated with collaboration. The economists' argument as articulated by Deakin and Wilkinson (1998:150) is that "in the law and economics literature, contract law is generally seen as providing a set of 'default rules' which serve to reduce transaction costs and overcome informational and related barriers to optimal exchange". This view is supported by the findings of this study, which indicate that formal contractual governance facilitates co-ordination and is negatively associated with the costs associated with inter-firm collaboration.

Two **methodological** contributions from this study directly lead to the conceptual contributions in the application of transaction cost theory. They include first, an operationalisation of the transaction costs incurred due to the collaborative nature of the project, and second, the development of a measure for the formal contractual governance construct which is more comprehensive than previously used measures.

Transaction costs associated with the inter-firm collaborative nature of the new product development were operationalised in this study as the time losses incurred through activities such as discussions, negotiations and time lost due to poor coordination and confusion in roles and responsibilities. This study's operationalisation of these costs as the "time losses incurred" provided a means for empirical assessment of the relative costs associated with two different governance mechanisms. At its core, transaction cost theory contends that governance significantly affects transaction costs; however, due to difficulties associated with operationalising transaction costs (Williamson, 1975; Shelanski and Klein, 1995) explicit empirical assessment of this contention has been sparse and previous researchers drawing on transaction cost theory have tended to focus on the extreme

"make or buy" decisions rather than the relative costs associated with different governance mechanisms for 'hybrid arrangements' (Gulati and Singh, 1998).

The findings of this study indicated that increasing comprehensiveness of formal contractual governance was negatively associated with collaboration costs. This finding is consistent with transaction cost theory and contract law reasoning that the contract provides a "set of 'default rules', which serves to reduce transaction costs" (Deakin and Wilkinson, 1998:150).

A second methodological contribution is that a measure was developed for formal contractual governance which is more comprehensive and precise than measures used in previous studies. For example, Poppo and Zenger (2002:717) measure formal contractual governance with a single item: "the formal contract is highly customised and required considerable legal work."

Further, Cannon *et al.* (2000) measure formal contractual governance with three items, as follows: (1) "We have specific, well detailed agreements with this vendor." (2) "We have formal agreements that detail the obligations of both parties." (3) "We have detailed contractual agreements with this supplier". Both Poppo and Zenger's (2002) and Cannon *et al.*'s (2000) scales used 7-point Likert scales, anchored by 'strongly agree' and 'strongly disagree'. While these scales implicitly reflect the level of detail in the contract, they utilise very general statements which do not provide an insight into the types of clauses that have been utilised and to what extent different types of clauses have been specified. Poppo and Zenger (2002:723) stress this limitation in their and previous researchers' operationalisation of formal contractual governance and note that "we did not measure, for example, the types of clauses that managers used in their contract", and "in particular, we see a need to ... develop more precise measures of contractual clauses".

The measurement scale for this study was developed through the exploratory interviews with entrepreneurs, managers, and legal experts and through examination of actual contracts used. The measure was further developed through a review of the law and economics literature and new product development literature. The measure was refined through a pilot pre-test and the properties of the final measure were

assessed by examining the Cronbach's alpha coefficient and by employing factor analysis, the results of which are shown in Chapter 4.

The final measure used comprised the following items, where the respondent was asked to indicate to what extent the items were represented in their alliance agreement on a seven-point scale, 1 indicated "not at all" and 7 "to a great extent".

1. Roles and responsibilities in each firm are clearly defined by the agreement.
2. Schedules and milestones are detailed in the agreement.
3. The agreement lists safeguards (such as confidentiality).
4. Intellectual property rights are detailed in the agreement.

By moving beyond merely measuring the level of detail in the contract as previously done, this operationalisation of formal contractual governance provides an insight into the nature of the contract and its comprehensiveness. Furthermore, items which are particularly relevant to the new product development focused alliance context are utilised.

This study contributes to the debate regarding the role of trust between firms in achieving economic gains. The findings of this study challenge the view that trust is of limited value in understanding economic gain in inter-firm exchange processes. Deakin and Wilkinson (1998) report that economists remain unconvinced regarding the role of trust, as revealed by Kay's (1996:256) allusion to "the idea of a disembodied notion of trust floating around somewhere in the social ether", and Williamson's (1996:256) reference to trust as 'redundant' and even, 'misleading' in exchange.

Many inter-firm relationship studies focusing on norms and trust, particularly in the marketing channel literature, have focused on trust and commitment as outcome variables (Lambe et al., 2001). Trust and commitment as outcomes are of less interest to economists[8] who are primarily concerned with costs, risks and economic gains.

[8] Arrow (1974) has a very different view and describes trust as a very efficient governance mechanism.

By examining the relationship of relational governance with new product development performance (where profitability is included in the measure of performance) and alliance team effectiveness, this study contributes to the economic debate by showing that the concepts of trust and norms (the degree to which trust and norms have developed are included in the operationalisation of the relational governance construct) are not marginal to the process of increasing new product development performance, which is a source of economic gains. Strong evidence was found that relational governance had a positive association with alliance team effectiveness ($p<0.001$), and that alliance team effectiveness in turn had a strong positive association with new product development performance ($p<0.001$). The findings of this study also indicated that relational governance had a strong direct association with the acquisition of knowledge-based and social resources. These resources are valuable and are considered to be important for the realisation of relational rents and the achievement of a competitive advantage (Dyer and Singh, 1998).

Social Exchange Theory, the Relational Exchange Perspective and Related Contributions

As typified by Lambe et al. (2000) and Lambe et al. (2001), research on relational exchanges draws heavily on social exchange theory to explain how an inter-firm relationship is established and maintained. Their review of literature on business to business exchange studies and relational exchange indicates that research has focused on long-term inter-firm relations and has left short-term relations unexplained. This is problematic, particularly since the occurrence of short-term focused alliances is increasing rapidly (Lambe and Spekman, 1997). Furthermore, Grayson and Ambler (1999:139) note that since, "longer relationships are qualitatively different from shorter ones, there is value in research that focuses specifically on either type of relationship in order to understand better the dynamics of each". . Thus, this study contributes to the literature by focusing on short-term, focused inter-firm relationships.

In addition, this study contributes to understanding the relevance and applicability of the relational exchange perspective in short-term inter-firm relations by empirically investigating the role of relational governance in short-term, focused alliances. The

findings showed relational governance to be positively associated with collaborative new product development performance. Secondly, higher levels of relational governance were associated with increased levels of alliance team effectiveness. Thirdly, alliance team effectiveness mediated the relationship between relational governance and new product development performance. Altogether, these findings suggest that as the level of trust and relational norms developed between collaborating firms increases, so their effectiveness as a team and their relationship satisfaction increases, and this ability to work well as a team has a positive relationship with new product development performance.

While the positive association between relational governance and performance and effectiveness is consistent with the relational exchange logic, this study sheds light on the mechanism through which relational governance enhances new product development performance. Full mediation by alliance team effectiveness of the relational governance and new product development performance relationship is evidenced which suggests that relational governance is related to new product development performance through its strong positive association with alliance team effectiveness.

This study additionally contributes to inter-firm relationship research by examining the association between relational governance and knowledge loss through inter-firm relationships. The results offered evidence suggesting that no statistically significant negative association between relational governance and knowledge loss existed, while formal contractual governance was found to have a statistically significant negative association with knowledge loss (beta= -0.28, $p<0.01$). This finding is contrary to the relational view argument, which suggests that relational governance should be more effective in safeguarding a firm from opportunistic behaviour than formal contractual governance (Dyer and Singh, 1998).

The findings of this study bring into question how appropriate social exchange theory and the relational exchange perspective are in addressing opportunism in short-term alliances, and support Lambe et al.'s (2001) contention that

> "a limitation of social exchange theory in explaining BTB exchange is its lack of consideration of opportunism. As much as transaction cost analysis has been criticised for its assumption of universal opportunism, social exchange theory should be criticised for its implicit assumption that relational exchange is devoid of opportunism." Lambe et al. (2001:26)

As suggested by Thibaut and Kelley (1959), when working norms have evolved between parties, members who are dependent on the relationship will perceive the threat of social sanctions as a strong deterrent to opportunistic behaviour. Das and Teng (2002), in their conceptual discussion, suggest that while social sanctions can be an effective deterrent in alliance networks, social sanctions may not be effective in simple alliance dyads. They further suggest that social sanctions may not act as a deterrent in short-term alliances, and that in short-term alliances more formalised economic or legal sanctions may represent a more effective deterrent to opportunistic behaviour. The findings of this study are strongly supportive of this recent argument presented by Das and Teng (2002) and challenge researchers to question the appropriateness of social exchange theory and the relational exchange perspective in viewing opportunism within short-term focused alliance dyads.

Contributions Related to the Resource-Based View

This study is supportive of the growing body of entrepreneurship research which draws on the resource-based view (for example Zahra and Kirchoff (2001); Alvarez and Barney (2002)) because it indicates that resource-constrained new firms engaging in new product development-focused alliances are able to access complementary resources in order to develop new products and that they are able to access additional social resources which are valuable for their growth (Eisenhart and Schoonhaven, 1996). However, as Das and Teng (2000) have observed, there have been relatively few studies which focus on the role of governance in drawing on the resource-based view and explaining resource gains through alliances. This study contributes to the understanding of the role of governance by examining its relationship with several outcomes. The findings revealed that governance did have a significant association with the degree to which relevant resources were acquired.

The resource-based view has often been criticised for viewing the firm as a repository of resources and for its static approach (Priem and Butler, 2001a). This research contributes to the resource-based view by highlighting the dynamic nature of resources and by investigating both desirable resource flows into the new technology-based firm and harmful resource flows out of the firm. The findings of this research suggested that the nature of the resource flow was strongly influenced by the alliance governance structure employed.

The findings of this study indicated that the governance mechanisms used by the firms effectively created an inter-firm boundary, which can be conceptualised as a selectively permeable membrane between two fluids, as discussed in the previous chapter. While relational governance facilitates desirable resource flows into the new technology-based firm, formal contractual governance acts as a filter, preventing undesirable knowledge flows out of the firm. Thus relational and formal contractual governance act in a complementary manner to ensure that while the new technology-based firm engages in transferring and sharing knowledge and acquiring intangible resources, it protects its own valuable proprietary knowledge.

Knowledge-based and social resources have been highlighted as resources which help firms achieve a competitive advantage (Doz and Hamel, 1998). Constant renewal and mobilisation of these resources allows firms to sustain the competitive advantage achieved (Eisenhart and Martin, 2000). In drawing on the resource-based view, numerous researchers, particularly in the entrepreneurship field, have focused on the acquisition of knowledge-based resources and on the expansion of a new firms' social resource base (Yli-Renko et al., 2001; Lee, Lee and Pennings, 2001; Amit and Zott, 2001). However, as observed by Zahra (1996) and Zahra and Bogner (1999), protection of a new technology-based firm's knowledge resources is also important to maintaining an advantage. However, much less research has focused on protecting resources than on acquiring resources. This study, therefore, makes a contribution to this discussion by empirically examining resource loss.

Research on inter-firm relationships (particularly in the marketing channel literature) have focused on exchange performance, making it the most studied outcome (Lambe et al., 2001). Exchange performance is typically measured as satisfaction with aspects such as the quality, cost and service provided by the exchange partner such as a

supplier (for example, Cannon et al., 2000; Poppo and Zenger, 2002; Anderson and Narus, 1990; Anderson and Weitz, 1992). This study contributes to the literature by examining multiple outcomes, both positive and negative, of new product development focused alliances, rather than focusing on only one outcome. Furthermore, the simultaneous investigation of both positive and negative outcomes is not common in previous alliance research. By examining a range of outcomes, a more holistic understanding can be gained regarding the role of different governance mechanisms on alliance outcomes.

Contributions to the Broader Literature on Alliances and Inter-Firm Linkages

Unit of Analysis

On a methodological level, the level of analysis selected for this study is the alliance dyad. Thus, this study responds to the call by researchers who have contributed to theory development in the alliance area to focus more empirical attention on the dyad level (Dyer and Singh, 1998). The few studies which have investigated new product development alliances have focused on the firm level and used counts of new products developed as a measure of performance (Yli-Renko et al., 2001; Deeds and Hill, 1996). When mere counts are used, insights regarding the individual development project such as the operational effectiveness of the collaboration, time losses incurred, and the profitability of the focal development, cannot be ascertained, as these can only be measured when the specific alliance is the unit of analysis. Analysis of alliances at this detailed level has been lacking (Spekman et al., 1998). This study has sought to contribute to filling that gap.

Time

A recent special issue of the Academy of Management Review (special issue editors, Goodman, Ancona, Lawrence and Tushman, 2001) observed that "time" has largely been neglected by management researchers, and this is the case in alliance related research. This is particularly problematic in the context of new product development focused alliances because development time is critical and time pressures can be considerable. An important methodological contribution of this study is the inclusion of the concept of time in the operationalisation of key constructs, which has not been

done previously. For example, the collaboration costs construct is operationalised to measure the time losses incurred as a consequence of the collaborative nature of the development. This study therefore makes a contribution to the examination of how governance is associated with a firm's ability to develop products successfully within the scheduled time, and to understanding the role of governance in minimising time losses incurred as a result of the collaborative nature of the product development.

Examination of multiple outcomes and the use of both formal and relational governance

The results of this study suggest that formal and relational governance are complementary in maximising the realisation of advantages for collaborating firms. These results challenge a body of literature which argues that the simultaneous employment of both formal and relational governance is problematic and incurs unnecessary costs as the two governance forms are substitutes for each other (for example, Dyer and Singh, 1998; Uzzi, 1997; Gulati, 1995; Larson, 1992; Ghoshal and Moran, 1996). Part of this argument is encapsulated in the proposition stated by Dyer and Singh (1998:671): "The greater the alliance partners' ability is to employ self-enforcing safeguards (for example trust) rather than third-party safeguards (for example legal contracts), the greater the potential will be for relational rents." A relational rent is defined by Dyer and Singh (1998:662) as a "supernormal profit jointly generated in an exchange relationship that cannot be generated by either firm in isolation and can only be created through the joint idiosyncratic contributions of the specific alliance partners".

This study examines multiple outcomes which both create relational rents generated through new product development, and outcomes that destroy relational rents through knowledge loss, and through incurring collaboration costs. By examining this range of value–creating and cost incurring outcomes, the study uncovered the benefits associated with the use of both formal and relational governance mechanisms, and challenges the argument that formal contractual governance in the presence of relational governance is either superfluous or destructive to the generation of relational rents.

In summary, this study has advanced our understanding of the role of governance in collaborative new product development. It indicated that governance choice does matter. This study is one of the first empirical studies to examine the role of governance in short-term focused alliances. It examined the role of two polar governance types and while numerous researchers have called for an investigation of the use of more than one governance type in alliances, few studies have investigated it and none have focused on short-term alliances.

This study addressed two additional limitations within the current research. The first limitation is that the current research has tended to focus on a single alliance outcome.

This study emphasized the need to examine multiple positive and negative outcomes in order to gain a holistic understanding of the role of governance, and has shown that the limited focus on a single outcome can result in misleading conclusions being drawn regarding the role of governance structure on the alliance. The second limitation, which this study has addressed, is that extant studies have largely neglected an examination of the costs associated with interfirm collaboration. This study is one of the first to propose that collaboration costs are significantly associated with both the formal, contractual governance structure and the relational governance structure employed. Although these costs are exacerbated in technology development alliances where co-ordination requirements are heightened, examination of these costs has remained sparse (Gulati and Singh, 1998).

Finally, this study provides evidence, which shows that alliance team effectiveness mediates the relationship between governance and collaboration outcomes. Although a number of practitioners have drawn attention to the importance of the alliance team in collaborative new product development contexts, there is no systematic work, which has examined how alliance team effectiveness influences the relationship between the governance mechanism employed and the outcomes realized in collaborative new product development.

7.2 IMPLICATIONS FOR MANAGEMENT PRACTICE

Drawing on the resource-based view and the relational exchange perspective, a number of researchers have suggested the need for managers to develop a "relational exchange competence" (Day, 1995; Lambe et al., 2000) which would allow firms to develop relational governance to a sufficiently high level so that greater value could be extracted from the inter-firm relationship.

The findings of this study, however, suggest that managers should develop a broader **'governance-structuring competence'** which includes not only a relational exchange competence, but also a 'contract-creating competence'. A contract-creating competence is the ability a manager has to negotiate a contract in a way that allows both firms to engage in discussion in a constructive, relationship-building way. It is also the ability to generate a contractual agreement in a way that encourages firms to articulate their expectations and concerns, particularly in new product development-focused alliances. This type of competency allows partners to voice concerns, align interests and clarify ambiguities, so preparing the ground for the development of an open relationship. Without a contract-creating competency, the process of negotiating the contract to govern the new product development alliance can easily create a hostile climate between alliance partners and initiate a rising spiral of distrust between partners, as formal contracts have often been associated with signalling distrust (Ghoshal and Moran, 1996; De Laat, 1997).

As mentioned earlier, another key contribution of this study is that it suggests that formal and relational governance act in a complementary way to enhance new product development performance. Further, while relational governance was found to be strongly associated with the acquisition of valuable social and knowledge-based resources, formal contractual governance was found to be strongly associated with decreasing collaboration costs and undesirable knowledge loss. This suggests that by employing both relational and formal contractual governance mechanisms, positive outcomes can be maximised, while negative outcomes are minimised. Formal and relational governance forms have been described as diametrically opposing governance forms (Ghoshal and Moran, 1996), suggesting that alliance managers confront a difficult task in trying to employ both types of governance mechanisms.

This study, however, suggests that developing a governance-structuring competence[9] that is, a competence to create and implement formal contractual governance in an appropriate way which encourages the building of trust and norms in the relationship, is a valuable competence in alliance management. In developing a governance structuring competence alliance managers must overcome the apparent tension in employing both relational and formal contractual governance mechanisms.

Costs Associated with Governance of the Collaborative New Product Development

Although the costs of using formal contractual governance are widely acknowledged (Dyer and Singh, 1998; Uzzi, 1997; Jap and Ganesan, 2000; Artz and Brush, 2000), utilising relational governance also requires a significant commitment in time and effort to develop requisite social processes and relational norms (Madhok and Tallman, 1998). It is important that entrepreneurs be cognizant of the costs associated with employing a particular governance structure.

Entrepreneurs are often more resource-constrained and more vulnerable than their larger, more established alliance counterparts (Millson, Raj and Wilemon, 1996). It is, therefore, particularly critical for entrepreneurs to make well considered choices regarding their governance preferences for the new product development alliance, rather than leaving the choice to an alliance partner.

This study found that governance structure significantly affects transaction costs associated with the collaborative nature of the new product development. These costs, measured in terms of time losses incurred, were further found to negatively affect new product development performance. Use of a formal contractual governance structure containing clear specifications of the project, such as roles, responsibilities, schedules, review points, and intellectual property ownership, was found to facilitate coordination between firms, in particular. This suggests that in time-pressured new product development focused alliances, formal contractual governance can be seen to

[9] Although Dyer and Singh (1998) in their conceptual discussion suggest that the ability to effectively govern alliances is a source of relational rents, they argue that a relational exchange competence and the ability to employ self-enforcing safeguards (e.g. trust) is superior to the use of formal contractual governance, which is argued to be a costlier substitute which can be copied with less difficulty. As discussed, this study challenges this view and asserts that formal contractual governance is a complement to rather than a substitute for relational governance.

provide a structure which allows for product development activities to be accomplished across firm borders in a way that minimises time losses, whilst the improved coordination, resulting from formal controls (March and Simon, 1958) enhances new product development performance. Reducing coordination difficulties and minimising sources of time loss is of critical importance for managers in new product development-focused alliances. The window of opportunity is often very short (Brown and Eisenhart, 1995), particularly in technology intensive industries. The new product development alliance needs to be short-term and focused on capitalizing on the opportunity with the minimum confusion and time loss. Thus, successfully reducing sources of delays in order to launch products in a timely manner yields numerous benefits for firms (Robinson and Min, 2002; Griffin, 1997).

Consequently, while certain entrepreneurs that were interviewed preferred not to use a formal contract to govern the alliance because they found the contract-creating process daunting, they need to be cognisant of the risks they expose themselves to, and the effect on outcomes of not using a contract. Although contracts can vary in their levels of detail, complexity, and the effort required from the alliance partners or a legal representative, a contract can be simple. The value was highlighted by one entrepreneur who, feeling strongly about the use of a contract, implored: "At the very least, put it on paper!", suggesting that even simply capturing the basic new product development alliance objectives and specifications on paper had some worth, and was preferable to a mere "handshake".

Moving from the simple to the complex, although certain entrepreneurs may view the development of social processes as being time-consuming, there are numerous benefits to investing in building an inter-firm relationship. The findings suggest that relational governance is positively associated with the effectiveness of the alliance team, which has a positive relationship with new product development performance.

A caveat that entrepreneurs need to consider in developing relational governance, is that while relational governance facilitates informal channels of communication which encourage knowledge transfer, these informal channels can also contribute to the unintended loss of proprietary knowledge. Brown and Duguid (2001:59) noted that "knowledge that seems sticky in formal channels may leak quite readily via

valuable back-channels." This study suggests that by employing formal contractual governance, entrepreneurs can reduce this type of unintended knowledge loss. Managers, however, also need to be aware of the **limitations of contracts**, in particular that it is very difficult for contracts to provide comprehensive protection for the firm in contexts characterised by high levels of uncertainty (Williamson, 1975; Nonaka and Teece, 2001).

The implications of these findings are that managers may need to look beyond relational and formal contractual governance mechanisms for ways of protecting their knowledge and maintaining a "know-how" advantage. The resource-based view, and in particular Nelson and Winter's (1982) discussion of the development of firm routines and Teece *et al.*'s (1997) and Eisenhart and Martin's (2000) discussion regarding dynamic capabilities, hold useful insights for managers. These discussions suggest that those managers at firms who are able to utilise "routine-changing routines" will be engaged in continuously developing new knowledge-creating and processing routines which other firms will find difficult to copy. Furthermore, even if another firm is able to imitate a particular routine, it will not pose as serious a threat to the innovating firm, because the innovating firm has a capability to consistently regenerate its knowledge-creating and processing routines, and is therefore able to sustain a competitive advantage despite exposure to knowledge loss.

Creativity versus Coordination Tension

A source of tension which managers engaged in new product development-focused alliances are confronted with, is that while new product development is a creative process which is enhanced by social norms and team processes (Crawford and Di Benedetto, 2000; Osborn, 1963), collaborative new product development is a complex activity requiring the coordination of different functions across two independent firms (Yoshino and Rangan, 1995). This complexity in coordination suggest that the new product development is more efficiently governed by formal controls (Gulati and Singh, 1998; March and Simon, 1958).

Whilst this study found that both relational norms and formal controls are associated with improved new product development performance, managing to implement these

two different types of controls is difficult. Managers must use formal controls to efficiently clarify sources of confusion, such as roles and responsibilities, and to facilitate coordination. However, they need to employ formal controls in a manner that does not stifle the social processes which are important to fostering creativity.

The results regarding the effect of two of the control variables yields interesting implications for managers. The first was that increasing firm age of the new technology-based firm was associated with reduced collaboration costs. This raises the possibility that as these new firms age, their managers gain more experience with collaboration and possibly are able to start developing routines and processes which make collaboration more efficient and reduce time losses. Kale et al. (2001) observe that increasing alliance experience is associated with reduced alliance costs.

The second result found was that increasing alliance partner size was associated with increasing collaboration costs. This result implies that entrepreneurs need to be aware that forming new product development alliances with larger, more established firms, exposes them to the risk of significant time loss. The hierarchical nature of larger firm, higher levels of bureaucracy and the enforcement of stringent collaboration requirements which must be met by the new technology-based firm, create a number of difficulties for managers of new technology-based firms, and these difficulties are manifested as time losses they experienced.

In summary, the following considerations and actions have a high degree of relevance to entrepreneurs engaged in collaborative product development projects.

- Entrepreneurs should invest in the social processes needed to develop a relational governance structure as a higher level of relational governance is strongly associated with an increased ability of the new technology based firm to acquire knowledge based and social resources.

- Although daunting to some, entrepreneurs need to equip themselves with an understanding of contracts and the use of formal contractual governance to minimize the risk they expose their firms to in collaborating with another firm.

- Entrepreneurs should optimally strive to develop a 'governance structuring competency' that is, the ability to construct a formal contractual governance structure which facilitates coordination and minimizes risk, whilst supporting the development of trust and relational governance important for building an interfirm relationship. This is particularly important for new product development focused collaboration as balancing the apparent tension between formal and relational governance is an imperative, product development demands strong relational and team processes, and creativity, whilst the heightened co-ordination requirements of product development spanning two independent firms calls for the use of formal controls to make co-ordination more efficient.

7.3 LIMITATIONS OF THIS STUDY AND DIRECTIONS FOR FUTURE RESEARCH

Cross-Sectional Design

The first limitation of this research study is that it utilises cross-sectional data. The study posits a number of causal linkages between governance and new product development alliance outcomes, but the cross-sectional nature of the data makes it impossible to confirm the causality proposed and a reverse causal linkage may actually exist. Hypothesised relationships were developed from relevant theory; however, in order to directly test and confirm the suggested causal linkages, a longitudinal study should be designed. For example, the data used in this study could be used as a base for collecting data at future periods.

Whilst conducting longitudinal studies on inter-firm linkages is difficult (Spekman et al., 1998), studies such as that by Jap and Ganesan (2000) illustrated the insights that can be gained. For example, in addition to confirming causality, longitudinal research based on this study's data would shed light on how the relationships between alliance governance and outcomes evolve over the term of the joint product development. Additional benefits in doing a longitudinal study in the future are discussed in the final section of this chapter.

Country

A second limitation of this study is that the data collected for this study are from British new technology-based firms, and the interviews were also all done in the UK. Although initial exploratory studies were done in South Africa (Parker, 2000; Parker and Campbell, 2001), the data used in this dissertation has all been collected in the United Kingdom.

Sako (1992) describes numerous differences between inter-firm relationships in Britain and Japan. She found that British firms made greater use of contracts to govern their inter-firm relationships than Japanese firms. Sako (1992) further found the level of perceived opportunism amongst British manufacturers and their suppliers to be much higher than amongst Japanese manufacturers and their suppliers, which reinforced the work of Dore (1983). Research by Deakin and Wilkinson (1998) showed that British, Italian and German firms exhibit strong differences in usage of contracts and associated practices. These studies indicated that culture and country specific factors have a strong influence on the types of governance mechanisms employed by firms to govern their inter-firm relationships. A limitation of this study, therefore, is that as all the data was collected in the UK; generalizability of the results to other countries cannot be assumed and will need to be established. Future research could entail replicating this study in other countries, in order to test the generalizability of these results.

Context

Another limitation of this study is that only three sectors representing technology intensive sectors were selected for this study. Hence, the generalizability of these results to less technology intensive or "low-tech" sectors may be problematic. Brush and Chagnanti (1996) suggest that it may not be appropriate to generalise the findings of studies done in the context of high-tech industry sectors to low-tech sectors as they find strong differences in the inter-firm relationships of firms in low-tech sectors compared to firms in high-tech sectors, particularly with regard to the use of formal contracts. Brush and Chagnanti (1996) observe that the inter-firm relationships of high-tech firms may appropriately be examined using transaction cost theory, while this is not appropriate for non-high-tech ventures. They suggest that social network

theories may be more appropriate for the examination of inter-firm relationships in non-high-tech sectors.

It would be useful to do a comparative study in the context of non-high-tech new firms in order to shed light on the role of governance on alliance outcomes in this context. Understanding whether and how the differential importance of relational governance and formal contractual governance in non-high-tech versus high-tech firms affects inter-firm relationship outcomes would provide useful insights for the development of public policies which are designed to promote inter-firm collaboration (initiatives that were highlighted by entrepreneurs interviewed included those developed by the Department of Trade and Industry in the United Kingdom, and European Union collaboration initiatives).

Short-Term New Product Development Focus

A further limitation of this study is its focus on short-term new product development collaborations (alliances). While the focus on short-term alliances responds to the call by Lambe *et al.* (2000), to direct more attention to short-term inter-firm relationships, this focus limits the generalizability of this study's findings. As highlighted by Grayson and Ambler (1999), long-term inter-firm relationships are quite different from short-term inter-firm relationships, and future research should therefore establish the degree to which these findings are valid in long-term inter-firm relationship contexts, particularly in that this study challenged some earlier findings in long-term relationship studies.

Perspective of the New Technology-Based Firm

Another limitation of this study is that the data collected only reflects the perspective of one partner in the new product development alliance, the new technology-based firm. The view of the other alliance partner is therefore not known.

The bulk of the research on inter-firm linkages has surveyed only one side of the alliance dyad (for example Poppo and Zenger, 2002; Zaheer and Venkatraman, 1995). While John and Reve (1982) and Provan and Skinner (1989) argue that this is not a

serious limitation, it would have been preferable to have data which reflected the views of both alliance partners. Collection of data from both sides of the alliance dyad would have improved this study in three ways. First, it would have allowed the data collected from the new firm to be validated. Second, areas of difference could have been analyzed, and thirdly, it would have improved the reliability of construct measures such as 'relational governance', which examines the degree to which trust and relational norms have developed between partners. Future research which is able to capture the perspectives of both the new technology-based firm and its alliance partner may uncover interesting insights, particularly with regard to the alliance partner's perceptions compared to those of the new technology-based firms.

Statistical Approach

Structural equation modelling is a statistical approach that is more rigorous in estimating factor structure and relationships between variables (Schumacker and Lomax, 1996), and it would thus have been preferable to use this approach rather than using regression analysis. Future work should attempt to overcome sample size limitations, in order to facilitate the use of structural equation modelling.

New Product Development Performance and Alliance Team Effectiveness Measures

The new product development performance and alliance team effectiveness measures are limited in their theoretical domains. The use of a greater number of indicators and multiple dimensions would address this limitation, and would provide a more holistic reflection of new product development performance (Griffin and Page, 1996), and alliance team effectiveness (Kahn, 2001). In future work, the new product development performance measure should in particular be developed to capture the dimensions relating to the radicalness of the product developed and the degree to which the product development has created new opportunities for the firm, and enhanced its competitive advantage (Gatignon and Xuereb, 1997; Griffin and Page, 1996). Including additional dimensions in the operationalisation of the new product development performance construct and the alliance team effectiveness construct would contribute to understanding whether and how governance influences these dimensions in collaborative new product development projects.

Formal Contractual Governance Measure

Another limitation of this study is that the examination of formal contractual governance was limited to the types of clauses which were most often used in new product development alliance contracts by the managers interviewed. The measurement of the formal contractual governance construct developed in this study is an improvement on that used by Cannon et al. (2000) and the single item measure used by Poppo and Zenger (2002). It does not, however, include the full range of clauses mentioned in the literature or by all the managers interviewed due to questionnaire length constraints. By examining a more extensive set of contractual clauses, future research could contribute to a greater understanding of how the nature of contractual clauses and the comprehensiveness of contracts influence the collaborative new product development.

Certain entrepreneurs who participated in the exploratory interviews highlighted that the process of discussing and jointly creating the contractual agreement was valuable in clarifying ambiguities. It would be useful for future research to try and explicitly measure the benefits derived from the contract negotiation process separately from the benefits derived in using the contract to guide alliance management through the joint product development.

The Need to Extend Focus from Dyad to Network Level

Another limitation of this study is that it is focused on the alliance dyad level, even though it has been argued that many firms are involved in networks of alliances rather than in a single alliance (Gulati, 1995; Nooteboom, 1999). This study found that in the alliance dyads studied, coordination of activities across two separate firms had a cost in terms of time losses incurred. It is conceivable that when activities need to be coordinated across a network of firms, that coordination challenges and costs may be exacerbated (Doz and Hamel, 1998).

While this study examined the role of formal contractual governance in addressing coordination costs, Das and Teng (2002) suggest that the development of a macro-culture – that is, a group culture of shared views and norms – will "result in a strategic

behavioral homogeneity" (2002:450) among the firms, which will effectively reduce coordination costs. Das and Teng (2002), however, assert that in alliance networks which are of a short-term nature (have a "short exchange horizon"), the development of a macro-culture is not feasible and that formal contractual governance mechanisms may be more effective in short-term networks. Thus, a useful avenue along which to extend this current study, would be from the alliance dyad level to the alliance network level, as there is a need to understand the role of governance in short-term alliance networks.

An additional area which future research should examine is the role of environmental factors. While certain firm-specific, partner-specific and environmental factors were included in the analysis – industry sector, firm size, firm age and alliance partner size (as had been done by previous researchers) – a limitation of this study is that environmental factors associated with the degree of change and uncertainty and the degree of competitive pressure that the new firm experiences were not examined. For example, Zahra and Bogner, (1999), have examined the role of environmental factors on the technology strategy – new venture performance relationship. Including such environmental factors in future research would contribute to the understanding of how they affect the governance-outcomes relationship in new product development-focused alliances.

The Need for a Future Longitudinal Study

Although the cross-sectional nature of this study has been mentioned as a limitation, and the need for extending this study into a longitudinal study in order to confirm causality has been highlighted, there would be three additional benefits gained by developing a longitudinal study in future.

First, a longitudinal study over the period of the alliance lifecycle could contribute to understanding how alliance governance mechanisms evolve over this period. Although Jap and Ganesan (2000) investigated long-term relationships [mean age = 15.73 years], longitudinal studies of short-term relationships are needed.

Second, a longitudinal study of the new technology-based firm's growth and performance over time and over a series of short-term alliances would shed light on how new firms govern their new product development-focused alliance with respect to their stages of development. As suggested by Zahra and Bogner (1999:169); a new firm's technology strategy may change and evolve as the new firm grows and matures. It is therefore conceivable that the strategic choice it makes with regard to how it governs its technology development and new product development alliances may change as the new firm grows and matures.

Longitudinal research would also shed light on whether the type of governance employed influences the sustainability of any competitive advantages achieved through the new product development alliance. Dyer and Singh (1998:671) argue that advantages created by relational governance are more sustainable than those created by formal contractual governance, as formal contractual governance structures are easier to copy. Finally, although this study suggests that firms realise advantages by using both formal and relational governance mechanisms, the cross-sectional nature of this study means that the sustainability of these advantages cannot be assessed. Future research should employ a longitudinal design to investigate the sustainability of the advantages created under different governance regimes.

Interaction Effects

Few researchers have examined the interaction of polar governance mechanisms. Two recent notable exceptions are the studies by Poppo and Zenger (2002) and Cannon, Achrol and Gundlach (2000). These studies have however both been done in the context of long-term buyer supplier relationships, an empirical examination of the interaction of polar governance mechanisms in short-term interfirm relationships has not been done (Lambe et al., 2000). In this study of short-term new product development focused alliances, there is evidence to suggest that formal, contractual governance has a relationship with relational governance. In future research it would be useful to explore possible interaction effects in this relationship in greater depth as it would yield a fuller understanding of the role of different governance mechanisms in short-term alliances.

Realisation of Advantages through a 'Governance Structuring Competency'

In view of the conclusions drawn, and their implications for management practice, an aspect that merits further attention is whether and how entrepreneurs that have developed a 'governance structuring competency' through collaborative new product development realise advantages in using this competency to govern their relationships with the broad range of firms and institutions they need to interact with.

Antecedents to Governance Choice

The findings of this study draw attention to the importance of the choice of mechanisms used to govern collaborative new product development. How entrepreneurs make choices regarding the mechanisms used to govern their short-term collaborations has not been explored in the extant literature. A research area that warrants further investigation, in the light of this study's findings, is an examination of the antecedents to governance choice, that is, how do entrepreneurs make their choices regarding the use of a particular governance mechanism for their collaborative new product development, and which factors influence this choice.

BIBLIOGRAPHY

Agresti, A., and Finlay, B., 1997. *Statistical methods for the social sciences.* 3rd edition. New Jersey: Prentice Hall.

Aiken, M., and Hage, J., 1968. Organisational interdependence and intra-organisational structure. *American Sociological Review,* 33, 912-930.

Alvarez, S.A., and Barney, J.B., 2002. Resource-based theory and the entrepreneurial firm. *In:* Hitt, M.A., Ireland, R.D., Camp, M.S., and Sexton, D.L., editors. *Strategic Entrepreneurship: creating a new mindset.* Oxford: Blackwell Publishers, 2001, 89-101.

Alvarez, S.A., and Barney, J.B., 2001. How entrepreneurial firms can benefit from alliances with large partners. *The Academy of Management Executive,* 15(February), 139-148.

Amit, R., and Schoemaker, P.J.H., 1993. Strategic assets and organizational rent. *Strategic Management Journal,* 14(1), 33-46.

Amit, R., and Zott, C., 2001. Value creation in e-business. *Strategic Management Journal,* 22, 493-520.

Anand, B., and Khanna, B., 1997. Intellectual property rights and contract structure. *Harvard Business School Working Paper,* 97-106.

Anderson, E., and Weitz, B., 1992. The use of pledges to build and sustain commitment in distribution channels. *Journal of Marketing Research,* 29(February), 18-34.

Anderson, J.C., and Narus, J.A., 1990. A model of distributor firm and manufacturer firm working partnerships. *Journal of Marketing,* 54(Spring), 42-58.

Armstrong, J.S., and Overton, T.S., 1977. Estimating non-response bias in mail surveys. *Journal of Marketing Research,* 14(August), 396-402.

Arrow, K.J., 1974. *The limits of organization.* New York: W.W. Norton.

Artz, K.W., 1999. Buyer-supplier performance: The role of asset specificity, reciprocal investments and relational exchange. *British Journal of Management,* 10, 113-128.

Artz, K.W., and Brush, T.H., 2000. Asset specificity, uncertainty and relational norms: An examination of coordination costs in collaborative strategic alliances. *Journal of Economic Behavior and Organization,* 41, 337-362.

Ayers, D., Dahlstrom, R., and Skinner, S.J., 1997. An Exploratory Investigation of Organizational Antecedents to New Product Success. *Journal of Marketing Research*. 34(February), 107-116.

Babbie, E., and Mouton, J., 2001. *The practice of social research*. Oxford: Oxford University Press.

Bagozzi, R.P., 1975. Marketing as exchange. *Journal of Marketing*, 39(October), 32-29.

Bagozzi, R.P., 1983. A holistic methodology for modelling consumer response to innovation. *Operations Research*, 31, 128-176.

Bagozzi, R.P., 1994. Measurement in marketing research: basic principles of questionnaire design. *In:* Bagozzi, R.P., editor. *Principles of marketing research*. Oxford: Blackwell Publishers, 1994, 1-49.

Bagozzi, R.P., and Philips, L.W., 1982. Representing and testing organizational theories: a holistic construal. *Administrative Science Quarterly*, 27, 459-489.

Bagozzi, R.P., and Yi, Y., 1988. On the evaluation of structural models. *Journal of the Academy of Marketing Science*, 16(1), 74-94.

Bailey, K.D., 1987. *Methods of Social Research*. New York: The Free Press.

Barnard, C.I., 1938. *The functions of the executive*. Cambridge, MA: Harvard University Press.

Barney, J.B., 1991. Firm resources and sustained competitive advantage. *Journal of Management*, 17, 99-120.

Barney, J.B., 2001. Is the resource-based 'view' a useful perspective for strategic management research? Yes. *Academy of Management Review*, 26, 41-56.

Barney, J.B., and Hansen, M.H., 1994. Trustworthiness as a source of competitive advantage. *Strategic Management Journal*, 7, 175-190.

Baron, R.M., and Kenny, D.A., 1986. The mediator-moderator variable distinction in social psychological research: conceptual, strategic and statistical considerations. *Journal of Personality and Social Psychology,* 51, 1173-1182.

Baum, J., and Oliver, C., 1991. Institutional linkages and organizational mortality. *Administrative Science Quarterly*, 36, 187-218.

Beale, H., and Dugdale, T., 1975. Contracts between businessmen: planning and the use of contractual remedies. *British Journal of Law and Society,* 2, 45-58.

Birley, S., 1985. The role of networks in the entrepreneurial process. *Journal of Business Venturing,* 1(1), 107-117.

Blau, P.M., 1964. *Exchange and power in social life*. New York: John Wiley and Sons.

Bonnaccorsi, A., and Lipparini, A., 1994. Strategic partnership in new product development: an Italian case study. *Journal of Product Innovation Management,* 11, 134-145.

Bourdieu, P., 1985. The forms of capital. *In:* Richardson, J.G., editor. *Handbook of theory and research for the sociology of education.* New York: Greenwood, 1985, 241-258.

Bradach, J., and Eccles, R., 1989. Price, authority, and trust: from ideal types to plural forms. *Annual Review of Sociology,* 15, 97-118.

Brown, J.S., and Duguid, P., 2001. Structure and spontaneity: knowledge and organisation. *In:* Nonaka, I., and Teece, D., editors. *Managing industrial knowledge: creation, transfer and utilization*. London: Sage Publications, 2001, 44-68.

Brown, S.L., and Eisenhart, K.M., 1995. Product development: past research, present findings and future directions. *Academy of Management Review*, 20(2), 343-378.

Brush, C., and Chaganti, R., 1996. Cooperative strategies in non-high-tech new ventures: an exploratory study. *Entrepreneurship: Theory and Practice,* 21(2), 37–55.

Burgel, O., 1999. *The internationalisation of British start-up companies in high-technology industries*. PhD dissertation, Warwick Business School: University of Warwick.

Burt, R.S., 1992. *Structural holes*. Cambridge, MA: Harvard University Press.

Burt, R.S., 2000. The network entrepreneur. *In:* Swedburg, R., editor. *Entrepreneurship: the social science view*. Oxford: Oxford University Press, 2000, 281-307.

Butchart, R., 1987. A new UK definition of high-technology industries. *Economic Trends,* 400, 82-88.

Bygrave, W.D., 2001. Calling on family and friends for start-up cash. *In:* Birley, S., and Muzyka, D., editors. *Mastering Entrepreneurship. Financial Times*. London: Prentice Hall, 2001, 97-98.

Cannon, J.P., Achrol, R.S., and Gundlach, G.T., 2000. Contracts, norms, and plural form governance. *Journal of the Academy of Marketing Science,* 28(2), 180-194.

Cannon, J.P., Perreault, W.D., 1999. Buyer-seller relationships in business markets. *Journal of Marketing Research*, 36(4), 439-461.

Cellini, G., 1993. Strategic alliances in the 90's. *Managing Accounting*, (June), 56-59.

Chaganti, R., DeCarolis, D., and Deeds, D.L., 1996. Predictors of capital structure in small ventures. *Entrepreneurship: Theory and Practice,* 20, 7-18.

Chandler, A.D., 1962. *Strategy and structure*. Boston: MIT Press.

Chandler, G.N., and Lyon, D.W., 2001. Issues of research design and construct measurement in entrepreneurship research: the past decade. *Entrepreneurship: Theory and Practice*, 25(4), 101-114.

Chau, P.Y.K., 1997. Reexamining a model for evaluating information center success using a structural equation modelling approach. *Decision Sciences*, 28(2), 309-334.

Child, J., 1998. Trust and international strategic alliances: the case of sino-foreign joint ventures. *In:* Lane, C., and Bachmann, R., editors. *Trust within and between organisations.* Oxford: Oxford University Press, 1998, 241-273.

Child, J., 2001. Trust – the fundamental bond in global collaboration. *Sloan Management Review,* 29(4).

Child, J., and Faulkner, D., 1998. *Strategies of cooperation: managing alliances, networks, and joint ventures*. Oxford: Oxford University Press.

Churchill, G.A., 1979. A paradigm for developing better measures of marketing constructs. *Journal of Marketing Research*, 16(February), 64-73.

Clark, K.B., 1979. Project scope and project performance: the effect of parts strategy and supplier involvement on product development. *Management Science,* 35, 1247-1263.

Coase, R., 1937. The nature of the firm. *Economica,* 4, 386-405.

Cockburn, I.M., and Henderson, R.M., 1998. Absorptive capacity, coauthoring behaviour, and the organization of research in drug discovery. *Journal of Industrial Economics*, 46(2), 157-182.

Cohen, D., and Prusak, L., 2001. *In good company: how social capital makes organisations work.* Boston: Harvard Business School Press.

Cohen, W.M., and Levinthal, D.A., 1990. Absorptive capacity: a new perspective on learning and innovation. *Administrative Science Quarterly*, 35, 128-152.

Coombs, J.E., and Bierly, P.E., 2001. The impact of firm legitimacy and social networks on the choice of alliance structure by newly public firms. *In:* Bygrave, W.D., Autio, E., Brush, C.G., Davidsson, P., Green, P.G., Reynolds, P.D., and Sapienza, H.J., editors. *Frontiers of Entrepreneurship Research.* Babson Park: Babson College, 2001, 381-389.

Cooper, D.R., and Emroy, C.W., 1995. *Business Research Methods.* 5th edition. Chicago: Levin.

Cooper, R., 1992. The newprod system: the industry experience. *Journal of Product Innovation Management,* 29, 113-127.

Cooper, R.; and Kleinschmidt, E., 1987. Success factors in product innovation. *Industrial Marketing Management,* 16, 215-223.

Crawford, C.M., and Di Benedetto, C.A., 2000. *New products management.* 6th edition. Boston: Irwin McGraw-Hill

Curran, J., and Blackburn, R.A., 2001. *Researching the small enterprise.* London: Sage Publications.

D'Aveni, R., 1990. Top managerial prestige and organizational bankruptcy. *Organization Science,* 1, 187-220.

D'Aveni, R.A., and Kesner, I.F., 1993. Top managerial prestige, power and tender offer response: a study of elite social networks and target firm cooperation during takeovers. *Organizational Science,* 1, 121-142.

Dahlstrom, R., and Nygaard, A., 1999. An empirical investigation of ex-post transaction costs in franchised distribution channel. *Journal of Marketing Research*, 36(May), 160-170.

Das, T.K., and Teng, B., 1998. Between trust and control: developing confidence in partner cooperation in alliances. *Academy of Management Review,* 23(3), 491-512.

Das, T.K., and Teng, B.S., 2000. A resource-based theory of strategic alliances. *Journal of Management*, 26(1), 31-62.

Das, T.K., and Teng, B.S., 2002. Alliance constellations: a social exchange perspective. *Academy of Management Review,* 27(3), 445-456.

Day, G., 1995. Advantageous alliances. *Journal of the Academy of Marketing Science,* 23(4), 297-300.

Day, G., 2000. Managing market relationships. *Journal of the Academy of Marketing Science,* 28(1), 24-30.

De Laat, P., 1997. Research and development alliances: ensuring trust by mutual commitments. *In:* Ebers, M., editor. *The formation of inter-organizational networks*. Oxford: Oxford University Press, 1997, 146-174.

Deakin, S., and Wilkinson, F., 1998. Contract law and the economics of inter-organisational trust. *In:* Lane, C., and Bachmann, R., editors. *Trust within and between organisations.* Oxford: Oxford University Press, 1998, 146-173.

Deeds, D.L., and Hill, C.W.L., 1996. Strategic alliances and the rate of new product development: An empirical study of entrepreneurial biotechnology firms. *Journal of Business Venturing,* 11, 42-55.

Deeds, D.L., and Hill, C.W.L., 1998. An examination of opportunistic action within research alliances: Evidence from the biotechnology industry. *Journal of Business Venturing*, 14, 141-163.

Deutsch, M., 1962. Cooperation and trust: some theoretical notes. *In:* Jones, M.R., editor. *Nebraska Symposium on Motivation.* Lincoln, Nebraska: University of Nebraska Press, 1962, 275-319.

Devlin, G. and Bleakley, M., 1989. Strategic alliances: guidelines for success. *Long Range Planning,* 21(5), 18-23.

Dickson, K., Lawton Smith, H., and Lloyd-Smith, S., 1991. Bridge over troubled waters? Problems and opportunities in interfirm research collaboration. *Technology Analysis and Strategic Management*, 3, 143-156.

Dickson, P.H., and Weaver, K.M., 1997. Environmental determinants and individual-level moderators of alliance use. *Academy of Management Journal,* 40(2), 404-425.

Dillman, D., 2000. *Mail and internet surveys: the tailored design method.* New York: John Wiley and Sons.

Dodgson, M., 1993. *Technological collaboration in industry*. London: Routledge.

Dore, R., 1983. Goodwill and the spirit of market capitalism. *British Journal of Sociology,* 34, 459-482.

Doz, Y.L., and Hamel, G., 1998. *Alliance advantage: the art of creating value through partnering*. Boston: Harvard Business School Press.

Dwyer, F.R., Schurr, P.H., and Oh, S., 1987. Developing buyer-seller relationships. *Journal of Marketing,* 51(April), 11-27.

Dwyer, F.R., and Oh, S., 1988. A transaction cost perspective on vertical contractual structure and interchannel competitive strategies. *Journal of Marketing,* 52, 4-21.

Dyer, J., 1997. Effective inter-firm collaboration: how firms minimise transaction costs and maximize transaction value. *Strategic Management Journal,* 187, 535-556.

Dyer, J., and Singh, H., 1998. The relational view: Cooperative strategy and sources of interorganizational competitive advantage. *Academy of Management Review,* 23(4), 660-679.

Easton, G., and Araujo, L., 1996. Characterising organisational competence: combining resource-based and industrial network approaches. *In:* Sanchez, R., Heene, A., and Thomas, H., editors. *Dynamics of competence-based competition: theory and practice in the new strategic management.* New York: Pergamon Press.

Ebers, M., and Grandori, A., 1997. The forms, costs, and development dynamics of inter-organizational networking. *In:* Ebers, M., editor. *The formation of inter-organizational networks.* Oxford: Oxford University Press, 1997, 265-287.

Eisenhardt, K.M., and Schoonhoven, C.B., 1990. Organizational growth: Linking founding team, strategy, environment, and growth among U.S. semiconductor ventures, 1978-1988. *Administrative Science Quarterly,* 35, 504-529.

Eisenhardt, K.M., and Tabrizi, B.N., 1995. Accelerating adaptive processes: Product innovation in the global computer industry. *Administrative Science Quarterly,* 40, 84-110.

Eisenhardt, K.M., and Schoonhoven, C., 1996. Resource-based view of strategic alliance formation: Strategic and social effects in entrepreneurial firms. *Organizational Science,* 7(2), 136-150.

Eisenhardt, K.M., and Martin, J.A., 2000. Dynamic capabilities: what are they? *Strategic Management Journal,* 21(10-11, Special Issue), 1105-1121.

Elfring, T., and Hulsink, W., 2001. Fighting for survival and legitimacy: growth trajectories of high technology firms in the Netherlands. *In:* During, W., Oakey, R., and Kauser, S., editors. *New technology-based firms in the new millennium.* Oxford: Elsevier Science, 2001, 4-26.

Farr, C. and Fischer, W., 1992. Managing international high technology co-operative projects. *R&D Management,* 22(1), 55-67.

Florida, R. Cushing, R., and Gates, G., 2002. When social capital stifles innovation. *Harvard Business Review,* 80(8), 20-22.

Forrest, J., and Martin, M., 1992. Strategic alliances between large and small research intensive organisations: experiences in the biotechnology industry. *R&D Management,* 22(1), 41-53.

Foss, N.J., 1997. Resources and strategy: problems, open issues and ways ahead. *In:* Foss, N.J, editor. *Resources, firms and strategies*. Oxford: Oxford University Press, 1997, 345-367.

Frazier, G.L., 1983. Interorganizational exchange behavior in marketing channels: a broadened perspective. *Journal of Marketing,* 47, 68-78.

Frazier, G.L., 1999. Organizing and managing channels of distributions. *Journal of the Academy of Marketing Science,* 27(2), 226-240.

Galbraith, J.R., 1977. *Organization Design*. Reading. MA: Addison: Wesley.

Gambetta, D., 1988. *Trust: making and breaking cooperative relations*. Oxford and New York: Basil Blackwell.

Gatignon, H., and Xuereb, J., 1997. Strategic orientation of the firm and new product performance. *Journal of Marketing Research,* 34, 77-90.

George, G., Zahra, S.A., Wheatley, K.K., and Khan, R., 2001. The effects of alliance portfolio characteristics and absorptive capacity on performance: a study of biotechnology firms. *Journal of High Technology Management Research,* 12(2), 205-227.

Geringer, M., and Herbert, L., 1991. Measuring performance in international joint ventures. *Journal of International Business Studies,* 22, 249-263.

Gersick, C.C.G., 1989. Marking time: predictable transitions in task groups. *Academy of Management Journal,* 32, 274-309.

Ghoshal, S., and Moran, P., 1996. Bad for practice: A critique of the transaction cost theory. *Academy of Management Review,* 21(1), 13-47.

Goodman, P.S., Ancona, D.G., Lawrence, B.S., and Tushman, M.L., special issue editors, 2001. Special topic forum on time and organizational research. *Academy of Management Review,* 26(4), 507-511.

Granovetter, M.S., 1985. Economic action and social structure: The problem of embeddedness. *American Journal of Sociology,* 91(3), 481-510.

Grant, R.M., 1991. *Contemporary strategy analysis*. Cambridge, MA: Blackwell.

Grant, R., 1996. Toward a knowledge-based theory of the firm. *Strategic Management Journal,* 17, 93-107.

Grant, R., 1998. The resource-based theory of competitive advantage: implications for strategy formulation. *In:* Segal-Horn, S., editor. *The strategy reader*. Oxford: Blackwell Publishers, 1998, 179-199.

Grayson, K., and Ambler, T., 1999. The dark side of long-term relationships in marketing services. *Journal of Marketing Research,* 36, 132-141.

Griffin, A., 1997. Modeling and measuring product development cycle time across industries. *Journal of Engineering and Technology Management,* 14, 1-24.

Griffin, A., and Hauser, J., 2001. Patterns of communication among marketing, engineering and manufacturing – a comparison between two new product teams. *Management Science,* 38(3), 360-372.

Griffin, A., and Page, A., 1996. PDMA Success measurement project: Recommended measures for product development success and failure. *Journal of Product Innovation Management, 13,* 478-496.

Gulati, R., 1995. Social structure and alliance formation patterns: *A longitudinal analysis. Administrative Science Quarterly,* 40, 619-652.

Gulati, R., and Singh, H., 1998. The architecture of cooperation: Managing coordination costs and appropriation concerns in strategic alliances. *Administrative Science Quarterly,* 43(4), 781-814.

Gundlach, G.T., and Murphy, P.E., 1993. Ethical and legal foundations of relational marketing exchanges. *Journal of Marketing*, 57(October), 35-46.

Hagedoorn, J., 1993. Understanding the rationale of strategic technology partnering: Interorganizational modes of cooperation and sectional differences. *Strategic Management Journal,* 14, 371-385.

Hagedoorn, J., and Narula, R., 1996. Choosing organisational modes of strategic technology partnering: international and sectoral differences. *Journal of International Business Studies,* 27(2), 265-285.

Hair, J.F. Jr., Anderson, R.E., Tatham, R.L., and Black, W.C., 1998. *Multivariate data analysis with readings.* 5th edition. Upper Saddle River, NJ: Prentice Hall.

Hamel, G., 1991. Competition for competence and interpartner learning within international strategic alliances. *Strategic Management Journal,* 12, 83-104.

Hamel, G., and Prahalad, C.K., 1998. Strategy and stretch and leverage. *In:* Segal-Horn, S., editor. *The strategy reader.* Oxford: Blackwell publishers, 1998, 35-50.

Hamel, G., Doz, Y. and Prahalad, C. K., 1989. Collaborate with your competitors and win. *Harvard Business Review,* 67(1), 133-139.

Haong, H., 2001. The determinants and evolution of new entrant-incumbent alliances: a study of cooperative interactions in the biopharmaceutical industry. *In:* Bygrave, W.D., Autio, E., Brush, C.G., Davidsson, P., Green, P.G., Reynolds, P.D., and Sapienza, H.J., editors. *Frontiers of Entrepreneurship Research.* Babson Park: Babson College, 2001, 394-408.

Harrigan, K.R., 1988. Joint ventures and competitive strategy. *Strategic Management Journal,* 9(2), 141-158.

Heide, J.B., and John, G., 1988. The role of dependence balancing in safeguarding transaction-specific assets in conventional channels. *Journal of Marketing,* 52, 20-35.

Heide, J.B., and John, G., 1990. Alliances in industrial purchasing: the determinants of joint action in buyer-supplier relationships. *Journal of Marketing,* 27, 24-36.

Heide, J., and John, G., 1992. Do norms matter in marketing relationships? *Journal of Marketing,* 56, 32-44.

Hofer, C., and Schendel, D., 1979. *Strategy formulation: analytical concepts.* St Paul, MN: West.

Homans, C.G., 1958. Social behaviour as exchange. *American Journal of Sociology,* 63, 597-606.

Human, S.E., and Provan, K.G., 1997. An emergent theory of structure and outcomes in small-firm strategic manufacturing networks. *Academy of Management Journal,* 40(2), 368-403.

Hunt, S.D., 1976. The nature and scope of marketing. *Journal of Marketing,* 40(July), 17-28.

Janis, I.L., 1983. *Groupthink: psychological studies of policy decisions and fiascoes.* Boston: Houghton Mifflin Company.

Jap, S.D., 1999. Pie-expansion efforts: collaboration processes in buyer-supplier relationships. *Journal of Marketing Research,* 36(November), 461-475.

Jap, S.D., and Ganesan, S., 2000. Control mechanisms and the relationship life cycle: Implications for safeguarding specific investments and developing commitment. *Journal of Marketing Research,* 37(May), 227-245.

Jarillo, J.C., 1988. On strategic networks. *Strategic Management Journal,* 9, 31-41.

Jarillo, C., and Stevenson, H., 1990. A paradigm of entrepreneurship: entrepreneurial management. *Strategic Management Journal*, 11, 17-27.

Jassawalla, A., and Sashittal, H., 1998. An examination of collaboration in high-technology new product development process. *Journal of Product Innovation Management,* 15, 237-254.

John, G., and Reve, T., 1982. The reliability and validity of key informant data from dyadic relationships. *Journal of Marketing Research*, 19(November), 517-524.

Johnson, D.R., and Creech, J.C., 1983. Ordinal measures in multiple indicator models: a simulation of categorization error. *American Sociological Review*, 48, 398-407.

Jones, C., Hesterly, W.S., and Borgatti, S.P., 1997. A general theory of network governance: exchange conditions and social mechanisms. *Academy of Management Review*, 22(4), 911-945.

Kahn, K., 2001. Market orientation, interdepartmental integration, and product development performance. *Journal of Product Innovation Management, 18*, 314-323.

Kale, P., Dyer, J., and Singh, H., 2001. Value creation and success in strategic alliances: alliancing skills and the role of alliance structure and systems. *European Management Journal*, 19(5), 463-471.

Kay, N., 1996. The economics of trust. *International Journal of the Economics of Business*, 3, 249-260.

Keller, G., and Warrack, B., 2003. *Statistics for management and economics*. 6th edition. California: Thomson Brooks.

Kennedy, P., 1992. *A guide to econometrics.* 3rd edition. Cambridge, MA: MIT Press.

Keogh, W., Stewart, V., and Taylor, J., 2001. Developing strategies for growth in HTSF's: looking beyond survival in an increasingly competitive market place. *In:* During, W., Oakey, R., and Kauser, S., editors. *New technology-based firms in the new millenium*. Oxford: Elsevier Science, 2001, 42-57.

Khavul, S., 2001. when high-technology start-up firms speed innovations to market: does ownership matter? *In:* Bygrave, W.D., Autio, E., Brush, C.G., Davidsson, P., Green, P.G., Reynolds, P.D., and Sapienza, H.J., editors. *Frontiers of Entrepreneurship Research.* Babson Park: Babson College, 2001, 480-494.

Kogut, B., 1988. Joint ventures: Theoretical and empirical perspectives. *Strategic Management Journal,* 9(4), 319-332.

Kogut, B., 2000. The network as knowledge: generative rules and the emergence of structure. *Strategic Management Journal, special issue,* 21(3), 405-425.

Kogut, B., and Zander, U., 1992. Knowledge of the firm, combinative capabilities, and the replication of technology. *Organization Science,* 3(3), 383-397.

Kogut, B., and Zander, U., 1996. What firms do? Coordination, identity, and learning. *Organization Science,* 7(5), 502-518.

Kotler, P., 1972. A generic concept of marketing. *Journal of Marketing,* 36(April), 46-54.

Kumar, N., Scheer, L.K., and Steenkamp, J., 1998. Interdependence, punitive capability, and the reciprocation of punitive actions in channel relationships. *Journal of Marketing Research,* 35(May), 225-235.

Lambe, C.J., and Spekman, R.E., 1997. Alliances, external technology acquisition, and discontinuous technological change. *Journal of Product Innovation Management,* 14(2), 102-116.

Lambe, C.J., Spekman, R.E., and Hunt, S.D., 2000. Interimistic relational exchange: Conceptualization and propositional development. *Journal of the Academy of Marketing Science,* 28(2), 212-225.

Lambe, C.J., Wittmann, C.M., and Spekman, R.E., 2001. Social exchange theory and research on business-to-business relational exchange. *Journal of Business-to-Business Marketing,* 8(3), 1-36

Lane, C., and Bachmann, R., editors, 1998. *Trust within and between organisations: conceptual issues and empirical applications.* Oxford: Oxford University Press.

Lane, P.J., and Lubatkin, M., 1998. Relative absorptive capacity and interorganizational learning. *Strategic Management Journal,* 19, 461-477.

Larson, A., 1992. Network dyads in entrepreneurial settings: a study of the governance of exchange relationships. *Administrative Science Quarterly,* 37, 76-104.

Lawton-Smith, H., Dickson, K. and Lloyd-Smith, S., 1991. There are two sides to every story: innovation and collaboration within networks of small and large firms. *Research Policy,* 20, 457-468.

Lee, C., Lee, K., and Penings, J., 2001. Internal capabilities, external networks, and performance: a study on technology-based ventures. *Strategic Management Journal,* 22, 615-640.

Leedy, P.D., 1993. *Practical research planning and design.* 5th edition. New York/Ontario: Macmillan Publishing Company.

Leedy, P.D., and Ormrod, J.E., 2001. *Practical research planning and design.* 7th edition. New York/Ontario: Macmillan Publishing Company.

Lei, D., and Slocum, J.W., 1991. Global strategic alliances: payoffs and pitfalls. *Organizational Dynamics*, 19(3), 44-63.

Levine, J.B., and Byrne, J.A., 1986. Corporate odd couples: beware the wrong partner. *Business Week*, 21 July, 98-103.

Levine, S., and White, P.E., 1961. Exchange as a conceptual framework for the study of interorganisational relationships. *Administrative Science Quarterly*, 5, 583-601.

Lipparini, A., and Sobrero, M., 1997. Co-ordinating multi-firm innovative processes: entrepreneur as catalyst in small-firm networks. *In:* Ebers, M., editor. *The formation of inter-organizational networks*. Oxford: Oxford University Press, 1997, 199-219.

Little, A.D., 1977. *New, technology-based firms in the United Kingdom and the Federal Republic of Germany*. London and Bonn: Anglo-German Foundation for the Study of Industrial Society.

Littler, D. Leverick, F., and Bruce, M., 1995. Factors affecting the process of collaborative product development: a study of UK manufacturers of information and communications technology products. *Journal of Product Innovation Management,* 12, 16-32.

Lorenzoni, G., and Lipparini, A., 1999. The leveraging of interfirm relationships as a distinctive organizational capability: a longitudinal study. *Strategic Management Journal*, 20(4), 317-338.

Mabert, V., Muth, J. and Schmenner, R., 1992. Collapsing new product development times: Six case studies. *Journal of Product Innovation Management,* 9(3), 200-212.

Macauley, S., 1963. Non-contractual relations in business: A preliminary study. *American Sociological Review*, 28, 55-67.

Macneil, I.R., 1978. Contracts: Adjustment of long-term economic relations under classical, neoclassical, and relational contract law. *Northwestern University Law Review,* 72(6), 854-906.

Macneil, I.R., 1980. *The new social contract*. New Haven, Yale University Press.

Madhok, A., and Tallman, S.B., 1998. Resources, transactions, and rents: Managing value through inter-firm collaborative relationships. *Organization Science,* 9(3), 326-339.

March, J.G., and Simon, H.A., 1958. *Organizations*. New York: Wiley & Sons.

Martinez Sanchez, A., and Perez Perez, M., 2003. Cooperation and the ability to minimize the time and cost of new product development within the Spanish automotive supplier industry. *Journal of Product Innovation Management, 20*(1), 57-69.

McDougall, P., and Robinson, R.B., 1990. New venture strategies: an empirical identification of eight archetypes of competitive strategies for entry. *Strategic Management Journal*, 11(6), 447-467.

McGee, J.E., and Dowling, M.J., 1994. Using R&D cooperative agreements to leverage managerial experience: A study of technology-intensive new ventures. *Journal of Business Venturing,* 9, 33-48.

McKenzie-Price, C., 2001. *Statistics from the company information database: whole of Oxfordshire*, July. Oxford: Oxfordshire County Council,.

Meyer, G.D., and Alvarez, S.A., 1998. Successful technology-based strategic alliances: an entrepreneurial perspective. *In:* Hitt, M.A, Ricart i Costa, J.E., and Nixon, R.D., editors. *Managing strategically in an interconnected world.* New York: John Wiley and Sons, 1998, 255-279.

Miles, M.B., and Huberman, A.M., 1994. *Qualitative data analysis: a sourcebook of new methods*. Newbury Park, CA: Sage Publications.

Miller, D., 1983. The correlates of entrepreneurship in three types of firms. *Management Science*, 29(7), 770-791.

Miller, D., and Shamsie, J., 1996. The resource-based view of the firm in two environments: the Hollywood film studios from 1936 to 1965. *Academy of Management Journal,* 39, 519-543.

Mills, J., Platts, K., Bourne, M., and Richards, H., 2002. *Strategy and performance: competing through competencies*. Cambridge: Cambridge University Press.

Millson, M., and Wilemon, D., 2001. The impact of organizational integration and product development proficiency on market success. *Industrial Marketing Management,* 1, 1-23.

Millson, M.R., Raj, S.P., and Wilemon, D., 1996. Strategic partnering for developing new products. *Research-Technology Management*, (May-June), 41-49.

Mitchell, W., Dussauge, P., and Garette, B., 2002. Alliances with competitors: How to combine and protect key resources? Creativity and Innovation Management, 11(3), 203-223.

Mohr, J., and Spekman, R., 1994. Characteristics of partnership success: partnership attributes, communication behavior, and conflict resolution techniques. *Strategic Management Journal*, 15(2), 135-142.

Montevrede, K., and Teece, D.J., 1982. Supplier switching costs and vertical integration in the automobile industry. *The Bell Journal of Economics*, 13, 206-213.

Moorman, C., Zaltman, G., and Deshpande, R., 1992. Relationships between providers and users in marketing research: the dynamics of trust within and between organizations. *Journal of Marketing Research,* 29(August), 314-329.

Morgan, R.M., and Hunt, S.D., 1994. The commitment-trust theory of relationship marketing. *Journal of Marketing,* 58(July), 20-38.

Morris, M. Bruynee, J., and Page, M., 1998. Relationship marketing in practice. Myths and realities. *Industrial Marketing Management,* 27, 359-371.

Morris, M.H., 1998. *Entrepreneurial intensity: sustainable advantages for individuals, organisations, and societies*. Westport: Quorum Books.

Morris, M.H., Pitt, L.F., and Honeycutt, E.D., 2001. *Business-to-business marketing: a strategic approach.* 3rd edition. Thousand Oaks: Sage Publications.

Mowery, D.C., Oxley, J.E., and Silverman, B.S., 1996. Strategic alliances and inter-firm knowledge transfer. *Strategic Management Journal*, 17, 77-91.

Murray, G., and Burgel, O., 1998. The international activities of British start-up companies in high-technology industries: difference between internationalisers and non-internationalisers. *In:* Reynolds, P.D., Bygrave, W.D., Carter,N.M., Davidsson, P., Gartner, W.B., Mason, C.M., and McDougall P.P., editors. *Frontiers of Enterpreneurship Research.* Wellesley, MA: Babson College, 1998.

Nahapiet, J., and Ghoshal, S., 1998. Social capital, intellectual capital and the organizational advantage. *Academy of Management Review,* 23(2), 242-266.

Nelson, R., and Winter, S., 1982. *An evolutionary theory of economic change.* Cambridge: Belknap.

Neuman, W.L., 1997. *Social research methods: qualitative and quantitative approaches.* 3rd edition. Needham Heights, MA: Allyn and Bacon.

Nohria, N., and Eccles, R.G., 1992. *Networks and organisations: structure, form and action.* Boston: MA: Harvard Business School Press.

Nonaka, I., 1991. The knowledge-creating company. *Harvard Business Review,* (November-December), 96-104.

Nonaka, I., and Takeuchi, H., 1995. *The knowledge creating company.* Oxford: Oxford University Press.

Nonaka, I., and Teece, D., 2001. *Managing industrial knowledge: creation, transfer and utilization.* London: Sage Publications.

Noordewier, T., John, G., and Nevin, J., 1990. Performance outcomes of purchasing arrangements in industrial buyer-vendor relationships. *Journal of Marketing,* 54, 80-93.

Nooteboom, B., 1999. *Inter-firm alliances: analysis and design.* London: Routledge.

Nooteboom, B., Berger, H., and Noorderhaven, N., 1997. Effects of trust and governance on relational risk. *Academy of Management Journal,* 40(2), 308-338.

Nunnally, J.C., 1978. *Psychometric theory.* 2nd edition. New York: McGraw Hill.

O'Regan, N., Ghobadian, A., and Liu, J., 2001. The barriers to the deployment of strategic planning in high technology small firms – an empirical assessment. *In:* During, W., Oakey, R., and Kauser, S., editors. *New technology-based firms in the new millennium.* Oxford: Elsevier Science, 2001, 71-84.

Ohmae, K., 1989. The global logic of strategic alliances. *Harvard Business Review* (March-April), 143-154.

Oliver, A.L., and Liebeskind, J.O., 1998. Three levels of networking for sourcing intellectual capital in biotechnology. *International studies of Management and Organizations,* 5(1), 109-125.

Oliver, C., 1990. Determinants of interorganizational relationships: Integration and future directions. *Academy of Management Review,* 15(2), 241-265.

Olson, E. Walker, O. Jr. Ruekert, R., and Bonner, J., 2001. Patterns of cooperation during new product development among marketing, operations and R&D: Implications for project performance. *The Journal of Product Innovation Management,* 18, 258-271.

Olson, E.M., Walker, O.C., and Ruekert, R.W., 1995. Organizing for effective new product development: the moderating role of product innovativeness. *Journal of Marketing*, 59(1), 48-62.

Osborn, A., 1963. *Applied imagination.* 3rd edition. New York: Charles Scribner's Sons

Osborn, R.N., and Baughn, C.C., 1990. Forms of interorganizational governance for multinational alliances. *Academy of Management Journal*, 22, 503-519.

Parker, H., 2000. Inter-firm collaboration and the new product development process. *Industrial Management and Data Systems,* 100(6), 255 – 261.

Parker, H., and Campbell, A., 2001. Risky Business? High-technology entrepreneurs in strategic technology alliances with large established firms. Paper presented at the *Babson Kauffman Entrepreneurship Research Conference.* Jonkoping, Sweden, June 12-17.

Parkhe, A., 1993. Strategic alliance structuring: A game theoretic and transaction cost examination of inter-firm cooperation. *Academy of Management Journal,* 36(4), 794-829.

Penrose, E., 1959 (and 1995 Reprint). *The theory of the growth of the firm.* Oxford: Blackwells.

Peteraf, M.A., 1993. The cornerstones of competitive advantage. *Strategic Management Journal,* 14, 179-188.

Pinto, M.B., Pinto, J.K., and Prescott, J.E., 1993. Antecedents and consequences of project team cross-functional cooperation. *Management Science*, 39(10), 1281-1297.

Pisano, G.P., Russo, M.V., and Teece, D., 1998. Joint ventures and collaborative agreements in the telecommunications equipment industry. *In:* Mowery, D., editor. *International collaborative ventures in U.S. manufacturing.* Cambridge, MA: Ballinger, 1988, 23-70.

Pitkethly, R., 2001. Intellectual property strategy in Japanese and UK companies: patent licensing decisions and learning opportunities. *Research Policy,* 30(3), 425-442.

Polanyi, M., 1966. *The tacit dimension*. New York: Anchor Day Books.

Poppo, L., and Zenger, T., 1998. Testing alternative theories of the firm: transaction cost, knowledge-based, and measurement explanations for make-or-buy decisions in information services. *Strategic Management Journal,* 19(9), 853-877.

Poppo, L., and Zenger, T., 2002. Do formal contracts and relational governance function as substitutes or complements? *Strategic Management Journal,* 23, 707-725.

Powell, W.W., Koput, K.W., and Smith Doerr, L., 1996. Interorganizational collaboration and the locus of innovation: Networks of learning in biotechnology. *Administrative Science Quarterly*, 41, 116-145.

Prahalad, C., and Hamel, G., 1990. The core competence of a corporation. *Harvard Business Review*. (May/June), 79-91.

Priem, R.L., and Butler, J.E., 2001a. Is the resource-based 'view' a useful perspective for strategic management research? *Academy of Management Review*, 26, 22-40.

Priem, R.L., and Butler, J.E., 2001b. Tautology in the resource-based view and the implications of externally determined resource value: further comments. *Academy of Management Review,* 26, 57-66.

Provan, K., and Skinner, S., 1989. Interorganizational dependence and control as predictors of opportunism in dealer-supplier relations. *Academy of Management Journal*, 32(1), 202-213.

Reed, R., and De Fillipi, R., 1990. Causal ambiguity, barriers to imitation and sustainable competitive advantage. *Academy of Management Review*, 15(1), 88-102.

Reve, T., 1992. Horizontal and vertical alliances in industrial marketing channels. *Advances in distribution Channel Research*, 1, 235-257.

Richardson, G.B., 1972. The organisation of industry. *Economic Journal,* 82, 883-896.

Ring, P.S., and Van de Ven, A.H., 1992. Structuring cooperative relationships between organizations. *Strategic Management Journal,* 13, 483-498.

Ring, P.S., and Van de Ven, A.H., 1994. Developmental processes of cooperative interorganizational relationships. *Academy of Management Review,* 19(1), 90-118.

Robertson, T., and Gatignon, H., 1998. Technology development mode: A transition cost conceptualisation. *Strategic Management Journal,* 19, 515-531.

Robinson, W.T., and Min, S., 2002. Is the first to market the first to fail? Empirical evidence for industrial goods businesses. *Journal of Marketing Research*, 39(1), 120-129.

Rochford, L., and Rudelius, W., 1992. How involving more functional areas within a firm affects the new product success. *The Journal of Product Innovation Management, 9*, 287-299.

Rousseau, D.M., Sitkin, S.B., Burt, R.S., and Camerer, C., 1998. Not so different after all: a cross-discipline view of trust. *Academy of Management Review*, 23(3), 393-404.

Rumelt, R.P., 1984. Toward a strategic theory of the firm. *In:* Lamb, R.B, editor. *Competitive Strategic Management.* Englewood Cliffs, NJ: Prentice-Hall.

Sako, M., 1992. *Prices, quality and trust: inter-firm relations in Britain and Japan.* Cambridge: Cambridge University Press.

Sako, M., 1998. Does trust improve business performance? *In:* Lane, C., and Bachmann, R., editors. *Trust within and between organisations.* Oxford: Oxford University Press, 1998, 88-146.

Saxenian, A., 1991. The origins and dynamics of production networks in Silicon Valley. *Research Policy,* 20, 423-437.

Schumacker, R.E., and Lomax, R.G., 1996. *A beginner's guide to structural equation modeling.* Mahwah, J.J: Lawrence Erlbaum Associates.

Schumpeter, J.A., 1934. *The theory of economic development: an inquiry into profits, capital, credit, interest, and the business cycle.* Cambridge, MA: Harvard University Press.

Sethi, R., 2000. Superordinate identity in cross-functional product development teams: its antecedents and effect on new product performance. *Journal of the Academy of Marketing Science,* 28(3), 330-344.

Shan, W., Walker, G., and Kogut, B., 1994. Interfirm cooperation and startup innovation in the biotechnology industry. *Strategic Management Journal,* 15, 387-394.

Sharma, D., 1998. A model for governance in international strategic alliances. *Journal of Business and Industrial Marketing,* 13(6), 511-528.

Sharma, S., 1996. *Applied multivariate techniques*. New York: John Wiley and Sons.

Shelanski, H.A., and Klein, P., 1995. Empirical research in transaction cost economics: a review and assessment. *Journal of Law, Economics and Organization,* 11(2), 335-361.

Sitkin, S.B., and Roth, N.L., 1993. Explaining the limited effectiveness of legalistic 'remedies' for trust/distrust. *Organization Science*. 4, 367-392.

Smith, T., 2003. Why businesses crash. *Cape Argus, Network Supplement*, April 10, page 1.

Song, X., and Parry, M., 1997. The determinants of Japanese new product successes. *Journal of Marketing Research,* 34, 64-76.

Souder, W.E., 1980. Promoting an effective R&D-marketing interface. *Research Management,* (July), 10-15.

Souder, W.E., 1988. Managing relations between R&D and marketing in new product development projects. *Journal of Product Innovation Management,* 5(4), 6-19.

Spekman, R.E., Forbes III, T.M., Isabella, L.A., and MacAvoy, T.C., 1998. Alliance Management: A view from the past and a look to the future. *Journal of Management Studies,* 35(6).

Statistica version 6 electronic manual. Computer software manual.

Stinchcombe, A., 1965. Social structure and organizations. *In:* March, J.G., editor. *Handbook of organizations.* Chicago: Rand McNally, 1965, 142-193.

Storey, D.J., 1994. *Understanding the small business sector*. London: Routledge.

Stuart, T., Hoang, H., and Hybels, R., 1999. Interorganisational endorsements and the performance of entrepreneurial ventures. *Administrative Science Quarterly,* 44, 315-349.

Swedburg, R., editor, 2000. *Entrepreneurship: the social science view*. Oxford: Oxford University Press.

Sydow, J., 1998. Understanding the constitution of interorganisational trust. *In:* Lane, C., and Bachmann, R., editors. *Trust within and between organisations.* Oxford: Oxford University Press, 1998, 31-64.

Szulanski, G., 1996. Exploring internal stickiness: Impediments to the transfer of best practice within the firm. *Strategic Management Journal,* 17, 27-43.

Teece, D., 1987. Profiting from technological innovation: Implications for integration, collaboration, licensing and public policy. *Research Policy*, 15, 285-305.

Teece, D.J., 1988. Technological change and the nature of the firm. *In:* Dosi, G., Freeman, C., Nelson, R., Silverberg, G., and Soete, L., editors. *Technical Change and Economic Theory.* London: Pinter, 1988, 256-281.

Teece, D.J., 1992. Competition, cooperation, and innovation: organisational arrangements for regimes of rapid technological progress. *Journal of economics behaviour and organisation*, 18, 1-25.

Teece, D., Pisano, G., and Shuen, A., 1997. Dynamic capabilities and strategic management. *Strategic Management Journal*, 18(7), 509-533.

Thibaut, J.W., and Kelley, H.H., 1959. *The social psychology of groups.* New York: John Wiley and Sons, Inc.

Thompson, J.D., 1967. *Organizations in action: social science bases of administration.* New York: McGraw-Hill.

Tsai, W.P., and Ghoshal, S., 1998. Social capital and value creation: An empirical study of intra-firm networks. *Academy of Management Journal,* 41(4), 464-476.

Uzzi, B., 1997. Social structure and competition in inter-firm networks: The paradox of embeddedness. *Administrative Science Quarterly*, 42(March), 35-67.

Van de Ven, A.H., Polley, E.D., Garud, R., and Venkataraman, S., 1999. *The innovation journey.* Oxford: Oxford University Press.

Venkataraman, N., and Grant, J.H., 1986. Construct measurement in organizational strategy research: a critique and proposal. *Academy of Management Review,* 11, 71-87.

Venkataraman, S., Van de Ven, A.H., Buckeye, J., and Hudson, R., 1990. Starting up in a turbulent environment: a process model of failure among firms with high customer dependence. *Journal of Business Venturing*, 5, 277-295.

Vesey, J.T., 1991. The new competitors: they think in terms of speed to market. *Academy of Management Executive,* 5(2), 23-33.

Von Hippel, E., 1988. *The sources of innovation*. New York: Oxford University Press.

Walker, G., and Weber, D., 1984. Transaction cost approach to make-or-buy decisions. *Administrative Science Quarterly*, 29, 373-391.

Walker, G., Kogut, B., and Shan, W., 1997. Social capital, structural holes and the formation of an industry network. *Organization Science,* 8(2), 109-125.

Weaver, K.M., and Dickson, P.H., 1998. Outcome quality of small-to-medium-sized enterprise-based alliances: The role of perceived partner behaviors. *Journal of Business Venturing,* 13(6), 505-523

Weick, K.E., 1993. The collapse of sensemaking in organizations: the Mann Gulch disaster. *Administrative Science Quarterly*, 38, 628-652.

Weitz, B.A., and Jap, S.D., 1995. Relationship marketing and distribution channels. *Journal of the Academy of Marketing Science,* 23(4), 305-320.

Wernerfelt, B., 1984. A resource-based view of the firm. *Strategic Management Journal,* 5, 171-180.

Williamson, O., 1975. *Markets and hierarchies: Analysis and antitrust implications*. New York: Free Press.

Williamson, O., 1979. Transaction-cost economics: The governance of contractual relations. *The Journal of Law and Economics,* 22(2), 233-261.

Williamson, O., 1985. *The Economic Institutions of Capitalism*. New York: Free Press.

Williamson, O., 1991. Comparative economic organization: The analysis of discrete structural alternatives. *Administrative Science Quarterly,* 36, 269-296.

Williamson, O., 1996. *The mechanisms of governance*. Oxford: Oxford University Press.

Wilson, D.T., 1995. An integrated model of buyer-seller relationships. *Journal of the Academy of Marketing Science,* 23(4), 335-345.

Yli-Renko, H., Autio, E., and Sapienza, H.J., 2001. Social capital, knowledge acquisition, and knowledge exploitation in young technology-based firms. *Strategic Management Journal*, 22, 587-613.

Yoo, So-Jin., 2001. Entrepreneurial orientation, environmental scanning intensity, and firm performance in technology-based SME's in frontiers of entrepreneurship research. *In:* Bygrave, W.D., Autio, E., Brush, C.G., Davidsson, P., Green, P.G., Reynolds, P.D., and Sapienza, H.J., editors. *Frontiers of Entrepreneurship Research.* Babson Park: Babson College, 2001, 356-368.

Yoshino, M. and Rangan, U., 1995. *Strategic alliances: an entrepreneurial approach to globalisation*. Boston, MA: Harvard Business School Press.

Young-Ybarra, C., and Wiersma, M., 1999. Strategic flexibility in information technology alliances: the influence of transaction cost economics and social exchange theory. *Organisation Science*, 10(4), 439-459.

Zaheer, A., and Venkatraman, N., 1995. Relational governance as an interorganizational strategy: an empirical test of the role of trust in economic exchange. *Strategic Management Journal,* 16, 373-392.

Zaheer, A., McEvily, B., and Perrone, V., 1998. Does trust matter? Exploring the effects of interorganizational and interpersonal trust on performance. *Organization Science*, 9, 141-159.

Zahra, S., 1996. Technology strategy and financial performance: Examining the moderating role of the firm's competitive environment. *Journal of Business Venturing,* 11, 189-219.

Zahra, S., and Bogner, W., 1999. Technology strategy and software new ventures performance: Exploring the moderating effect of the competitive environment. *Journal of Business Venturing,* 15, 135-173.

Zahra, S., Ireland, R., Duane, Hitt,, and Michael, A., 2000. International expansion by new venture firms: International diversity, mode of market entry, technological learning, and performance. *Academy of Management Journal,* 43(5), 925–951.

Zahra, S.A., and Kirchhoff, B.A., 2001. The impact of maturity upon firm growth among technology-based new ventures. *In:* Bygrave, W.D., Autio, E., Brush, C.G., Davidsson, P., Green, P.G., Reynolds, P.D., and Sapienza, H.J., editors. *Frontiers of Entrepreneurship Research.* Babson Park: Babson College, 2001, 368-377.

Zajac, E., 1998. Commentary on 'Alliances and Networks' by R. Gulati. *Strategic Management Journal,* 19, 319-321.

Zajac, E.J., and Olsen, C.P., 1993. From transaction cost to transaction analysis: implications for the study of interorganizational strategies. *Journal of Management Studies*, 30, 131-145.

Zand, D.E., 1972. Trust and managerial problem-solving. *Administrative Science Quarterly*, 17, 229-239.

Zikmund, W.G., 1997. *Business research methods*. 5th edition. Forth Worth: Harcourt Brace College Publishers.

Zoller, S., 1999. Are you satisfied with your technology alliances? *Research Technology Management,* (March), 10-12.

Zucker, L.G., 1986. Production of trust: Institutional sources of economic structure, 1840-1920. In: Staw, B.M. and Cummings, editors. *Research in Organizational Behaviour*, Greenwich, CT: JAI Press, 1986, 8, 53-111.

APPENDICES

Appendix 1 Survey Questionnaire

NEW PRODUCT DEVELOPMENT AND ALLIANCE RESEARCH QUESTIONNAIRE

Please return completed questionnaire to
Hamieda Parker **FAX 01865 274125**
Wolfson College **EMAIL hamieda.parker@wolfson.oxford.ac.uk**
Oxford University

We are interested in your experiences regarding new product development and alliances or partnerships with other firms. These partnerships are aimed at developing a new product or service. The partnerships may be with any other firm, a customer, a supplier, competitor or complementor (not a direct customer or supplier but another firm whose service, skills or products are used). For this study a strategic alliance is understood to be a close cooperative relationship with another organisation, requiring substantial sharing of information, skills or other resources. New product development in this study refers to a product, service, or process development. Please answer questions in the space provided and circle where relevant. Thank you in advance for your participation.

1. How many **new products** has your company developed in the last three years_____
2. How many of these products were developed via an alliance with another firm_____
3. In how many of these alliances was an informal agreement used and for how many was a formal one used
   Informal (verbal agreements)_____**Formal (written agreements)** _____
4. How many **long-term alliance agreements** has your firm entered into_____
5. How many of these long-term agreements are formal as compared to informal
   Informal (verbal agreements)_____ **Formal (written agreements)** _____
6. How many of the products that you firm has developed over the last three years have taken longer than initially scheduled to develop and introduce _____
7. What is your average new product development time from concept to market _____months
8. What percentage of total sales in the last year was from products developed in the last 3 years
   *1-10% *10-30% *more than 30%

New Product Development Alliance

Please could you think of the most recent new product that your firm has developed and introduced via an alliance with another firm, and answer the following set of questions regarding this new product development alliance.

9. Would you describe this alliance partner as a: (please circle most appropriate option)
   *Customer *Supplier *Competitor *Complementor *Other (please specify)_____
10. Approximately how many employees does your alliance partner have _____
11. How well did you know your alliance partner prior to forming this alliance
    *very well *quite well *hardly at all
12. When did your firm begin its relationship with this partner?_____
13. What was the duration of this new product development alliance _____
14. What type of alliance agreement was used for this product development
    *an informal verbal agreement *a written agreement *a formal legally drafted agreement

If you had a written alliance agreement please answer the questions under the heading "written agreement", while if you had an informal verbal agreement please answer the questions under the heading "informal verbal agreement". Please indicate to what extent the following statements characterize your alliance, where (1) represents not at all and (7) represents to a great extent

(please circle the most appropriate number)

WRITTEN AGREEMENT	**Not at all**						**Great Extent**
15. Roles and responsibilities in each firm are clearly defined by the agreement	1	2	3	4	5	6	7
16. Schedules and milestones are detailed in the agreement	1	2	3	4	5	6	7
17. The agreement lists safeguards (such as confidentiality)	1	2	3	4	5	6	7
18. Intellectual property rights are detailed in the agreement	1	2	3	4	5	6	7
19. To what extent has the agreement clearly defined profit sharing	1	2	3	4	5	6	7
20. To what extent has the agreement made the development process more efficient	1	2	3	4	5	6	7
21. To what extent did drawing up the alliance agreement take up much time	1	2	3	4	5	6	7
22. The agreement protects you from your partner behaving dishonestly	1	2	3	4	5	6	7
INFORMAL VERBAL AGREEMENT							
23. To what extent did using an informal agreement save you time	1	2	3	4	5	6	7
24. To what extent did the verbal agreement give rise to some confusion regarding responsibilities	1	2	3	4	5	6	7
25. To what extent did you have greater flexibility due to having an verbal rather than written agreement	1	2	3	4	5	6	7
26. To what extent has the use of a verbal agreement encouraged a greater degree of trust between you and the alliance partner	1	2	3	4	5	6	7

Please indicate to what extent the following statements characterize your alliance, where (1) represents not at all and (7) represents to a great extent

	Not at all						**Great Extent**
27. To what extent does any decision you make on this project have to have this alliance partner's approval	1	2	3	4	5	6	7
28. To what extent does the alliance partner have more bargaining power	1	2	3	4	5	6	7
29. To what extent do meetings and discussions take up much time	1	2	3	4	5	6	7
30. To what extent does monitoring the alliance take up much time	1	2	3	4	5	6	7
31. Written documents such as plans, schedules important in this project	1	2	3	4	5	6	7
32. To what extent does managing the alliance complicate the development process	1	2	3	4	5	6	7
33. Personal relationships influenced the selection of this partner	1	2	3	4	5	6	7
34. To what extent do you trust the alliance partner	1	2	3	4	5	6	7
35. We would easily engage in another alliance with this partner	1	2	3	4	5	6	7
36. We have developed personal as well as business relationships with this partner	1	2	3	4	5	6	7
37. In this alliance do informal verbal agreements have the same significance as written agreements	1	2	3	4	5	6	7
38. To what extent did visits and other forms of interaction take place between firms	1	2	3	4	5	6	7
39. To what extent did this alliance meet the performance objectives set	1	2	3	4	5	6	7
40. To what extent was this product developed within the scheduled time	1	2	3	4	5	6	7
41. To what extent has this product met profit objectives	1	2	3	4	5	6	7
42. This project has opened an opportunity window on a new market for our firm	1	2	3	4	5	6	7
43. Our alliance partner has made specific investments for our project	1	2	3	4	5	6	7
44. We have made specific investments tailored to working with them	1	2	3	4	5	6	7
45. Will the knowledge gained in this alliance be useful to you in other projects	1	2	3	4	5	6	7
46. Working with this partner allowed us to develop this product faster	1	2	3	4	5	6	7

Please indicate to what extent the following statements characterize your alliance, where (1) represents not at all and (7) represents to a great extent (please circle the most appropriate number)

	Not at all						Great Extent
47. Our physical location plays an important role in this relationship	1	2	3	4	5	6	7
48. In our partner's firm, even small matters had to be referred to someone higher	1	2	3	4	5	6	7
49. Information from our alliance partner is often difficult to understand	1	2	3	4	5	6	7
50. Information from our alliance partner is complete and on time	1	2	3	4	5	6	7
51. In our partner's firm it is easy to speak to anyone you need to, regardless of rank	1	2	3	4	5	6	7
52. This alliance was critical to the successful development of this product	1	2	3	4	5	6	7
53. We have been willing to make changes for the benefit of the alliance	1	2	3	4	5	6	7
54. They have been willing to make changes for the benefit of the alliance	1	2	3	4	5	6	7
55. The integration between our two firms was very good for this project	1	2	3	4	5	6	7
When conflicts arise, we (our firm and the alliance partner)							
56. Openly share concerns and issues	1	2	3	4	5	6	7
57. Try and keep differences of opinion quiet	1	2	3	4	5	6	7
58. Treat issues in a conflict as a win-lose contest	1	2	3	4	5	6	7
59. See constructive changes on the project because of conflict	1	2	3	4	5	6	7
To what extent did your firm realize the following positives from this alliance							
• Increased network of business contacts	1	2	3	4	5	6	7
• Increased marketplace credibility	1	2	3	4	5	6	7
• Gained market and user knowledge	1	2	3	4	5	6	7
• Gained technical knowledge	1	2	3	4	5	6	7
To what extent was your firm exposed to the following negatives from this alliance							
• Loss of valuable information	1	2	3	4	5	6	7
• Fear that partner uses our proprietary information for their own interests	1	2	3	4	5	6	7
• Loss of time through alliance negotiations and discussions	1	2	3	4	5	6	7
• Loss of time through confusion regarding responsibilities	1	2	3	4	5	6	7
60. How much greater are the positive effects of this alliance compared to the negative effects where (1)indicates that the negatives are much greater (4) indicates positives equal negatives and (7) positives are much greater	1	2	3	4	5	6	7

Please indicate to what extent the following statements characterize your firm, where (1) represents not at all and (7) represents to a great extent

	Not at all						Great Extent
61. Our firm is characterized by a high rate of new product or service introductions compared to competitors	1	2	3	4	5	6	7
62. Our firm is characterized by an emphasis on continuous improvement in methods of production and/or service delivery	1	2	3	4	5	6	7
63. We prefer to manage resources by renting or leasing, rather than owning	1	2	3	4	5	6	7
64. The environmental demands on us are constantly changing	1	2	3	4	5	6	7
65. The management of our firm often take risks in seizing opportunities	1	2	3	4	5	6	7
66. Our firm is characterized by active searches for big opportunities	1	2	3	4	5	6	7
67. Our firm is characterized by rapid growth as the dominant goal	1	2	3	4	5	6	7
68. Our firm's strategy is directed by the perception of untapped opportunities	1	2	3	4	5	6	7
69. Our firm's strategy is greatly influenced by the resources we have	1	2	3	4	5	6	7
70. Compared to our competitors we have shorter product development cycle times	1	2	3	4	5	6	7
71. The timing of our product introduction is good	1	2	3	4	5	6	7
72. Our new product development costs are lower than competitors	1	2	3	4	5	6	7

73. Quick, flexible decision making ability is encouraged by our firm 1 2 3 4 5 6 7

Please indicate to what extent your firm possesses the following capabilities, where (1) represents to a small extent and (7) represents a great extent

	Not at all	Great Extent
74. Technical capabilities that are important for the growth of your firm	1 2 3 4 5 6 7	
75. Marketing capabilities that are important for the growth of your firm	1 2 3 4 5 6 7	
76. Managerial capabilities that are important for the growth of your firm	1 2 3 4 5 6 7	
77. Alliance management capabilities important for achieving alliance goals	1 2 3 4 5 6 7	
78. Capabilities that are important for developing new products quickly	1 2 3 4 5 6 7	

For this new product development alliance: (please answer in the spaces provided or circle as appropriate)

79. How long would it take to replace this alliance partner
*less than 1 month *1-12 months *over 1 year *cannot be replaced
80. What percentage of the development tasks is the alliance partner responsible for_____
81. What percentage of the development costs were carried by the alliance partner_____
82. On average how many people in your firm participate in meetings with this alliance partner_____
83. How much time did your firm spend checking your alliance partner's capabilities prior to engaging it in this alliance _____days
84. How many hours were spent in negotiation with this alliance partner before agreement was reached _____
85. When does your firm realize the greatest benefits from engaging in an alliance with another firm, when it is developing: - a) a radically new product for your firm or b)a product modification or range extension

For your firm, (please answer in the spaces provided, please circle N/A if the question is not applicable to your firm)

86. What percentage of the products developed during the last three years were new to your market_____
87. What percentage of the products developed during the last three years represent modifications or extensions of existing products_____
88. How many technologies has your firm licensed in thus far_____ N/A
89. How many technologies has your firm licensed out thus far_____ N/A
90. How many patents has your firm registered and/or applied for in the last three years_____ N/A
91. Are you involved in any research projects or technology exchange programs linked to a university or research institution Y / N. If yes, how many _____
92. How many venture capitalist firms have invested in your firm_____ N/A
93. How many angel investors have invested in your firm _____ N/A
94. How many trade or industry associations are you active in _____ N/A
95. If you are located on a science or business park, how many alliances do you have with other firms on the park_____ N/A

At which stage would you say your business is at, from the following descriptions _____
(**start-up**- currently in the process of developing concepts and products, have not yet realized any sales; **established** – have at east one year of positive sales; **growing** – already established, actively growing and expanding; **mature** – stable and secure in present market)

Company name _____ Your Title _____
How many years experience do you have in your present type of work _____
How many employees does your firm employ _____
What year was your company founded_____
What is the nature of your main business _____

Would you be interested in receiving the summary report Y/N ____
If yes, please provide an email address to which the report will be sent _____

Thank you very much, your help is greatly appreciated.

Appendix 2 Construct Reliability and Exploratory Factor Analysis

Table 1 Reliability Test of Constructs in Pilot Test Survey

Construct	Cronbach's alpha Pilot reported
Formal Contractual Governance	0.71
Relational governance	0.79
Alliance Team Effectiveness	0.87
New Product Development Performance	0.74
Social Resource Acquisition	0.77
Knowledge Acquisition	0.69
Knowledge Loss	0.89
Collaboration Costs	0.92

Appendix 2

Table 2 Overall Exploratory Factor Analysis Results

Items	Factor 1 Knowledge Loss	Factor 2 Social Res. Acquisition	Factor 3 Alliance Team Effectiveness	Factor 4 NPD Performance	Factor 5 Collaboration Costs	Factor 6 Relational Governance	Factor 7 Formal Governance	Factor 8 Knowledge Acquisition
-roles and responsibilities	0.06	0.02	0.22	0.21	0.23	0.15	**0.81**	-0.03
-schedules and milestones	0.11	0.07	0.19	0.22	0.18	0.11	**0.84**	0.10
-safeguards	0.09	0.03	0.29	0.19	0.13	0.12	**0.79**	-0.09
-intellectual property rights	0.07	0.01	0.18	0.15	0.11	0.14	**0.84**	0.04
-trust	0.14	0.18	0.22	0.26	0.11	**0.70**	-0.12	0.20
-personal relations	0.21	0.16	0.15	0.25	0.13	**0.65**	-0.06	0.31
-our flexibility	0.06	0.11	0.15	-0.10	0.19	**0.71**	0.11	0.21
-partner flexibility	0.20	0.21	0.11	-0.08	0.13	**0.73**	0.09	0.11
-conflict resolution	0.16	0.07	0.08	0.15	0.17	**0.69**	0.06	0.17
-willing to work together again	0.19	0.14	**0.78**	0.30	0.16	0.17	0.08	0.31
-met performance objectives	0.13	0.12	**0.72**	0.25	0.13	0.14	0.05	0.21
-integration	0.20	-0.09	**0.74**	0.31	0.11	0.19	0.03	0.26
-npd schedule met	-0.08	0.20	0.16	**0.79**	0.14	0.11	0.22	-0.04
-npd profitability met	0.09	0.12	0.10	**0.82**	-0.09	0.19	0.14	0.10
- npd opened new opportunities	0.15	0.23	0.19	0.32	0.02	0.10	0.03	0.29
-increased contacts	0.07	**0.82**	-0.15	0.20	0.08	0.19	0.16	0.14
-increased credibility	0.04	**0.85**	0.16	0.12	0.18	0.10	0.07	0.24
-gained market knowledge	0.18	0.29	0.05	0.08	0.02	0.17	0.18	**0.73**
-gained technical knowledge	0.14	0.26	0.10	0.18	0.09	0.05	0.12	**0.71**
-knowledge loss-leakage	**0.84**	0.10	0.17	0.04	0.27	0.02	0.10	0.14
-knowledge loss-opportunism	**0.83**	0.20	-0.01	0.08	0.29	0.06	0.04	0.24
-time loss-discussions	0.21	0.15	0.16	0.16	**0.79**	0.11	0.10	-0.05
-time loss-confusion in roles	0.20	0.12	0.05	0.06	**0.82**	0.03	0.16	0.01
Eigenvalue	5.51	4.80	4.40	3.84	2.23	1.52	1.34	1.15
% Variance Explained	32.1	29.3	25.1	17.4	14.5	12.3	10.8	8.4

Principal components extraction using VARIMAX rotation was employed

Appendix 3 Examples of Tests for Response Bias

Table 1 T-tests for Difference between Early and Late Respondents

Variable	Early respondents (mean)	Late respondents (mean)	t-statistic	p
Formal contractual governance	4.66	4.92	-0.39	0.700
Relational governance	5.38	5.22	0.61	0.542
Firm Size (number of employees)	19	24	-0.82	0.042

Table 2 T-tests for Difference between those that Responded via Fax and E-mail

Variable	Responded via fax (mean)	Responded via e-mail (mean)	t-statistic	p
Formal contractual governance	4.85	4.92	-0.17	0.863
Relational governance	5.26	5.06	1.12	0.265
Firm Size (number of employees)	25	33	-1.69	0.094

Appendix 4 Examples of Reasons Given for not Completing the Questionnaire

Too Busy

"We have received the questionnaire but I am afraid that we do not have the time to complete such a document." (fax received 4 Oct 2001 Hampshire, UK)

Not relevant to us

"We are not involved in developing new products so most of the questionnaire does not apply to us." (fax received 3 Oct 2001, Bridgend , UK)

Interested but unable to complete questionnaire as have not engaged in any new product development alliances

"(our company) has been involved with product development and manufacture for five years. We developed one major product and a host of add-ons and options for this product.

The company has not developed any new products that, to date have used product development partnerships. However there are two projects in planning that might well be carried out as a partnership.

We are willing and keen to develop such a partnership for 2 reasons

- We have limited in-house resource
- We have specific knowledge of some areas (in particular in the field of Calorimetry)

As a result I do not believe that most of your questions can be answered"

(fax received 26 Sep 2001, Bletchley, UK)

Appendix 5 Regression Analyses

Table 1 The Direct Relationship between Governance and New Product Development Performance

Variable	β (Beta coefficient)	p-value
Formal Contractual Governance	0.40	0.000
Relational Governance	0.25	0.011
Firm Age	Redundant	
Firm Size	0.24	0.087
Alliance Partner Size	Redundant	
Sector 1	Redundant	
Sector 2	Redundant	
Adjusted R^2	0.24	
F-Statistic	8.59	0.000

Effect	Steps	F to remove	P to remove	F to enter	P to enter	Effect Status
Formal Contractual Governance	Step 1			16.64	0.000	Entered
Relational Governance				8.29	0.003	Out
Firm Age				0.18	0.674	Out
Firm Size				0.60	0.439	Out
Alliance Partner Size				0.00	0.991	Out
Sector 1				0.17	0.685	Out
Sector 2				1.59	0.211	Out
Formal Contractual Governance	Step 2	16.64	0.000			In
Relational Governance				4.63	0.017	Entered
Firm Age				0.28	0.596	Out
Firm Size				2.10	0.152	Out
Alliance Partner Size				0.05	0.831	Out
Sector 1				0.42	0.521	Out
Sector 2				0.99	0.323	Out
Formal Contractual Governance	Step 3	12.50	0.000			In
Relational Governance		4.63	0.017			In
Firm Age				0.27	0.606	Out
Firm Size				3.02	0.087	Entered
Alliance Partner Size				0.00	0.968	Out
Sector 1				0.34	0.560	Out
Sector 2				1.11	0.295	Out
Formal Contractual Governance	Step 4	14.09	0.000			In
Relational Governance		5.55	0.011			In
Firm Size		3.02	0.087			In
Firm Age				0.13	0.717	Out
Alliance Partner Size				0.00	0.932	Out
Sector 1				0.27	0.606	Out
Sector 2				0.77	0.383	Out

Table 2 **The Relationship between Governance and Alliance Team Effectiveness**

Variable	β (Beta coefficient)	p-value
Formal Contractual Governance	0.16	0.044
Relational Governance	0.59	0.000
Firm Age	Redundant	
Firm Size	Redundant	
Alliance Partner Size	Redundant	
Sector 1	Redundant	
Sector 2	Redundant	
Adjusted R^2	0.41	
F-Statistic	25.99	0.000

Effect	Steps	F to remove	P to remove	F to enter	P to enter	Effect Status
Formal Contractual Governance	Step 1			7.34	0.004	Out
Relational Governance				47.66	0.000	Entered
Firm Age				1.41	0.239	Out
Firm Size				0.12	0.734	Out
Alliance Partner Size				0.01	0.904	Out
Sector 1				0.33	0.569	Out
Sector 2				0.55	0.462	Out
Relational Governance	Step 2	47.66	0.000			In
Formal Contractual Governance				2.99	0.044	Entered
Firm Age				2.15	0.147	Out
Firm Size				0.25	0.616	Out
Alliance Partner Size				0.10	0.750	Out
Sector 1				0.80	0.375	Out
Sector 2				0.79	0.376	Out
Relational Governance	Step 3	40.59	0.000			In
Formal Contractual Governance		2.99	0.044			In
Firm Age				2.32	0.132	Out
Firm Size				0.50	0.483	Out
Alliance Partner Size				0.04	0.837	Out
Sector 1				0.66	0.421	Out
Sector 2				0.54	0.464	Out

Table 3 **The Relationship between Alliance Team Effectiveness and New Product Development Performance**

Variable	β (Beta coefficient)	p-value
Alliance Team Effectiveness	0.47	0.000
Firm Age	Redundant	
Firm Size	Redundant	
Alliance Partner Size	Redundant	
Sector 1	Redundant	
Sector 2	0.15	0.074
Adjusted R^2	0.23	
F-Statistic	17.26	0.000

Effect	Steps	F to remove	P to remove	F to enter	P to enter	Effect Status
Alliance Team Effectiveness	Step 1			30.60	0.000	Entered
Firm Age				1.29	0.258	Out
Firm Size				0.01	0.924	Out
Alliance Partner Size				0.17	0.677	Out
Sector 1				0.70	0.405	Out
Sector 2				2.79	0.098	Out
Alliance Team Effectiveness	Step 2	30.60	0.000			In
Firm Age				0.21	0.647	Out
Firm Size				0.57	0.450	Out
Alliance Partner Size				0.03	0.860	Out
Sector 1				1.15	0.287	Out
Sector 2				3.26	0.074	Entered
Alliance Team Effectiveness	Step 3	30.93	0.000			In
Sector 2		3.26	0.074			In
Firm Size				0.59	0.444	Out
Alliance Partner Size				0.05	0.817	Out
Sector 1				0.05	0.827	Out
Firm Age				0.06	0.802	Out

Table 4 The Relationship between Governance, Alliance Team Effectiveness and New Product Development Performance

Variable	β (Beta coefficient)	p-value
Formal Contractual Governance	0.33	0.002
Relational Governance	Redundant	
Alliance Team Effectiveness	0.40	0.000
Firm Age	Redundant	
Firm Size	0.15	0.116
Alliance Partner Size	Redundant	
Sector 1	Redundant	
Sector 2	Redundant	
Adjusted R^2	0.33	
F-Statistic	13.09	0.000

Effect	Steps	F to remove	P to remove	F to enter	P to enter	Effect Status
Formal Contractual Governance	Step 1			16.64	0.000	Out
Relational Governance				8.29	0.003	Out
Alliance Team Effectiveness				23.86	0.000	Entered
Firm Age				0.18	0.674	Out
Firm Size				0.60	0.439	Out
Alliance Partner Size				0.00	0.991	Out
Sector 1				0.17	0.685	Out
Sector 2				1.59	0.211	Out
Alliance Team Effectiveness	Step 2	23.86	0.000			In
Relational Governance				0.01	0.468	Out
Formal Contractual Governance				9.34	0.002	Entered
Firm Age				0.04	0.850	Out
Firm Size				1.19	0.278	Out
Alliance Partner Size				0.00	0.955	Out
Sector 1				0.64	0.427	Out
Sector 2				1.04	0.311	Out
Alliance Team Effectiveness	Step 3	15.89	0.000			In
Formal Contractual Governance		9.34	0.002			In
Relational Governance				0.01	0.452	Out
Firm Age				0.00	0.990	Out
Firm Size				2.52	0.117	Entered
Alliance Partner Size				0.01	0.910	Out
Sector 1				0.87	0.354	Out
Sector 2				0.73	0.397	Out
Alliance Team Effectiveness	Step 4	16.20	0.000			In
Formal Contractual Governance		10.71	0.002			In
Firm Size		2.52	0.117			In
Firm Age				0.03	0.874	Out
Relational Governance				0.01	0.463	Out
Alliance Partner Size				0.00	0.989	Out
Sector 1				0.77	0.382	Out
Sector 2				0.47	0.495	Out

Table 5 The Relationship between Governance and Social Resource Acquisition

Variable	β (Beta coefficient)	p-value
Formal Contractual Governance	Redundant	
Relational Governance	0.33	0.002
Firm Age	Redundant	
Firm Size	Redundant	
Alliance Partner Size	Redundant	
Sector 1	Redundant	
Sector 2	Redundant	
Adjusted R^2	0.10	
F-Statistic	8.84	0.002

Effect	Steps	F to remove	P to remove	F to enter	P to enter	Effect Status
Formal Contractual Governance	Step 1			0.32	0.286	Out
Relational Governance				8.84	0.002	Entered
Firm Age				0.87	0.354	Out
Firm Size				0.56	0.456	Out
Alliance Partner Size				0.01	0.918	Out
Sector 1				0.02	0.898	Out
Sector 2				0.34	0.562	Out
Relational Governance	Step 2	8.84	0.002			In
Formal Contractual Governance				0.02	0.451	Out
Firm Age				0.92	0.342	Out
Firm Size				0.15	0.700	Out
Alliance Partner Size				0.10	0.754	Out
Sector 1				0.04	0.840	Out
Sector 2				0.35	0.558	Out

Table 6 **The Relationship between Governance and the Acquisition of Knowledge-Based Resources**

Variable	β (Beta coefficient)	p-value
Formal Contractual Governance	Redundant	
Relational Governance	0.39	0.000
Firm Age	Redundant	
Firm Size	Redundant	
Alliance Partner Size	Redundant	
Sector 1	Redundant	
Sector 2	Redundant	
Adjusted R^2	0.14	
F-Statistic	13.23	0.000

Effect	Steps	F to remove	P to remove	F to enter	P to enter	Effect Status
Formal Contractual Governance	Step 1			0.01	0.453	Out
Relational Governance				13.23	0.000	Entered
Firm Age				0.64	0.426	Out
Firm Size				0.01	0.907	Out
Alliance Partner Size				0.08	0.783	Out
Sector 1				0.03	0.865	Out
Sector 2				1.79	0.185	Out
Relational Governance	Step 2	13.23	0.000			In
Formal Contractual Governance				0.60	0.221	Out
Firm Age				0.70	0.407	Out
Firm Size				0.39	0.533	Out
Alliance Partner Size				0.00	0.960	Out
Sector 1				0.01	0.919	Out
Sector 2				2.01	0.160	Out

Table 7 The Relationship between Governance and Knowledge Loss

Variable	β (Beta coefficient)	p-value
Formal Contractual Governance	-0.28	0.009
Relational Governance	Redundant	
Firm Age	Redundant	
Firm Size	Redundant	
Alliance Partner Size	Redundant	
Sector 1	Redundant	
Sector 2	Redundant	
Adjusted R^2	0.06	
F-Statistic	5.93	0.009

Effect	Steps	F to remove	P to remove	F to enter	P to enter	Effect Status
Formal Contractual Governance	Step 1			5.93	0.009	Entered
Relational Governance				3.47	0.033	Out
Firm Age				0.24	0.628	Out
Firm Size				0.25	0.619	Out
Alliance Partner Size				0.24	0.628	Out
Sector 1				0.66	0.420	Out
Sector 2				0.80	0.374	Out
Formal Contractual Governance	Step 2	5.93	0.009			In
Relational Governance				1.82	0.091	Out
Firm Age				0.29	0.589	Out
Firm Size				0.03	0.856	Out
Alliance Partner Size				0.15	0.703	Out
Sector 1				0.52	0.473	Out
Sector 2				1.37	0.246	Out

Table 8 The Relationship between Governance and Collaboration Costs

Variable	β (Beta coefficient)	p-value
Formal Contractual Governance	-0.27	0.006
Relational Governance	Redundant	
Firm Age	-0.22	0.046
Firm Size	Redundant	
Alliance Partner Size	0.29	0.008
Sector 1	Redundant	
Sector 2	Redundant	
Adjusted R^2	1.17	
F-Statistic	5.92	0.001

Effect	Steps	F to remove	P to remove	F to enter	P to enter	Effect Status
Formal Contractual Governance	Step 1			6.32	0.007	Out
Relational Governance				0.50	0.240	Out
Firm Age				2.54	0.115	Out
Firm Size				0.45	0.503	Out
Alliance Partner Size				6.46	0.013	Entered
Sector 1				1.23	0.271	Out
Sector 2				2.40	0.126	Out
Alliance Partner Size	Step 2	6.46	0.013			In
Relational Governance				0.84	0.182	Out
Firm Age				3.71	0.058	Out
Firm Size				0.77	0.382	Out
Formal Contractual Governance				6.14	0.008	Entered
Sector 1				1.09	0.300	Out
Sector 2				3.66	0.060	Out
Alliance Partner Size	Step 3	6.28	0.015			In
Formal Contractual Governance		6.14	0.008			In
Firm Age				4.12	0.046	Entered
Firm Size				1.60	0.210	Out
Relational Governance				0.12	0.365	Out
Sector 1				1.46	0.231	Out
Sector 2				2.97	0.089	Out
Alliance Partner Size	Step 4	7.53	0.008			In
Formal Contractual Governance		6.53	0.006			In
Firm Age		4.12	0.046			In
Firm Size				1.25	0.268	Out
Relational Governance				0.12	0.366	Out
Sector 1				1.26	0.266	Out
Sector 2				2.22	0.140	Out

Table 9 **The Relationship between Collaboration Costs and New Product Development Performance**

Variable	β (Beta coefficient)	p-value
Collaboration Costs	-0.21	0.015
Firm Age	Redundant	
Firm Size	Redundant	
Sector 1	Redundant	
Sector 2	Redundant	
Adjusted R^2	0.03	
F-Statistic	4.88	0.015

Effect	Steps	F to remove	P to remove	F to enter	P to enter	Effect Status
Collaboration Costs	Step 1			4.88	0.015	Entered
Firm Age				1.29	0.258	Out
Firm Size				0.01	0.924	Out
Alliance Partner Size				0.17	0.677	Out
Sector 1				0.70	0.405	Out
Sector 2				2.79	0.098	Out
Collaboration Costs	Step 2	4.88	0.015			In
Firm Age				0.76	0.385	Out
Firm Size				0.02	0.894	Out
Alliance Partner Size				0.01	0.913	Out
Sector 1				0.46	0.500	Out
Sector 2				2.41	0.124	Out