

AUT

Master of Business Programme

*Towards a synthesis of supply chain management
and partnering strategies
within the construction industry*

**Thesis in partial fulfilment for the degree of
Master of Business
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Auckland
New Zealand**

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ACKNOWLEDGEMENTS

I would like to acknowledge my sincere gratitude to the following organisations and individuals, who, in one way or another, have had a hand in the completion of this thesis. Without them this would still be work in progress.

To Haydn & Rollett Construction, for their financial support throughout the MBus programme and allowing me the time to study. I am proud and fortunate to be associated with such a dynamic organisation.

To my AUT supervisors Dr Nevan Wright and Martie-Louise Verreyenne who have provided continuous guidance and support in both core papers and the thesis process of the MBus degree, you have both been professional, personable and always positive.

To my sister Fran Ryan who, whilst fighting her own demons, has typed every word of this thesis. Her enthusiasm, motivation and continual prodding have seen this thesis beast to the end.

Finally, to my family, wife Alison and three sons Max, Sam and Liam for your patience, understanding and encouragement.

Thank you.

Abstract

Partnering and supply chain management (SCM) are concepts or approaches that can be applied as initiatives to solve problems in the construction industry and meet or surpass the expectations of supply chain members and final customers. With the benefit of an Action Research study on the construction process of a large format bulk retail development, by a prominent Auckland construction company, the application of the combined approaches and their relationships are discussed.

It can be concluded that the concepts or approaches mentioned are useful for the company in achieving best results. However, whilst this combined approach provides useful insights to alternative construction procurement; it is by no means a catchall remedy for traditional contracting methods. In order to successfully adopt the SCM approach the size, type and scope of the project would need to be fit-for-purpose and embrace organisational and cultural enablers.

The study identifies a growing need for future research in strategic collaborative approaches to project procurement, in order for the construction industry to grow as a whole.

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“Organisations are filled with people who have different interpretations of what is happening and what should be happening. Each version contains a glimmer of truth but each is a product of the prejudices and blind spots of its maker. No single story is comprehensive enough to make an organisation truly understandable or manageable. Effective managers need multiple tools, the skill to use each of them, and the wisdom to match frames to situations.”

Bolman and Deal 1997

1.0 INTRODUCTION

1.1 Background

The thesis is based on the New Zealand construction industry where the student is a partner in an Auckland based mid-size privately owned contracting company.

The construction industry has been forced into a continued search for improved business methods. Several issues such as, heightened customer expectations, new technologies, and high-risk investments have required new business strategies, with an emphasis on cost effectiveness, risk management and total customer satisfaction. (Matthews, Pellew, Florence, Rowlinson 2000)

In this situation, a vehicle for improvement in the business environment is required to create a collaborative attitude among all team players. The partnering concept has been suggested as a vehicle to reach improved performance in which both customers and suppliers of goods and services can achieve greater satisfaction and trust in their relationships. (Matthews et al. 2000).

Partnering has become an increasingly popular form of business relationship within construction over the last decade (Crane, Felder, Thompson, Thompson, Sanders 1997).

The adoption of partnering into the construction industries of the USA, UK, Australia and New Zealand can be attributed to the fact that relationships in these industries were commonly lacking in trust, respect and honesty between professionals, main contractors and sub-contractors. (Matthews et al. 2000).

The consequence to this lack of collaboration is that construction projects have often resulted in litigation and unsatisfied customers. (Matthews et al. 2000).

The majority of research undertaken in construction partnering has been with the relationship between the main contractor and the contracting client, with little or no mention of adopting partnering with sub-contractors, trade merchants and the design team collectively.

According to Nobbs (1993) the contribution of subcontractors and trade merchants to the total construction process can account for as much as 90 per cent of the total value of a construction project. He suggests that the increased involvement of subcontractors in the shift away from the traditional craft-base has led to a greater reliance on increasingly sophisticated technological based products, which has led to main contractors concentrating their efforts on managing site operations rather than employing direct labour to undertake construction work. Jamieson, Thorpe, Tyler (1996) also attribute the increased

use of subcontractors to the increased complexity of both the construction of buildings and the organisational relationships. The increase in complexity and the over-supply of specialist firms has cultivated an adversarial atmosphere which has had a negative effect on main contractor – subcontractor relationships. As main contractors have realised that the greatest potential for cost savings lies with subcontractors, the prevalence of unfair contract conditions, subcontract auctioning and other onerous practices has increased (Matthews et al. 1996). Many subcontractors do not have the necessary resources and expertise to undertake work satisfactorily and, as a consequence, are unable to give their clients the service they require and many of the undesirable traits common to the main contractor – subcontractor relationship are also common to the subcontractor – sub subcontractor relationship.

Agapiou, Flanagan, Norman, and Notman (1998) conclude that builders' merchants are an important link within the construction supply chain and that partnering could help improve the supply chain and reduce costs. (Matthews et al. 2000).

The thesis presented herein, provides a review of how partnering within the construction industry may include more members of the supply-chain. By synthesising the strategies of partnering and supply-chain integration, the thesis seeks to identify what are the key links within the construction industry supply chain, which may be considered a benefit to gaining improved performance.

The thesis places the various stakeholders within a construction project into a supply chain, and synthesises partnering linkages within an integrated supply chain, which highlights the potential benefits to its members. Further research to test the validity of the supposed benefit of supply chain integration within the construction industry is recommended.

1.2 Motivation

The construction industry's outputs vary greatly in type and scope. Each product has its own design and a distinct process of production or erection – the product is, in general, a prototype. Unlike manufacturing, the construction process is not continuous and repetitious – and the steps involved are not always identifiable. Process segments, whether they are design or construction based, overlap and impinge on one another in a reciprocally dependent manner producing an outcome that is inherently uncertain. However, like the manufacturing industry, construction requires a vast number of suppliers, subcontractors and consultants. (O'Donnell, 2002).

Matthews et al. (2000) stressed the need for improving cooperation between organisations through the sharing of risks and resources. This aspect of sharing of risks and resources through the formation of partnering arrangements in the supply chain has received ubiquitous support in the normative management literature (Campbell, 1985; Landeros & Monczka, 1989; Lamming, 1993; Patterson et. al., 1999). Crowley and Karim (1995) have proposed an alternative structure to strengthen partnering. Their proposed approach permits

an improved flow of information and other resources in terms of speed, quantity and the level of confidentiality across the boundaries of the parties, and ensures a cooperative relationship between construction parties. Thus, the sharing of risks and resources can be anticipated (Gulati, 1999).

It is evident from reviewing the literature on construction partnering that there remains a significant gap in research undertaken on the concept of partnering throughout the construction supply chain. The numerous studies undertaken in the U.S and the U.K. on construction partnering are predominantly large sample, geographically dispersed and based on a single link, the client and the main contractor. There is however, frequent mention for the need to include other members of the supply chain in order to generate improved performance and competitive advantage.(Crowley and Karim ,1995).

1.3 Research Question and Objectives

The research question is:

How can supply chain management strategies improve construction partnering performance?

The objectives of the thesis are to:

1. Identify partnering linkages throughout the supply chain for the benefit of all parties to the project.
2. Establish what aspects of partnering within the supply chain might generate benefits.
3. Develop skills as a practitioner – researcher, by researching and reflecting on my practice.

The purpose of the research design and the criteria for determining whether the study will be judged successful is explained in chapter 3.

1.4 Scope

This thesis is produced in partial fulfilment of the Master of Business degree. The thesis is a research based thesis by way of case study, with a focus on an amalgamated business management strategy, encompassing supply chain integration and partnering within the construction industry.

In Chapter two of this thesis, prior research on two business strategies, supply chain management and construction partnering are thoroughly reviewed.

In the first section of the literature review the focus is placed on identifying supply chain management and supply chain integration and the components of each are defined. The literature review is then extended to discuss the importance of senior management support in order to implement the integrated supply chain strategy and reviews the necessity of cultural compatibility as a criterion to achieving integration. Some of the obstacles to achieving supply chain coordination are highlighted. Whilst the paper addresses supply chain integration broadly, it does not address in depth, the human aspects of relationship management, dynamic capabilities and intra-organisational culture, all of which are said to be paramount to successful supply chain management. Further, the paper has purely a general management focus and does not address in detail, the significant role of Information Technology and Management Information Systems and their strategic importance in inter-organisational communication and knowledge sharing in relation to supply chain management.

The second section of the literature review covers the progression of project partnering within the construction industry and provides an insight to the origins, assumptions and business processes related thereto. The paper provides a discussion on the benefits of partnering to the client and contractor and examines some of the limitations and barriers that exist due to the inherent adversarial nature within the industry.

The third section of the literature review synthesises partnering and supply chain management, by applying the principles of supply chain management

into a typical construction project, and provides a theoretical model of how construction partnering can be improved.

Chapter three of the thesis presents the research methodology and design undertaken to address the thesis objectives and answer the research question. The chapter discusses the reasons why Action research and case study was chosen as the preferred methodology and identifies the benefits and limitations of the case study as a research strategy. The chapter goes on to describe the case in point, and addresses the boundaries of the study.

Chapter four presents the findings of the case study, the unit of analysis being a mixed – use bulk retail construction project in the rapidly expanding Botany Downs suburb of Auckland. The study covers the project from a preconstruction phase and value-engineering phase, through to final handover to the various end-users. The focus of the study is on the partnering processes introduced at the project inception and explores the benefits of extending the partnering relationship beyond the Client and Main Contractor to also include members of the design team and consultants and also key subcontractors and material suppliers, in order to ascertain whether a supply chain strategy applied to construction partnering is achievable and appropriate. The duration of the study was approximately eighteen months.

The chapter continues with a discussion and comparison of the findings with prior literature and archival records and informs the theoretical framework on supply chain partnering.

Chapter five provides the conclusions drawn from the research and identifies the limitations of the research, discusses future research recommendations and the contribution to theory and practice of this thesis.

Chapter six provides a reflective report on the Master of Business degree course work modules and the research project. The report offers the writer's personal critical reflection of the four-year journey.

2.0 LITERATURE REVIEW - A SYNTHESIS OF STRATEGIES

The literature review encompasses two main management strategies; supply-chain management and construction partnering.

2.1 The supply chain

The term supply chain refers to the links between a firm and its suppliers, through its distribution organisation and on to its customers. In other words, a supply chain is a buyer-supplier relationship. So, in construction, a supply chain refers to linkages of those parties participating in a construction project, since they are all involved in the supply of resources. Neo (1998) and Cox (1999) have suggested that supply chain research in construction should focus on the development of interactive inter-organisational relations such as partnering.

2.1.1. Background to Supply Chain Management and Supply Chain Integration

A supply chain can be viewed as a complex web of information systems, operational activities, and management techniques that exist amongst entities that maintain relationships of varying strengths with one another (Chandra and Kumar, 2001a). The supply chain encompasses the entire product cycle from the introduction of raw materials to the point of end-user product consumption (Stock and Lambert, 2001).

Lambert and Cooper (2000) define supply chain management as the integration and management of key business processes and multiple relationships across the supply chain. Kalakota and Robinson (1999) describe Supply Chain Management (hereinafter referred to as SCM) as involving the “co-ordination” of material flows, information flows, and financial flows between and among all participating organisations. SCM can further be described as a system formed by the cooperation and synchronisation of supply chain members that have bonded together to solve common problems. This cooperation includes the sharing of common objectives, goals, policies, and financials as well as forming commitments about issues such as capacity and production (Chandra & Kumar, 2001a). To manage and synchronise the multiple entities within the supply chain, it is necessary to encompass areas such as material flow, operations, production, and logistics through a common set of principles, strategies, policies, and performance metrics (Lee & Billington, 1998).

There appears to be some ambiguity in the terminology used in the literature for the concept of supply chain integration (hereinafter referred to as SCI). For example Lambert et al. (2000) refers to integration simultaneously as the culmination of SCM (i.e. the end-goal of an integrated supply chain) as well as the process of progressively moving closer to suppliers and customers. Other authors refer to integration more in the dictionary sense, i.e. the linkage of organisation processes and information systems between an organisation and its suppliers and customers. Some further decompose integration in terms of integration towards the customer (forward integration), towards the supplier

(backward integration), and internal integration. Another group in the literature describe SCM as being facilitated by a “coordinated” supply chain (Chopra & Meindl, 2001, Chapter 13; Kalakota et al., 1999). For this reason supply chain coordination is considered to be analogous to SCI. (Campbell, 2002).

A problem that has been identified in the literature is a lack of a normative model that can guide managers in their efforts to develop and manage supply chains (Lambert et al., 2000). It has also been remarked that it is much easier to write a definition of SCM than it is to implement (Cooper, Lambert & Pagh, 1997).

SCM differs from logistics in that it extends the scope of logistics to encompass the belief that all functions and business processes in the supply chain need some level of upstream and/or downstream coordination and visibility (Cooper et al., 1997). SCM expands the notion of integration beyond a single company to encompass all related trading partners (Campbell, 2002; Ferguson, 2000).

Many authors speak of the benefits gained by competing as an integrated supply chain. A key idea is that if all stages of the chain take coordinated actions, optimisation occurs and total supply chain profits are increased. In other words, SCM often has the objective of reducing the total amount of resources required to provide the necessary level of customer service to a specific segment (Lambert et al., 2000; Ferguson, 2000). Important

prerequisites of closer relationships between members of the supply chain include the implementation of systems that allow fluid information flows within the supply chain, the development of management coordination in the supply chain and the development of business processes that are universal throughout the supply chain. There is a belief that this integration and coordination of supply chain activities will lead to a sustainable competitive advantage for the supply chain (Cooper et al., 1997; Chopra et al., 2001, Chapter 13) and greater flexibility and agility to shifts in demand (Chandra et al., 2001a). Coordination can lead to improvements in the overall performance of each member and the group, and to reduction in components such as lead-times (Chandra, 1997).

To summarise, the benefits are said to be:-

- Optimisation of effort
- Increased profits
- Fluid information flows
- Co-ordination of management
- Development of universal processes
- Flexibility and ability to react to shifts in demand
- Reduction in lead times

2.1.2. SCM Components

Lambert et al. (2000) believe that SCM is based on three components; the supply chain network structure (consisting of member firms and linkages between these firms); business processes (activities that produce a specific output of value for the customer); and management components (managerial variables by which business processes are integrated and managed throughout the supply chain) (Cooper et al., 1997). Gilmour (1999) sees the three components of SCM as supply chain structural components, information technology capabilities, and organisational capabilities. Most of the literature suggests that SCM has a business process integration component, an information technology connectivity component, and a managerial component. (Campbell, 2002).

Good decision-making throughout the supply chain is supported by an information flow structure that delivers frequent and accurate information to the members of the supply chain (Lambert et al., 2000). Many authors see this step as key in achieving better coordination throughout the supply chain (Campbell, 2002).

Lambert et al, (2000) stated an important predecessor for SCM being “a change from managing individual functions to integrating activities into key supply chain business processes”. This is because employees and organisations that are working from a functional perspective often act as filters of visibility along the supply chain (Neill & Wilk, 1999). An organisation pursuing SCM also needs to consider both internal and external integration

(Daugherty, Ellinger & Gustin, 1996; Campbell, 2002). It is emphasised in the literature that a company needs to have “its own house in order” before trying to integrate with its trading partners. Many authors believe that a focus on the internal supply chain is necessary before an organisation attempts to integrate with its business partners. As such, internal coordination is an important prerequisite for successful SCM (Stock & Lambert, 2001; Burnell, 1999). Internal integration involves achieving seamless integration of organisational functions (logistics, production, etc) facilitated by reorganising the organisational structure around key business processes (Daugherty et al., 1996; Lambert et al., 2000). Once a firm becomes organised internally, it is recommended that organisations should integrate those processes that do not require a change in information technology as a first point of call. As connections with trading parties grow, further processes that may require some changes to information technology capabilities will also be developed (Burnell, 1999; Campbell, 2002).

Cooper et al. (1997) believe that the managerial and behavioural components indicated in the above section will strongly influence the physical and technical aspects of supply chain connectivity. Likewise, Chopra & Meindl (2001) talk of two types of managerial components, action-oriented levers (including components such as information technology, operational improvements, etc) and relationship-oriented levers (involved with the building of trust and cooperation within the supply chain) (Campbell, 2002).

Kalakota (2000) brings further insight into some of the activities that need to be integrated during SCM initiatives. SCM involves disciplines such as procurement, supplier management, multi-site manufacturing management, customer management, order processing, distribution planning, forecasting, demand management, warehousing and transportation. It is time-consuming and difficult to integrate such a wide variety of areas across the supply chain. Kalakota develops a series of steps that he believes are important when commencing SCM (Campbell, 2002).

Kalakota's first stage is for an organisation to clarify its goals for the supply chain. This step may result in the decision of the direction of integration efforts, for example, that the supply chain would be best to pursue (e.g., towards the supplier). The development of a supply chain readiness audit is also important and this stage intends to discover what steps have been taken to promote integration. Kalakota adds that the information capability of each organisation that comprises the supply chain is also an important area to ascertain, as it allows the assessment of the potential for systems integration. It is also important for focal organisations to determine the costs and benefits from establishing connectivity throughout the supply chain. This can assist in getting both trading partner and top management buy-in for integration initiatives. The use of a supply chain coordination unit comprised of a group of cross-trained staff is also suggested for establishing ties with trading partners. Customers and suppliers should be encouraged (through preferential treatment for example) and even coaxed under threat to become involved in integration initiatives. Once integration starts, it is important to develop

ground rules with integration partners and also to ensure communication throughout the affected parties. The evaluation of any problems that arise should also be a priority (Kalakota, 2000; Campbell, 2002).

2.1.3 Managerial Components of SCM and SCI

Lambert and Cooper (2000) refer to the need for one or two focal organisations within the supply chain to drive SCM initiatives. These organisations fulfil an important role in the supply chain, often holding initiatives in place, providing knowledge to supply chain members, and focussing the supply chain in a common direction. (Chopra et al., 2001; Campbell, 2002).

Focal companies are often responsible for the shape of the supply chain as they are the decision-point, deciding what organisations will be included in SCM initiatives. Lambert and Cooper (2000) draw on this concept when they state that because of scarce resources, a focal company will develop linkages with organisations based on a perception of each link's strategic importance. They also suggest that a focal company will use three different focal links with members of the supply chain and these are subsequently outlined. Managed process links are those links that are fully integrated and managed by the focal company. Monitored process links are those that are audited by the focal company but are not directly integrated and managed. Non-managed business links are those linkages that are not actively pursued (Lambert et al., 2000; Campbell, 2002).

As mentioned earlier, top-down leadership from focal companies is seen as an important enabler of SCM. However, it is important for these organisations to carefully balance the power position they hold in the supply chain, i.e., on the one hand to encourage participation in supply chain integration efforts but on the other hand, to not force participation which may cause the exit of some trading partners (Lambert et al., 2000; Cooper et al, 1997).

2.1.4 Top Management Support

Wright and Race (2004) find that top management commitment towards supply chain integration is an important prerequisite for SCI. The reason for this is that supply chain optimisation often requires individual members in a supply chain to subordinate their local interests for the greater interest of the supply chain. Also, SCM efforts may require many partners in the supply chain to change their traditional practices to supply chain processes and this requires top management initiatives. Top management also need to develop an environment that communicates company and supply chain goals to all employees.

Because SCM requires such intense management support and organisational resources, special management teams are often set up to manage integration efforts and ensure forward progress (Chopra et al., 2001, Chapter 13). This initiative must be implemented, supported, reinforced, and driven by upper management. Survey research reveals management support to be a very important enabler of SCI (Daugherty et al., 1996).

2.1.5. Cultural Compatibility and Trust Based Relationships

Cultural compatibility is an important consideration in integration efforts. The meshing of the cultures of trading partners can be time consuming (Lambert et al., 2000). Likewise, differences in the management methods of organisations in the supply chain can hinder integration efforts. Good initial cultural linkages are seen by many authors as prerequisites for the development of closer relationships between trading partners (Daugherty et al., 1996). It is also important to break the corporate culture that considers SCM a component of the logistics department and ignores the much more wide-ranging organisational impact of SCM (Burnell, 1999; Campbell, 2002).

A trust-based relationship is seen as important in the development of an integrated supply chain. Chopra et al.,(2001) sees a trust relationship as initially involving a leap of faith by the involved parties resulting in an atmosphere of dependability between these parties. An important facilitator of trust relationships is the ability of the involved parties to take account of the welfare of other supply chain members and to consider the ramifications of their actions on the objectives of other members. Trust is also seen as an important prerequisite to enable other forms of integration, such as shared information systems and operational optimisation between the trading partners. A trust-based relationship may also avoid the duplication of effort in areas such as inspection and forecasting (Chopra et al., 2001; Campbell, 2002).

Chopra et al. (2001) see two different ways by which trust can be invoked in a relationship. One is the deterrence-based view where trust and cooperation are enforced through the use of formal contracts that discourage negative behaviour. The process-based view speaks to the scenario where trust and cooperation are built up over time as a result of positive interactions between parties. The deterrence view is often predominant in the early stages of relationships and as trust develops the process-based view becomes more important.

2.1.6 Cross-Functional Collaboration

Many authors see the use of collaborative planning, involving important players in the supply chain, as being a key enabler of SCI. This process can assist in achieving goal commonality and aligning strategies throughout the supply chain. It can also enhance communication, trust, and knowledge transfer throughout the supply chain (Chopra et. al., 2001). This process may start simply by the use of cross-functional teams within the focal organisation that at some stage cross over to external parties. An example would be cross-functional design teams that expand to encompass suppliers and customers in design initiatives. Some authors see this effort as resource intensive but it does allow the ability to develop good long-term relationships and also utilise unique cross-functional talent (Neill & Wilk, 1999). Cross-functional collaboration is an indication that the supply chain is becoming more integrated (Lambert et al., 2000; Stock et al., 2001).

Chandra and Kumar (2001a) also make reference to the need for good communication to enable effective collaboration. Regular communication is important because it helps with the development of areas such as shared goals, mutually beneficial actions and conflict resolution. If conflicts arise there can be a tendency for the focal player to be in a position of power but the literature speaks to the importance of ensuring that strategies are in place to ensure fairness and equity for all supply chain members in conflict resolution (Chopra et al., 2001, Chapter 13). A method to clear up any misunderstood and conflicting goals through easy dialogue between affected parties is a further facilitator of goal commonality (Milligan, 1999).

A major focus of this collaboration is to align goals and incentives within the supply chain so that all within the supply chain work towards maximising total supply chain profits (Chopra et al., 2001). This strategy needs to be one that crosses external and internal boundaries. This can occur when the focal firm's strategy has become the supply chain strategy . There is the obvious necessity here for organisations to modify their accepted norms to accommodate common goals (Chandra et al., 2001a). It is also important to remind all firms in the supply chain that competition is now chain-based.

Chandra et al. (2001a) expound the idea that supply chains should be Pareto-optimal or satisfying rather than optimising. The idea expressed by this concept is that it is seldom possible that a decision made to optimise one organisation within the supply chain will optimise others in the supply chain simultaneously. The concept was developed by Wilfredo Pareto, who was a

nineteenth- century Italian economist, who concluded that 80% of the wealth was held by 20% of the population. Wright & Race (2004) explains the same phenomenon has often been found in business, where for example 80% of the sales come from 20% of the customers. The same can be said of the construction supply chain, 80% of the value of a project would be carried out by 20% of the supply chain members.

Chandra et al. (2001a) suggest it is important to cross-functionally develop solutions for supply chain issues that take into account the impact on other chain members. If it is impossible to develop a solution that is advantageous for all supply chain members it is suggested that compensation needs to be developed to support the disadvantaged member (Chandra et al., 2001a).

Chandra et al. (2001a) also suggest that it is important for members of the supply chain to develop norms for the cooperative supply chain system. These include items such as allocation rules for sharing scarce resources, rules for cooperation and coordination, adoption of a problem solving approach, definition of the roles and responsibilities of each member and establishment of rules for negotiation and compromise. Chopra and Meindl (2001) also cite the use of cross-functional communication to aid in the development of definable operational roles for members in the supply chain. Chopra and Meindl (2001) see interdependence as a key issue here. Sequential interdependence is one method of interdependence and occurs when a partner's activities in the supply chain precede another's. However, reciprocal interdependence where parties come together and jointly exchange

information to fulfil tasks is seen to be more conducive to supply chain integration, as it increases trust and organisational understanding, causing each member to take into account others in the supply chain.

2.1.7 Relationship Assessment

It is commonly agreed that it is important to identify those trading parties within the supply chain that are key to integrate with (Wright and Race 2004). This is because the investment in establishing connectivity with parties that occupy a very small proportion of an organisation's transactional volume may neither be strategically important nor financially justifiable (Handfield et al., 2000). One way to assess importance is to integrate and create joint processes and procedures with a supplier or customer based on the dollar value of transactions with them. This is a widely used method; however, it often overlooks those products with a low-dollar volume that are of critical importance to the firm (Neill & Wilk, 1999). Hence, a system is required to evaluate those organisations that are of strategic importance to the supply chain and this is often facilitated by management assessment at the focal organisation (Stock et al., 2001, Chapter 2; Chopra et al., 2001, Chapter 12).

2.1.8 Measuring the Benefits of Relationships

It would seem that an important step in facilitating SCI would be to ascertain the mutual benefits to the organisations that participate in the relationship. Often the motivation is to improve total profits between the parties involved. This assessment stage should use a method that can ascertain actual benefits with equity. A focal organisation should be able to educate the affected parties

about how the figures were arrived at (Ring & Van de Ven, 1994). Cokins (2000b) says that the costs each organisation will incur (in terms of information systems development, etc) to develop the relationship, needs to be recognised.

He argues that it is important to grasp the actual costs and benefits of doing business with a particular trading partner and this requires both organisations to have high visibility into the true costs that each has in doing business with one another. Activity Based Costing (ABC) is suggested as a key enabler to allow the tracing of how all resources are consumed in outputs, products, channels, customers, suppliers, etc (Cokins, 2000b). ABC costing works differently from financial accounting in that it attempts to attribute costs, through a series of activity bases and drivers, to the actual part of the organisation or supply chain that has generated that specific cost (Cokins, 2000a).

Davis and Pain (2002) define ABC as an approach to costing and monitoring of activities which involves tracing resource consumption and costing final outputs. Resources are assigned to activities and activities to cost objects based on consumption estimates. The latter utilise cost drivers to attach activity costs to outputs. ABC is consequently a good tool for measuring the “true costs” and hence benefits of doing business and removing unnecessary and redundant costs from organisations and the supply chain (Cokins, 2000a). Cokins describes how correct costing, using ABC, enables organisations to accurately calculate factors such as the profitability of customer segments,

product margins and rebates for particular customers, and the benefits that can arise from getting customers to buy differently from an organisation. Common experiences that organisations have when implementing ABC is they discover that items they thought were profitable are really very unprofitable and vice versa. Raising prices is not always an option so it comes down to deciding whether to drop or improve a particular item or trading partner.

ABC is especially important when deciding who will share the benefits of collaboration, both between the two trading organisations and with the final customer (Cokins, 2000a). The problem of ascertaining the benefit distribution can be overcome through the use of ABC because it allows organisations to know the true costs and benefits of a particular action, enabling easier and more informed decision making. It also develops a strongly grounded cost-basis that is very useful in relationship building and that is easily defensible. Cokins notes that collaboration among trading partners is facilitated when all parties have fact-based financial data through the use of ABC.

ABC costing also requires trust and coordination between the potential trading partners in the supply chain. This is because visibility into actual costs is needed (in and between both organisations) to be able to use ABC. Sometimes the focal organisation will need to help out smaller players in this respect (Cokins, 2000b), also see Mowshowitz (1997a) and Barnes and Hunt (2001).

A key focus should also be directed to inter-organisational performance and costs rather than just individual components. This is because certain points in

the supply chain may be required to hold high levels of inventory when compared with others. A common case is raw materials suppliers' holding the bulk of inventory in a supply chain because it is cheaper to hold at the supplier. There should be an attempt to drive costs out of the supply chain or alternatively compensate those parties who hold more than their fair share of supply chain costs (Burns, 2000). ABC facilitates such analysis, also see Davis and Pain (2002).

2.1.9. Supply Chain Business Processes

Davenport defines a process as “a structured and measured set of activities designed to produce a specific output for a particular customer or market” (Davenport, 1993). Traditionally however, organisations have been based around functions. Lambert et al. (2000) as do Basu and Wright (1998) see the overcoming of these functional silos (both internally, within individual organisations and externally, in the supply chain) and the reorganisation of the supply chain to a business process basis as the first step towards an integrated supply chain. Lambert et al. (2000) makes reference to the experience of major organisations such as 3M who believe that adopting a process approach, both within their organisations and the supply chain, is the best way to optimise product flows.

The business processes that are used throughout an integrated supply chain are often derived from those that have been used internally by a focal organisation. One rationale for this approach is that it overcomes process disparities amongst supply chain members by enforcing commonality.

Lambert et al. (2000) see this practice as a key enabler of supply chain integration.

2.1.10 The Supply Chain Structure

Lambert et al. (2000) suggest the use of a tiered representation of the supply chain to indicate the position of individual supply chain members. The supply chain is seen to have a number of tiers across the supply chain (e.g. 1st tier customer, 2nd tier supplier, etc) and this is referred to as the horizontal structure of the supply chain. They also describe a vertical structural dimension that refers to the number of entities that operate in each specific tier. A specific company will occupy a definable horizontal position. This procedure can establish the position and importance of individual supply chain members and be used to ascertain the type of connectivity to pursue with each member.

The documentation of the supply chain network structure is important in allowing focal companies to optimise resource use and integrate with the most important supply chain entities. It also allows organisations to understand how firms within the supply chain perform tasks and activities. Lambert et al. (2000) believe it is impossible and often counterproductive to fully integrate with all members of the extended supply chain. He classifies organisations in the supply chain as being either primary or supporting supply chain organisations. Primary organisations are those organisations that carry out activities within key business processes. The supporting organisations provide

resources and knowledge for the primary organisations. It is obviously more important to integrate with primary organisations. Chandra et al. (2001a) express similar ideas with respect to the importance of developing the network structure for supply chain decision-making. They reinforce the ideas of Lambert et al. (2000) with respect to nodal structure and the existence of primary and support organisations in the supply chain. Some authors on the other hand suggest that companies should attempt to integrate and act as a single entity as much as possible. They believe that organisations that integrate in the biggest “arc” (from customer to supplier) within the supply chain will enjoy the biggest benefits (Barlet & Ghoshal , 1994).

2.1.11 Obstacles to SCI

Chopra et al. (2001) identify some obstacles to achieving supply chain coordination and these can be used to highlight some of the necessary organisational components required in an integrated supply chain. Key reasons for the lack of coordination at different stages of the supply chain include differences in management objectives within the supply chain and also the movement of distorted information between different stages. This results in a lack of visible demand information. Chopra et al. (2001) further break down these components into five types of obstacles which are:-

1. Incentive Obstacles
2. Information Processing
3. Operational Obstacles
4. Pricing Obstacles

5. Behavioural Obstacles

Incentive obstacles are described as incentives offered to different stages of the supply chain that serve to reduce supply chain effectiveness. It is important that incentives are aligned with the end goal of maximising supply chain profits. Information processing obstacles speak to the potential for information to become distorted as it moves between different parts of the supply chain. This can be resolved if greater information is shared throughout the chain allowing all members to view actual demand information. Operational obstacles are those actions that cause variability, e.g. ordering in large lots, gaming, and irregular replenishment lead-times. Pricing obstacles such as lot-sized discounts contribute to this obstacle. Behavioural obstacles such as managing locally, blaming others in supply chain for problems, and optimistic behaviour also cause integration difficulties. These obstacles can be overcome through a change in management techniques towards greater supply chain orientation and greater information connectivity. (Campbell, 2002)

Trading parties may also lose interest in SCI if they are not convinced by the focal organisation that benefits will result from closer relationships. Insufficient supplier resources in terms of information systems, employee skills, and organisational resources may also hamper efforts. This is because integration can be resource intensive (Neuman & Samuels, 1996). In such cases, some assistance may be given by the focal organisation.

2.2 Partnering

Partnering has emerged internationally in the construction industry as a means of transforming the traditionally hostile and adversarial relationship between owners and contractors into a more collaborative team relationship (Larson & Drexler, 1997). Project partnering is where the client and contractor work together in closer harmony to avoid conflict on projects and thereby increasing both their profits (Smith & Tonks, 1995; Campbell, 2002).

2.2.1 Introduction

In recent years there has been a growing interest in the use of partnering in construction (CII, 1989, 1991; NEDO, 1991; Latham, 1994; ACTIVE, 1996). During the 1990s, partnering and related forms of collaboration have been seen as a way of dealing with the fragmentation and lack of integration that have bedevilled attempts to improve project performance over the years (Banwell, 1964; NEDO, 1988; Bresnen & Marshall, 2000). (As will be seen, not only do definitions of partnering vary widely, but also forms such as ‘alliancing’ are referred to. For ease of presentation, ‘partnering’ is used in this paper to refer generically to all such collaborative approaches). Research has suggested that performance, in terms of cost, time, quality, buildability, fitness-for-purpose and a whole range of other criteria, can be dramatically improved if participants adopt more collaborative ways of working (Bennett & Jayes, 1998; Bennett et al., 1996). Consequently, a good deal of attention has been directed towards examining the conditions which encourage or inhibit collaboration between clients and their contractors (Bennett & Jayes, 1998; Barlow & Cohen, 1996; Bennett et al., 1996; Green & McDermott, 1996;

Holti & Standing, 1996; Barlow et al., 1997). At the same time, there is still considerable disagreement about precisely what form partnering can or should take, under what conditions it is likely to develop and how such ways of working can be fostered and developed (Barlow et al., 1997; Bresnen et al., 2000).

2.2.2 Background

Publications on construction industry partnering have demonstrated how the owner-contractor relationship affects construction project success (Mosely et al. 1991; Weston & Gibson 1993; Harback et al. 1994; Larson & Gray 1994; Larson 1995, 1997). If either party is suspicious of the motives and actions of the other, successful project completion may be jeopardised. Owners are likely to challenge and delay approval of appropriate changes in plans or budgets, force compliance by withholding funds, and obsessively monitor the progress of a project. Contractors are likely to exploit loopholes in the contract, aggressively negotiate change orders and withhold vital information. Small problems often mushroom into major disputes that create costly delays and ultimately lead to formal litigation. On the other hand, when both parties are able to merge their interests and develop a collaborative working relationship, disputes can be handled in a timely manner: information is freely exchanged, creative solutions to problems emerge, and both parties are able to work together to complete the project successfully (Bresnen et al., 2000).

2.2.3 Partnering Origins

Project partnering is a method of transforming contractual relationships into a cohesive, cooperative project team with a single set of goals and established procedures for resolving disputes in a timely and effective manner (Cowan, Gray & Larson, 1992).

Partnering is more than a set of goals and procedures; it is a state of mind, a philosophy. Partnering represents commitment to respect trust, cooperation, and excellence for all stakeholders in both partners' organisations (Cowan, et al., 1992).

Partnering is not just restricted to construction. For example, a computer company may use partnering to contract for software development as well as for a specific component in a new system under development. Partnering can apply to all industries and all sizes of projects (Cowan, et al., 1992).

2.2.4 Partnering Assumptions

Partnering is based on the assumption that the traditional adversarial relationship between owner and contractor is inefficient, ineffective, and self-defeating. Before exploring the rationale behind partnering it is important to recognise the origins of the traditional adversarial relationship (Cowan, et al., 1992).

The tendency for both owner and contractor to assume an adversarial posture with each other centres on the inherent conflict between owners' costs and contractors' profits. Simply put, one person's gain is another person's loss (Cowan, et al., 1992).

Wright and Race (2004) suggest that the apparent conflict of interest predisposes buyers to be naturally suspicious of sellers. In construction this translates to owners being suspicious of contractors. The writer's own experience finds that this suspicion is sometimes reflected in oppressively monitoring the contractor's performance, challenging each and every request to make an adjustment in plans or budget, and forcing compliance by withholding funds. To some extent owners assume that a lack of trust is good and that only by being suspicious of contractors' motives can their own interests be protected. Contractors are placed in a subservient position, trying to meet the demands of the owner while maintaining a reasonable profit margin for themselves. They are prone to exploiting loopholes in the contract for their own advantage. Furthermore, the uncertainties involved in completing a project invariably lead to the need to make adjustments in the original plan. Recalcitrant responses from the owner slow the decision making process down, consuming time which cuts into the profit margin. Suspicion contributes to posturing and game playing with information on the part of the contractors. (Cowan, et al., 1992) reinforce the prevalence of suspicion (and its effects) between owners and contractors.

Suspicion and mistrust prevent effective negotiation and problem solving. When conflicts emerge they are deferred up the hierarchy. This creates costly delays as well as at times questionable responses since upper management is often too removed from the problem to make an effective decision. Such disputes typically end up in court as either side realises that the only way to protect their interests is through litigation (Cowan, et al., 1992).

The shift from traditional contracting to Supply Chain Integration In the Construction Industry

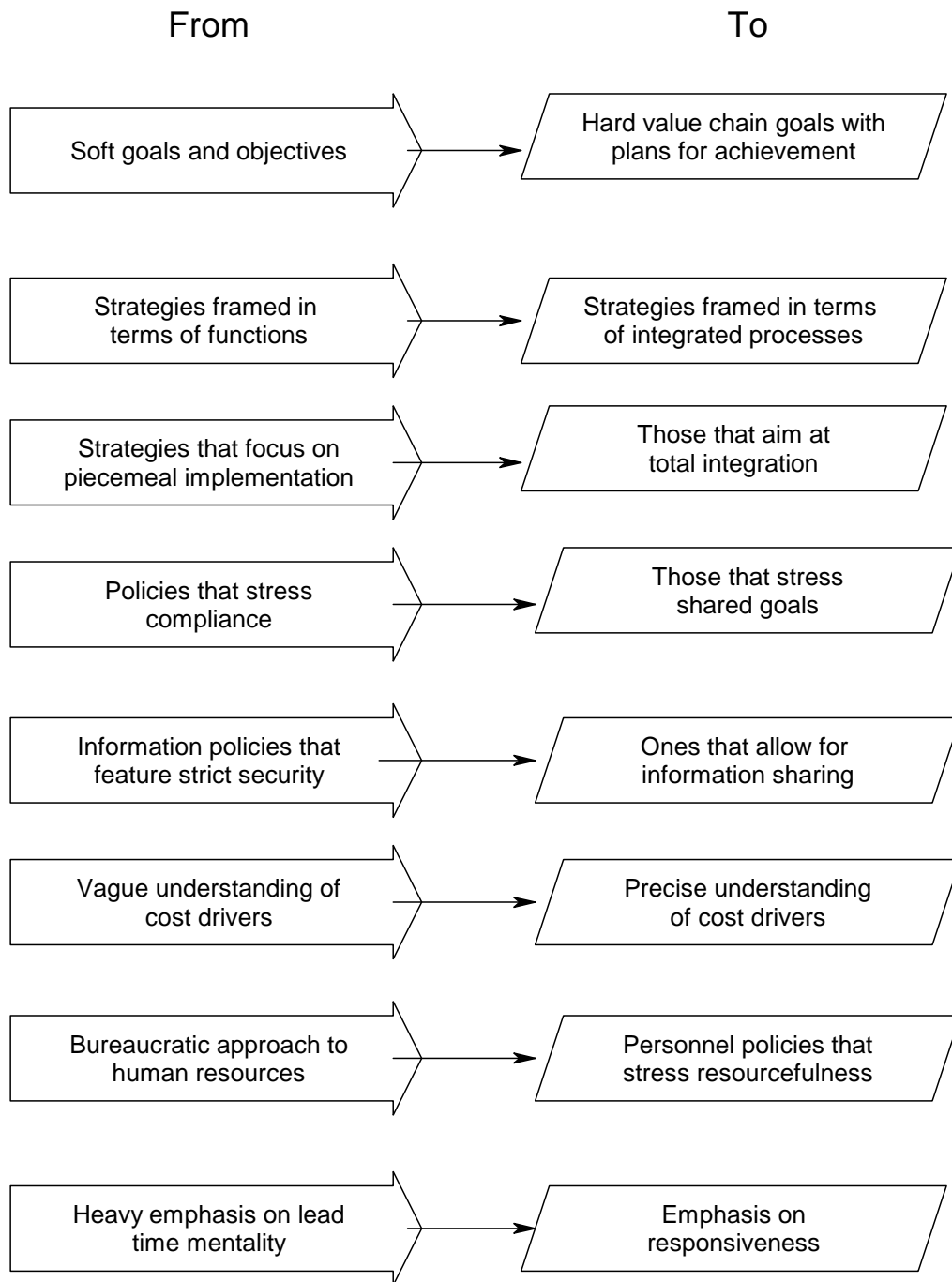


Figure 1. Paradigm Shift in construction procurement

Adapted from Morgan & Monczka, 2003

In summary, the typical contractor/owner relationship is characterised by win-lose strategies and mistrust. This mode shackles project management through adversarial confrontation in solving problems. Partners maintain an arms-length relationship with two independent project teams with conflicting objectives. Risk is transferred to the other party. Contracts are filled with “legalese” guaranteed to thwart creativity. Major effort is spent “developing the case” for the claims that follow completion of the project. Management effort is on form rather than substance. This mode has resulted in an exponential growth in litigation during the eighties (Cowan, et al., 1992). There is no evidence that the situation improved during the nineties

Partnering is based on the realisation that the traditional win-lose adversarial relationship between owner and contractor degenerates into a costly lose-lose situation for both parties. Despite the inherent conflict between owner and contractor, they share sufficient common goals to form a more collaborative relationship. For example, both contractor and owner are interested in providing a quality product within budget. Neither party wants rework. Both parties would prefer to avoid costly litigation. Both want the project completed on time and in a safe manner. The existence of common goals and the prohibitive costs of the alternative provide a basis for transforming a competitive, distributive situation into an integrative, problem solving relationship. Contractors and owner do not approach each other as adversaries, but rather as partners who share common interests and destiny (Cowan, et al., 1992).

Project partnering represents more than a change in attitude; partnering represents a process that fosters collaborative relationships between contractor and owner. Partnering attempts to replace deception with open communication, delays with timely decisions, factionalism with synergy, litigation with joint problem solving, and win-lose with win-win. Project management teams work together to reach common objectives and to resolve problems. “No litigation” is a mutual objective of all stakeholders; “building a case” is not allowed. Risk is now shared, rather than decided later in a lawsuit. Mutual trust, respect, and cooperation are constantly reinforced by senior management partners (Cowan, et al., 1992).

2.2.5 The Partnering Process

The actual partnering process can take many different shapes and forms depending upon the nature of the contract, the number of contractors involved, and prior experiences between contractors and owner. For those firms that have a history of partnering together the process can be initiated relatively quickly by adapting procedures established from previous successes. Alternatively, for those firms that are enjoying partnering for the first time, much more time and energy must be invested upfront to lay the groundwork for a successful application (Cowan, et al., 1992).

2.2.6 Definitions of Project Partnering

Definitions of project partnering focus on one, or more, of the benefits outlined below:

Albanese (1993), focuses on the team building and commitment aspects and defines partnered projects as “a project focused process that builds and develops shared goals, interdependence, trust and commitment, accountability among team members and seeks to improve team members’ problem solving skills”. (Albanese, 1993; O’Donnell, 2002).

Cowan, et al. (1992), emphasise team building and dispute resolution and define partnering as “transforming contractual relationships into a cohesive, project team with a common set of goals and an established set of procedures for resolving dispute in a timely and effective manner”. (Cowan, et al. 1992; O’Donnell, 2002).

Smith and Tonks (1995) concentrate on the reduction of conflict in their definition of project partnering as “project partnering is where the client and contractor work together in closer harmony to avoid conflict on projects and thereby increasing both their profits: (Smith & Tonks 1995; O’Donnell, 2002).

Hanson (2000) also emphasises the problem solving aspect as “In a partnered relationship if something goes wrong there is likely to be a more collaborative approach to solving the issue and potentially reducing the problem”. (Hanson 2000; O’Donnell, 2002).

The Construction Industry Institute (USA), (1991) defines partnering as “... the relationship is based upon trust, dedication to common goals and understanding of each others individual expectations and values”.

Turner (1995) focuses on the risk reduction benefits of partnering as “Partnering is characterised by the allocation or sharing of risk between the parties to their mutual benefit”. (Turner, 1995).

Despite the different focuses of the above authors, all the definitions share a common theme – that by developing trust, commitment and shared vision, the project is more likely to be successful and the impact and likelihood of risk negatively affecting the project is reduced (O’Donnell, 2002).

2.2.7 Benefits of Partnering

Partnering is based on a “win-win” assumption which believes that mutual goals exist which can be achieved through cooperation and open communications (Turner 1995). The benefits of partnering should accrue to both parties to the contract and, through the achievement of a successful project, to the other stakeholders (O’Donnell, 2002).

Parties undertake partnering for the following reasons: Clients achieve value for money, Contractors achieve income stability and both achieve a reduction in confrontation. (Smith & Tonks 1995). Smith and Tonks believe that partnering benefits should be reviewed on a long-term basis and that profit maximisation should be seen as a secondary benefit.

Reduction in confrontation is also sighted by NEDO (1991) as one of the main benefits in partnering and construction litigation is a major risk, and cost for the industry. (Turner 1995).

In a study of the US Army Corps of Engineers, using partnering (Western and Gibson 1993) the following benefits were found:

- Reduction in litigation 40.00%
- Cost Increases: reduction of 9.12%
- Programme growth: reduction of 7.19%
- Variation costs: reduction of 7.15%
- Value Engineering: benefits increased by 15 times

The above study showed a substantial increase in “Reduction and Litigation” and “Value Engineering”. Other benefits are more modest. The study does not record any cost or programme savings, but a small decrease in additional cost and programme overruns.

Other studies in partnering forms of contract do show cost and programme decreases. Pascale and Sanders (1997) report that partnered projects experience a reduced cost and schedule (programme duration), improved quality and greater payback to both parties; all within an environment that puts the fun back into work. (Pascale & Sanders 1997).

“Design – Build” contracts, a specific contract type associated with partnering, have been shown to provide a 10-30% programme duration saving when the

client partners with the design/builder (contractor). Cost savings can also result from the shorter construction period and through efficiencies achieved in integrating the design, procurement and construction process. Cost savings of up to 15% have been found in studies of various projects. (Williams, 1997). Disputes and claims are also reduced as much as 50% by “Design – Build” as the parties usually have more to gain by solving their disputes than by creating more differences. Other benefits cited are less change orders (variations), more certainty of outcome, lower administration costs for coordination and checking, higher quality and warranty, service, improved buildability and greater flexibility. (Williams 1997).

Neo (1998) believes, based upon his experience in the Singapore construction industry, that the benefits for the two main stakeholders (client and contractor) include many of the above items but also highlights; increased efficiencies arising from redirecting energies away from defensive behaviour and adversarial issues and onto the project goals, and the advantage in time and minimisation of waste, gained from open communication and unfiltered information.

The amount of construction wastage, down-time, miscommunication and rework is a well documented part of the “traditional” construction process and which partnering should be able to reduce with resulting benefits in time and cost. (Ashworth, 2000; Williams, 1997).

The benefits of partnering are less conclusive in other studies. Larson and Drexler (1997) report that it may work. They point to a small but growing body of evidence to support this view. They believe that the Weston and Gibson (1993) study on the US Army Corps of Engineers is the most rigorous research to show that partnered projects achieved superior results in controlling cost, and had better technical performance and customer satisfaction than non-partnered projects. Larson and Drexler (1997) state that more research is needed to validate the efficacy of partnering and to identify the conditions under which it should be applied.

Proponents of partnering believe it is focused on meeting the needs of the client organisation and the project. The objectives of the parties are aligned at an early stage of the project and the process of doing this builds trust and provides a reward for all the parties if the project is successful.

The advantages for the client and the contractor described by Smith and Tonks (1995) are the most comprehensive found and incorporate the aspects highlighted by other authors and will therefore be assumed to represent the full range of “benefits” possible by using partnering and are summarised as:

2.2.7.1 Benefits to the client

- More likely to meet their particular needs and expectations
- Less confrontation, disputes and litigations
- Increased product quality

- In-house cost reduction (less time/money on tender analysis and checking costs)
- Risk reduction (lower learning curves, multi disciplined risk management)
- Improved buildability in design
- Better quality of documentation
- Cost certainty (earlier and better estimates of cost, reduction in variations)
- Lower contract cost
- Programme gains (reduction in duration and programme overruns)
- Single point responsibility

2.2.7.2 Benefits for the contractor

- Less confrontation, disputes and litigation
- Workload stability (resource planning and cashflow forecasting, and maintaining of skilled personnel)
- Reduced expenditure on tendering process, speed of establishing the contractual relationships with subcontractors
- Enables a focus on future – improving systems and capabilities, staff career development, safety procedures
- Risk reduction (better understanding of the project scope, increased time for pricing, negotiated risk management plan, development of relationships with good subcontractors, and reduction of conflict with subcontractors)

2.2.8 Limitations

Great improvements in performance have been observed in manufacturing, particularly in the automobile industry in the past couple of decades. These improvements have not been a product of radical or sharp change of technology but the result of the application of a philosophy which leads to “lean production” (Alarcon, 1997). This production philosophy is a generalisation of such partial approaches as JIT, TQM, time-based competition, and concurrent engineering. Undoubtedly, more attention is now being paid in the construction industry to the lessons that can be learnt from manufacturing for improving its production processes (Matthews et. al., 2000).

Lean production gained popularity as a result of the landmark study by Womack et al. (1990) which investigated the Japanese automobile industry and ascribed its success in achieving a technological and competitive edge to the concept of lean production systems. The approach resulted in “greatly decreased cost and time with improved quality and customer service across the industry”, (Matthews et.al., 2000). However, it was not until the early 1990s that the concept of lean construction was coined as a derivative of what Koskela (1994) described as the “new production philosophy” also commonly known as lean production (Matthews et. al., 2000).

In the construction industry, the overall diffusion of the philosophy is still rather limited and its applications incomplete. Quality assurance and TQM have been adopted by a growing number of organisations in construction, first in construction material and component manufacturing and later in design and

construction, but this has often been driven by commercial imperative rather than as a business philosophy. (Matthews et. al. 2000; Koskela 1993) commented that the diffusion of the lean production philosophy has been so slow in construction because of the following barriers to the implementation of these ideas:-

- cases and concepts commonly presented to teach about and diffuse the new approach have often been specific to certain types of manufacturing and this is not easy to internalise and generalise from the point of view of construction;
- relative lack of international competition in construction; and
- lagging response by academic institutions.

Koskela (1992) identified that the first task for academics “is to explain the new philosophy in the context of construction”. He explains the overwhelming dominance of conversion thinking in construction and argues for replacing the conversion model with a flow/conversion model in order to reduce waste resulting from non-value adding activities.

O’Brien (1996) argued that the construction industry needed to shift its focus to the underlying philosophy of lean production by recognising construction as a flow process in which construction should be seen as a hierarchical collection of value generating flows and achieve the goals of lean construction, hence the move to the term value chain, rather than simply supply chain, as it emphasises a holistic view based around the value concept. Ballard & Howell (1998) have proposed that lean revolution is essentially a

conceptual revolution, at the heart of which are the flow and value models (Matthews et. al. 2000).

The characteristics which the construction industry possesses are “one-of-a-kind nature of projects, site production and temporary multiorganisation” (Koskela, 1992). Because of this the construction industry is often seen as being different from manufacturing. Indeed, these characteristics may prevent the attainment of flows as efficient as those in manufacturing. However, the general principles of flow design and improvement apply for construction flows and in spite of these characteristics, construction flows can be improved to reduce waste and increase value in construction (Matthews et. al. 2000).

As it is not possible to change the circumstances of the construction industry to fit a theory that is useful in a more stable environment such as manufacturing, other approaches are necessary. Initiatives undertaken in several countries have been trying to alleviate related problems associated with construction’s peculiarities. The one-of-a-kind feature of the construction industry can be reduced through standardisation, modular coordination and widened role of contractors and suppliers. (Matthews et. al. 2000). Difficulties of site production are alleviated through increased prefabrication, temporal decoupling and through specialised or multi-functional teams. Finally, the number of liaisons between organisations is reduced through encouragement of longer-term strategic alliances and partnering.

Whilst partnering has been seen as a “programmatically band-aid” on the current construction management system, there is a need to develop the concept of partnering and start revising the current mindset and practice of partnering (Howell et al., 1996). The ambiguous definitions of partnering illustrate, among other things, the extent to which the current practice is deficient. It is easy to identify at least half a dozen different perspectives on partnering, of which the application of lean production is one. The widespread use of partnering is evidence that the current rules provide an inadequate basis to manage complex, uncertain and quick projects and that it is time to re-conceive the construction process. (Matthews et. al. 2000).

2.3 LITERATURE REVIEW CONCLUSIONS

The construction industry has numerous problems because of its complicated nature of operation. This industry is comprised of a multitude of occupations, professions and organisations (Milakovich, 1995; Sommerville, 1994). They are involved in the different phases of a construction project, which, according to Schultzel and Unruh (1996), include: feasibility, development, finance concept development and review, estimate, detailed engineering, procurement, construction and start-up. The client, consultants, contractor and sub-contractors of a construction project all have a role to play in delivering a quality project. Failure of any of the parties will seriously affect the quality of the final project. Moreover, the parties have different objectives which keep them apart.

Rowlinson and Walker (1995) point out that the construction industry is also characterised by its non-standardisation. Production processes are to some extent different from each other. Hence, no universal standard or specification can be applied to the product, which leads to difficulties in quality assurance. Moreover, excessive changes to the details of the design of a project are typical throughout the construction process. They may be the result of the lack of buildability of the design produced or variations by the contractors for the sake of speed and cost of production. Quality is often at risk because of the excessive changes. As a result of the changes, delays in completion of the construction project and claims by different parties to the project often occur.

2.3.1 Project Partnering

Project partnering is an approach used to enable the different parties involved in a project to work co-operatively. Project partnering is a synergy; a co-operative, collaborative management effort among contracting and related parties to complete a project in the most efficient, cost-effective method possible, by setting common goals, keeping lines of communication open and solving problems together as they arise.

The driving force behind the adoption of project partnering stems from the recognition that win-lose conflict is expensive, and that no one gains from it. This kind of lose-lose situation and the arm's length relationships among the parties in the supply chain are very pervasive in the construction industry worldwide. It calls for cultural changes among the different parties, from adversarial to co-operative relationships.

The project partnering process often involves bringing the different stakeholders of a project together in meetings or workshops, with a view to making clear the intention to partner, have each party committed to working together as partners and arrive at a partnering agreement. If issues arise, stakeholders are encouraged to solve the issues within the group where they first surface. However, for issues that cannot be solved by the group, the stakeholders are encouraged to bring them quickly to the attention of the next level of management.

To be effective, partnering clearly involves and requires exceptionally high levels of trust and sharing. Unfortunately, by nature neither individuals nor organisations are very trusting or sharing (Scheltzel & Unruh, 1996).

The concept of SCM helps to give meaning to project partnering. It sees the different parties as a supply chain. Christopher (1992) defines a supply chain as the network of organisations that are involved, through upstream and downstream linkages, in the different processes and activities that produce value in the form of products and services in the hands of the ultimate consumer. Supply chain management is a new way of managing supply chains. It adopts a systems and integrative approach to managing the operations and relationships among the different parties in a supply chain. It has aims of building trust and co-operation, improving co-ordination, exchanging market information, developing new products and streamlining material flow among all parties in the supply chain. The supply chain in the construction industry may be; owner-consultants-main contractor-subcontractors-suppliers. Each actor in the supply chain has its role to play. Communication with different parties and team operation among different parties are essential to provide best performance. The owner perceives a need to invest in a building project. The owner employs consultants like architects and engineers to design the project. The main contractor is then selected to construct the project according to the design. The main contractor will employ many domestic subcontractors, plus other subcontractors named or nominated by the client to carry out the construction work. Suppliers will also be involved to supply the required builders materials. Himes (1995) suggests that

there is an inherent conflict between many of the parties' goals. The contractor, architect, engineer, etc. have profit as their goal, and the owner has the goal of minimum costs. Faster is better to many service providers, but that can often result in sloppy workmanship. Again, the owner's goal is not met.

Under SCM, partnering relationships among the different parties are encouraged so as to better co-ordinate their goals and build trust among them, such that the whole supply chain can work as a single unit.

Project partnering is about fostering a close working relationship among different parties in the construction project. It is expected that a synergistic effect can be obtained by working closely together. It is a philosophy of teamwork and co-operation. SCM supports project partnering in the sense that it sees the different parties as a supply chain which needs integration to ensure best performance. In the supply chain, different parties perform the different functions of a production process. In the supply chain, there is also a series of customer and supplier relations. The output of one party is the input of the next party.

Although not universally agreed, it is generally believed that substantial benefits from all partners will accrue if partners are genuine in their approach.

Figure 2. below depicts a structural model of a proposed construction supply chain and identifies the major organisational constructs and strategies that are required for successful supply chain partnering. Chapter 4 lists, discusses and compares the findings from the case study and literature review and how these findings inform this theoretical model.

Structural Model of proposed Construction Supply Chain

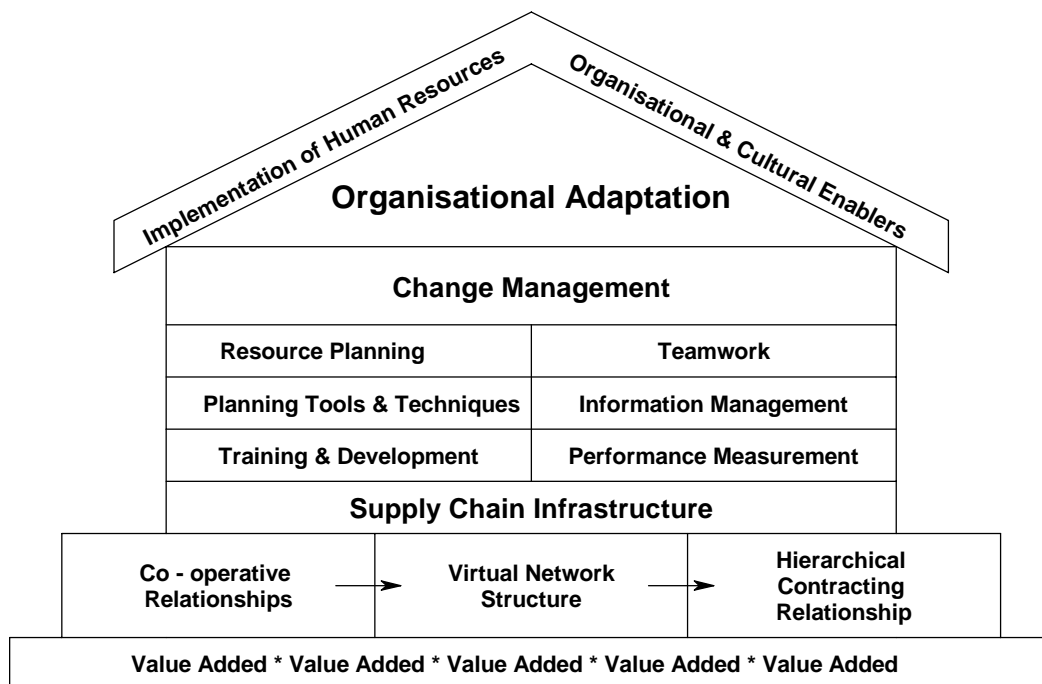


Figure 2. Construction Supply Chain Model
Adapted from Dervitsiotis (1998)

3.0 RESEARCH METHODOLOGY AND DESIGN

3.1 Introduction

This chapter outlines the research paradigm, methodology and design used in the collection of empirical data for this study. A case study incorporating action research was selected as the methodology and the rationale for this choice is included in this chapter. Also included is the research design that was applied and details of the various modes of data collection and reference.

3.2 Research paradigm

The design of a study begins with the selection of a topic and a paradigm. Paradigms in the human and social sciences help us understand phenomena. They advance assumptions about the social world, how science should be conducted, and what constitutes legitimate problems, solutions and criteria of proof (Firestone, 1987; Kuhn, 1970). As such paradigms encompass both theories and methods. Although they evolve, differ by discipline fields, and often are contested, two are discussed widely in research literature: the qualitative and the quantitative paradigms (Hussey & Hussey, 1997)

A qualitative study is designed to be consistent with the assumptions of a qualitative paradigm, the study is an inquiry process of understanding a social or human problem, based on building a complex, holistic picture, formed with words, reporting detailed views of participants, and conducted in a natural setting. (Hussey & Hussey, 1997)

Alternatively a quantitative study is an inquiry into a social or human problem, based on testing a theory composed of variables, measured with numbers, and analysed with statistical procedures, in order to determine whether the predictive generalisations of the theory hold true. (Hussey & Hussey, 1997).

3.3 Assumptions of the Paradigms

The quantitative paradigm is termed the traditional, the positivist, the experimental, or the empiricist paradigm. The quantitative thinking comes from an empiricist tradition established by such authorities as Comete, Mill, Durkheim, Newton and Locke (Smith, 1983).

The qualitative paradigm is termed the constructivist approach or naturalistic (Lincoln & Guba, 1985), the interpretative approach (Smith, 1983), or the postpositivist or postmodern perspective (Hussey & Hussey, 1997). It began as a counter movement to the positivist tradition in the late 19th century through such writers as Dilthey, Weber, and Kant (Hussey & Hussey, 1997).

Table 1. displays assumptions of quantitative and qualitative paradigms based on several approaches, which provide direction for designing all phases of the research study. Given the subjective nature of the research question, my relationship and role to that being researched and the inductive process of the study, the framework for this research fits squarely within the qualitative paradigm.

Table 1. Quantitative and Qualitative Paradigm Assumptions

<i>Assumption</i>	<i>Question</i>	<i>Quantitative</i>	<i>Qualitative</i>
Ontological Assumption	What is the nature of reality?	Reality is objective and singular, apart from the researcher	Reality is subjective and multiple as seen by participants in a study
Epistemological Assumption	What is the relationship of the researcher to that researched?	Researcher is independent from that being researched	Researcher interacts with that being researched
Axiological Assumption	What is the role of values?	Value-free and unbiased	Value-laden and biased
Rhetorical Assumption	What is the language of research?	Formal Based on set definitions Impersonal voice Use of accepted quantitative words	Informal Evolving decisions Personal voice Accepted qualitative words
Methodological Assumption	What is the process of research?	Deductive process Cause and effect Static design-categories isolated before study Context free Generalisations leading to prediction, explanation, and understanding Accurate and reliable through validity and reliability	Inductive process Mutual simultaneous shaping of factors Emerging design - categories identified during research process Context-bound Patterns, theories developed for understanding Accurate and reliable through verification

SOURCE: Based on Firestone(1987); Guba & Lincoln(1998); and McCracken (1998)

3.4 Research Methods

Having determined the research to fit within a qualitative paradigm, the next step in the research process was to establish the most appropriate qualitative research strategy; Experiment, Survey, Archival analysis, History or Case Study.

Each has a different way of collecting and analysing empirical evidence, following its own logic. And each strategy has its own advantages and disadvantages.

According to Yin (2003), the first and most important condition for differentiating among the various research strategies is to identify the type of research question being asked. In deciding on which strategy is most appropriate, Yin suggests three conditions need to be considered;

1. The type of research question posed.
2. The extent of control an investigator has over actual behavioural events.
3. The degree of focus on contemporary as opposed to historical events.

Generally, case studies are the preferred strategy when “how” or “why” questions are being posed, when the investigator has little control over events, and when the focus is on a contemporary phenomenon within some real-life context (Yin, 2003).

Hussey and Hussey (1997) define a case study as an extensive examination of a single instance of a phenomenon of interest and as an example of a phenomenological methodology. The importance of the context is essential and Eisenhardt (1989) refers to the case study as a research study that focuses on understanding the dynamics present within a single setting.

Stake (1994) defines a case study as the process of learning about the case and the product of our learning. Similarly, Jarvis suggests that case studies are both about the process of learning about and researching the specific phenomenon under investigation and about the product of that learning and research. (Jarvis, 1999)

The case study inquiry

- copes with the technically distinctive situation in which there will be many more variables of interest than data points, and as one result
- relies on multiple sources of evidence, with data needing to converge in a triangulating fashion, and as another result
- benefits from the prior development of theoretical propositions to guide data collection and analysis. (Yin, 2003)

According to Yin, as a research strategy, the case study is used in many situations to contribute to our knowledge of individual, group, organisational, social, political, and related phenomena. The case study has been a common research strategy in psychology, sociology, political science, social work business, and community planning (Yin, 2003).

In other words, you would use the case study method because you deliberately wanted to cover contextual conditions – believing that they might be highly pertinent to your phenomenon of study and because phenomenon and context are not always distinguishable in real-life situations (Yin, 2003). Given my role as Practitioner – researcher, the exploratory nature of the study and the research question, an exploratory case study was selected as the most appropriate research method.

3.5 Criticisms of the case study method

Although the case study is a distinctive form of empirical inquiry, many research investigators nevertheless disdain the strategy. In other words, as a research endeavour, case studies have been viewed as a less desirable form of inquiry than either experiments or surveys (Yin, 2003).

Perhaps the greatest concern has been over the lack of rigor of each case study research. Too many times, the case study investigator has been sloppy, has not followed systematic procedures, or has allowed equivocal evidence or biased views to influence the direction of the findings and conclusions. Such lack of rigour is less likely to be present when using the other strategies – possibly because of the existence of numerous methodological texts providing investigators with specific procedures to be followed. In contrast, few if any texts cover the case study method in similar fashion (Yin, 2003).

A second common concern about case studies is that they provide little basis for scientific generalisations. “How can you generalise from a single case?” is a frequently heard question. The answer is not simple (Kennedy, 1976).

However, consider for the moment that the same question had been asked about an experiment (Yin, 2003).

In defence of case study research Eisenhardt (1989), Glaser and Strauss (1967) and Yin (1994) argue that these problems are not restricted to just the case study approach. But there are a number of tactics that can be employed by the researcher in order to avoid the potential problems that have been identified. Careful design and case selection and the control of reliability and validity allow research to be undertaken with sufficient rigor.

3.6 Research Design

Research design is concerned with explaining issues related to the case selection, unit of analysis, data collection, validity and reliability and data analysis.

In response to the conclusions drawn in Section 2.3, This Section outlines the relevant research design, purpose, unit of analysis, and the criteria for interpreting the findings. Sections 3.3, 3.4 and 3.5 outlines each of the three methodologies that were utilised (action research – incorporating participant observation and document analysis and literature review). This includes their relevance, strength and significance in answering part or all of the research question and objectives. The chapter concludes with a discussion on the case study data base, chain of evidence, the validity and reliability of this study and data analysis.

Research Question

As discussed in chapter 1. the research question is:-

How can supply chain management strategies improve construction partnering performance?

The objectives of the thesis are to:-

- 1 Identify partnering linkages throughout the supply chain for the benefit of all parties to the project.
- 2 Establish what aspects of partnering within the supply chain might generate benefits.
- 3 Develop skills as a practitioner – researcher by researching and reflecting on my practice.

3.7 Case Description

The purpose of this study was to extend the boundaries of the proposed project partnering alliance, which consisted of the client, consultants and contractor, to other members of the project supply chain, specifically, key subcontractors and material suppliers, to establish whether their inclusion was effective, added value to the project and to ascertain whether this business model could be adopted for future projects.

In order to address the research question and meet the objectives, the study needed to specifically identify:

- How was value added to the project by including the key subcontractors and merchants as partners

- Were the benefits realised by the key stakeholders

The criterion for success in this study is:

- The inclusion of the extended supply chain member's added value to the project by, proactive behaviour, motivation, time, cost, quality and customer satisfaction, so that the project benefited as a whole

The ability to measure the level of success was derived primarily from participant observation and document analysis.

The boundaries in this study were primarily specific phases and outcomes of the project, being; the pre-construction phase of the project, in terms of the organizational structure, the value engineering phase and the benefits provided by the supply chain members, and the subsequent outcomes at project completion.

3.8 Theory development

The case will show why the inclusion of key subcontractors and material suppliers into a partnering-based project supply chain, can add significant benefits to all partners.

3.9 Unit of Analysis

The unit of analysis for this study is the project, as described later in section 4. This is a single case design, providing a holistic study of management intervention, processes and outcomes.

3.10 Role of the Researcher

Particularly in qualitative research the role of the researcher as the primary data collection instrument necessitates the identification of personal values, assumptions and biases at the outset of a study. The investigators contribution to the research setting can be useful and positive rather than detrimental (Lincoln & Guba, 1985). In this study I am fortunate to assume the role of practitioner – researcher, in undertaking action research, as the case relates to a construction project, in which my role was project manager. My perceptions of supply chain partnering within the construction industry have been shaped by my personal experiences. Prior to this study, I have had the benefit of 18 years construction management experience, and have been involved in numerous partnered projects both in New Zealand and internationally and without exception they have all been a positive experience and had positive outcomes. As a result I bring certain biases to this study. Although every effort will be made to ensure objectivity, these biases may influence the way I interpret my experiences.

3.11 Data Collection

Triangulation is a research technique wherein multiple methods are used to analyse the same theoretical question . This means that case studies allow researchers to understand the nature and complexity of processes by using multiple sources of data (Yin 1981). Yin (2003) identified six primary methodologies for case study research; documentation, archival records, interviews, direct and participant observation and physical artefacts. All are not essential in every case study, but the importance of multiple sources of

data to the reliability of such studies has been well-established (Stake 1994; Yin 1994). This study employed the following key methodologies – Action research, which included participant observation, document analysis and literature review on construction partnering and supply chain management. It is important to note that the findings (presented in Chapter Four) are by no means generalisable, and will purely be used to refine the model for further future study.

3.12 Action Research

Action Research (AR) is a form of collective, self-reflective enquiry undertaken by participants in social situations in order to improve the rationality, coherence, satisfactoriness or justice of their own social or educational practices, as well as the understanding of these practices and the situations in which these practices are carried out (Kemmis and McTaggart, 1988).

It is in the building of theory about, in, or from practice that the understanding of the situation by the group is enhanced. (Melrose, 1999)

AR is based on educational theories about action learning (Revans, 1991; Zuber-Skerritt, 1992; Mc Taggart, 1997a), praxis (Schwab, 1969; Webb, 1991; Zuber-Skerritt, 1992), experiential learning (Kolb, 1984; Zuber-Skerritt, 1992), personal construct theory (Kelly, 1970; Zuber-Skerritt, 1992), critical education (Carr and Kremmis, 1986, Zuber-Skerritt, 1992, Webb, 1996) action science (Argyris et al., 1995; McTaggart, 1997a), reflection (Schon, 1987)

reflexivity (Hall, 1996, Winter, 1996), and soft systems methodology (Checkland, 1995). (Melrose, 1999)

While these theories differ from one another the web of theory that supports AR includes ideas about being critical, evaluative, systematic, strategic, participatory, collegial, collaborative, self-reflective about practice, empowering, emancipatory, and having theory inform practice and practice inform theory. (Melrose, 1999)

Carr and Kremmis (1983) distinguished between three kinds of AR, technical, practical and emancipatory, differentiated by the research focus and purpose and the role of the researcher. Technical AR aims to improve practitioner effectiveness and skills and the researcher co-opts, facilitates and manages the group. Practical AR aims to build group understanding and professional development and the researcher asks critical questions to probe for understanding. Emancipatory AR is similar to practical AR but aims at a critical response to organized constraints, with the researcher acting as moderator to provide the conditions for emancipation (Zuber-Skerritt, 1992).

Action research is emancipatory when it aims not only at technical and practical improvement, the participants' transformed consciousness, and change within their organisation's existing boundaries and conditions, but when it also aims at changing the system itself or those conditions which impede desired improvement in the organization. (Zuber-Skerritt, 1992).

According to Zuber-Skerritt (1992), emancipatory AR is an appropriate methodology for organization development, managers 'own the problem' and feel responsible and accountable for solving it through teamwork and through following a cyclical process of (1) strategic planning, (2) implementing the plan (action), (3) observation, evaluation and self-evaluation, (4) critical and self-critical reflection on the results of (1) – (3), and making decisions for the next cycle of action research – that is, a revised plan, followed by action, observation and reflection, and so on. (Zuber-Skerritt, 1992)

In each cycle there is an emphasis on action and then on critical reflection on the process and outcomes. Planning is not a completely separate step but rather is embedded in action and reflection . Critical reflection involves two stages, a meta-review of what has happened in the previous cycle and planning what to do in the next cycle. (Melrose, 1999)

3.13 Participant Observation

Participant observation is a method for collecting data associated with either a qualitative or quantitative methodology (Boote & Mathews 1999; Hussey & Hussey 1997). Due to the exploratory nature of the research, observation was of a qualitative nature. The aim of observation is to gather first-hand information about processes in a naturally occurring context (Silverman 2000).

3.13.1 Relevance and Strength

According to Boote and Mathews (1999) observation is an appropriate methodology for conducting research when the phenomenon under investigation is easily observable, and follows a pattern of activity. It is seen as an effective, economical methodology to uncover patterns of behaviour in certain situations (Boote & Mathews 1999; Simpson & Tuson 1995). This approach was clearly beneficial to this research on project partnering, allowing the researcher to gain an insight and understanding into the behaviour (Silverman 2000) and actions of key stakeholders and observes the actual processes that they engage in with respect to partnering. It allowed for events to be observed in context and in real time (Boote & Mathews 1999).

The information gained from observation was primarily the behavioural aspects of the key supply chain members, in terms of their proactive approach to problem solving. These observations have been recorded in a daily site diary, an excerpt of which is attached as appendix D.

3.14 Document Analysis

Qualitative researchers use written material to produce reliable insights into the behaviours, characteristics and practices of a particular sample (Silverman 2000). This method is referred to as document analysis.

3.14.1 Relevance and Strength

Compared with other methodologies, document analysis has several advantages and distinct characteristics (Silverman 2000) that were important to this research study. Firstly and most importantly, document analysis is an unobtrusive technique – an important element when engaging in work experience. Secondly is its reliability (Bryman 1988). Formal and informal documents, through language and symbolism, can often be an excellent indicator of organisational culture, attitudes and organisation styles (Jauch, Osborn & Martin 1980). Thirdly, document analysis accepts unstructured material (Yin 1994) including e-mails, faxes and notes. These kinds of documents can often provide reliable data that spans time, therefore uncovering consistent organisational behaviour.

The documents analysed to support the findings in this research were;

Project CPM Programme, see appendix A, for its relevance identifying time savings. Subcontractors, weekly co ordination meeting minutes, see appendix B, which provides an insight to organisational and cultural enablers, teamwork and relationships. Project managers monthly report, see appendix C, which on top of providing time and cost positions and forecasts, also provides a narrative on key issues, client relationship, subcontractor performance and relationship as well as comments on a variety of general business issues. Daily site diary, see appendix D, provides an audit trail of supply chain members planning, action, critical issues, health and safety and weather conditions.

3.14 Literature review

The functions of the traditional literature search, according to Merriam and Simpson (1995) are to provide a foundation for building knowledge; show how a study advances, refines, or revises what is already known; help conceptualise the study; provide clues to methodology; and offer a collective point of reference for interpreting the researchers own findings. (Jarvis, 1999)

Section 2 of this study provides a thorough review of supply chain management, construction partnering and synthesis the similar strategy concepts. The findings of the research will be compared and discussed in relation to the literature search, to provide reliability.

3.16 Case Study database

A case study database is a formal assembly of evidence and should be distinct from the final case study report. The aim of the database is to increase the reliability of the study. In this study the database included the project proposal and brief, Main contractors method statement, Project control group meeting minutes, contractor/subcontractor co ordination meeting minutes, detailed monthly project reports, a daily site diary was kept, and an exhaustive review and collation of prior literature relating to project partnering and supply chain management was undertaken. Table 2. provides a database schedule showing how the themes from the literature correspond to the research objectives and findings.

Table 2. Database Matrix					
Data/Information	Thesis Section/Page	Data Type	Author	Reference to Findings Section	What Objective Did This Information Contribute to
<u>Literature review themes</u>					
SCM benefits	2.1.1 / p.17	Book	Chopra et al., 1997	Comparison of benefits & relevance to model	Objective 2.
SCM Components	2.1.2 / p.18-20	Journal	Lambert et al., 2000	Relevance to model & Action research	Objective 3.
Managerial components	2.1.3 / p.21	Mcom Thesis	Campbell, 2002	Focal company need to drive initiatives	Objective 2.
Top Management support	2.1.4 / p.22	Book	Wright & Race, 2004	Organisational enablers - refer to model	Objective 2.
Cultural compatibility & trust	2.1.5 / p.23	Journal	Lambert et al., 2000	Informs model & subcontractor selection	Objective 1&2.
Cross functional collaboration	2.1.6 / p.24-25	Journal	Chandra & Kumar, 2001a	Communication flows/ co-ordination meetings	Objective 2.
Relationship assessment	2.1.7 / p.27-28	Book	Stock & Lambert, 2001	Selecting key members of the supply chain	Objective 1.
Measuring benefits of relationships	2.1.8 / p.28-30	Journal	Cokins, 2000a	ABC costing and financial benefits	Objective 2.
Supply chain business processes	2.1.9 / p.31	Journal	Lambert et al., 2000	Informs model	Objective 3.
The supply chain structure	2.1.10 / p.32	Journal	Lambert et al., 2000	Selecting the optimal partners	Objective 1.
Obstacles to supply chain integration	2.1.11 / p.33-34	Book	Chopra et al., 2001	Subcontractors limitations	Objective 3.

Data/Information	Thesis Section/Page	Data Type	Author	Reference to Findings Section	What Objective Did This Information Contribute to
<u>Literature review themes</u>					
Partnering Assumptions	2.2.4 / p. 37-42	Journal	Cowan,Grey, Larsen,1992	Reasons to extend partnering within supply chain	Objective 1.
Definitions & processes of partnering	2.2.5/6/ p.42-44	Dissertation	O'Donnell, 2002	Informs model in regard to Teamwork	Objective 1.
Benefits of partnering	2.2.7/8/9 / p.44-48	Book	Smith & Tonks, 1995	Collaboration	Objective 2.
		Book	Turner,1995	Communication	Objective 2.
		Journal	Larson & Drexler, 1997	The need for identifying the right conditions	Objective 2.
		Journal	Pascale & Saunders, 1997	Programme time savings	Objective 2.
		Journal	Williams, 1997	Improved buildability/ certainty of outcome	Objective 2.
		Journal	Matthews et al.,2000	Flow and value models	Objective 2.
		Journal	Weston & Gibson,1993	Value engineering	Objective 2.
Limitations to partnering	2.2.10 / p.48-52	Journal	Matthews et al., 2000	Barriers to successful partnering	Objective 3.
			O'Brien, 1996	The need for the industry to shift focus	Objective 3.
			Koskela, 1994	Barriers to implementation	Objective 3.
<u>Action Research / Document Analysis</u>					
Project CPM Programme	Appendix A	Programme	Ward, 2001/ 2	Evidence of time savings accomplished through SCM and performance measurement	Objective 2
			Practitioner-researcher		
Subcontractors Co ordination	Appendix B	Minutes	Ward, 2001/ 2	Evidence of collaboration, trust based relationships, resource planning, communication and info.	Objective 1.
Meeting Minutes			Practitioner-researcher	Management	
Project Managers Monthly Report	Appendix C	Report	Ward, 2001/ 2	Identifies key issues throughout the month, primarily performance, health & safety, financial & relationships	Objective 2 & 3.
			Practitioner-researcher		
Daily Diary / Journal	Appendix D	Diary	Ward, 2001/ 2	provides an audit trail of progress and issues encountered	Objective 2 & 3.
			Practitioner-researcher	on a daily basis, and how supply chain partners managed various unforeseen issues	

3.17 Chain of Evidence

A chain of evidence should show the explicit links between the question asked, the data collected and the conclusions drawn. Yin (1994) says that sufficient citation to the case study database should provide enough evidence for the reader to trace the steps of the researchers' analysis.

3.18 Validity and Reliability

Guba and Lincoln (1981) suggest that case studies do have a number of disadvantages in regards to reliability, including over-simplification, exaggerations of the fact, and interpretations of selective facts; they are unscientific, opportunistic, and unrepresentative. (Jarvis, 1999).

The objective is to be sure that if a later investigator followed the same procedures as described by an earlier investigator and conducted the same case study all over again, the later investigator should arrive at the same findings and conclusions. The goal of reliability is to minimise the errors and biases in a study (Yin, 2003). Yin suggests that the problem lies in the notion of generalising to other case studies instead the researcher should try to generalise findings to theory.

Yin further suggests a way of approaching a reliability problem is to make as many steps as operational as possible and to conduct research as if someone was always looking over your shoulder.

Reliability was achieved in this study through clearly recorded progress reports and Project Control Group meeting minutes. Thus, the results of the study can be replicated with the established data base.

Construct validity is to ensure that the correct operational measures for the phenomena being studied are established, Yin (2003). Through the use of multiple sources of evidence and in supplying a chain of evidence, construct validity ensured that I had developed a correct set of operational measures. Through action research, document analysis and archival records I was able to compare the ideas discovered in the different sets of data. Where there was similarity between the data I had greater confidence that the concepts I found were true and I was able to provide evidence to show this.

As internal validity is concerned with establishing causal relationships in explanatory or causal studies it was not a relevant concern in this study as the aim of this study was primarily exploratory.

External validity is to ensure the domain to which a study's findings can be generalised, Yin (2003). External validity was also a low priority in this study. As an exploratory study the aim of the research was to identify whether the inclusion of the additional supply chain members would add value to the project. Given this, it was not expected that the results would be generalisable but rather the study would inform a contemporary under-researched aspect of construction work arrangements.

3.19 Data Analysis

As there were no propositions made prior to data collection, the main method of data analysis was based on case description. The case description provided a framework from which organised analysis occurred. In describing the case the aim was to create a rich description of the case and to provide an overall pattern of complexity that could then be explained. The preliminary framework concentrated around themes expressed in the research objectives.

As discussed in section 3.7, the criterion for success in this study is that the inclusion of the extended supply chain member's added value to the project by, proactive behaviour, motivation, time, cost, quality and customer satisfaction, so that the project benefited as a whole

The ability to measure the level of success was derived primarily from participant observation and document analysis, the findings of which are then compared and contrasted against prior literature in order to establish a convergence of themes through a triangulation of methods.

3.20 Summary

By grounding the research within a qualitative paradigm and combining action research and case study as a research methodology, the study proposes that following a design of participant observation and document analysis, the benefits of extending a partnering arrangement to include additional key members of a construction project supply chain can be identified. It is contended that the findings from the research design will provide rich insights to organisational and cultural enablers of the supply chain members, as well as identifying the imperatives of time, cost, quality and customer satisfaction, within the boundaries of the pre-construction and value engineering phases of the project.

Figure 3. Shows a flow chart of the research structure and the links between the research question and objectives, and how the specific focus of the study is linked to the research methods in order to identify the findings.

Figure 3. Research Structure

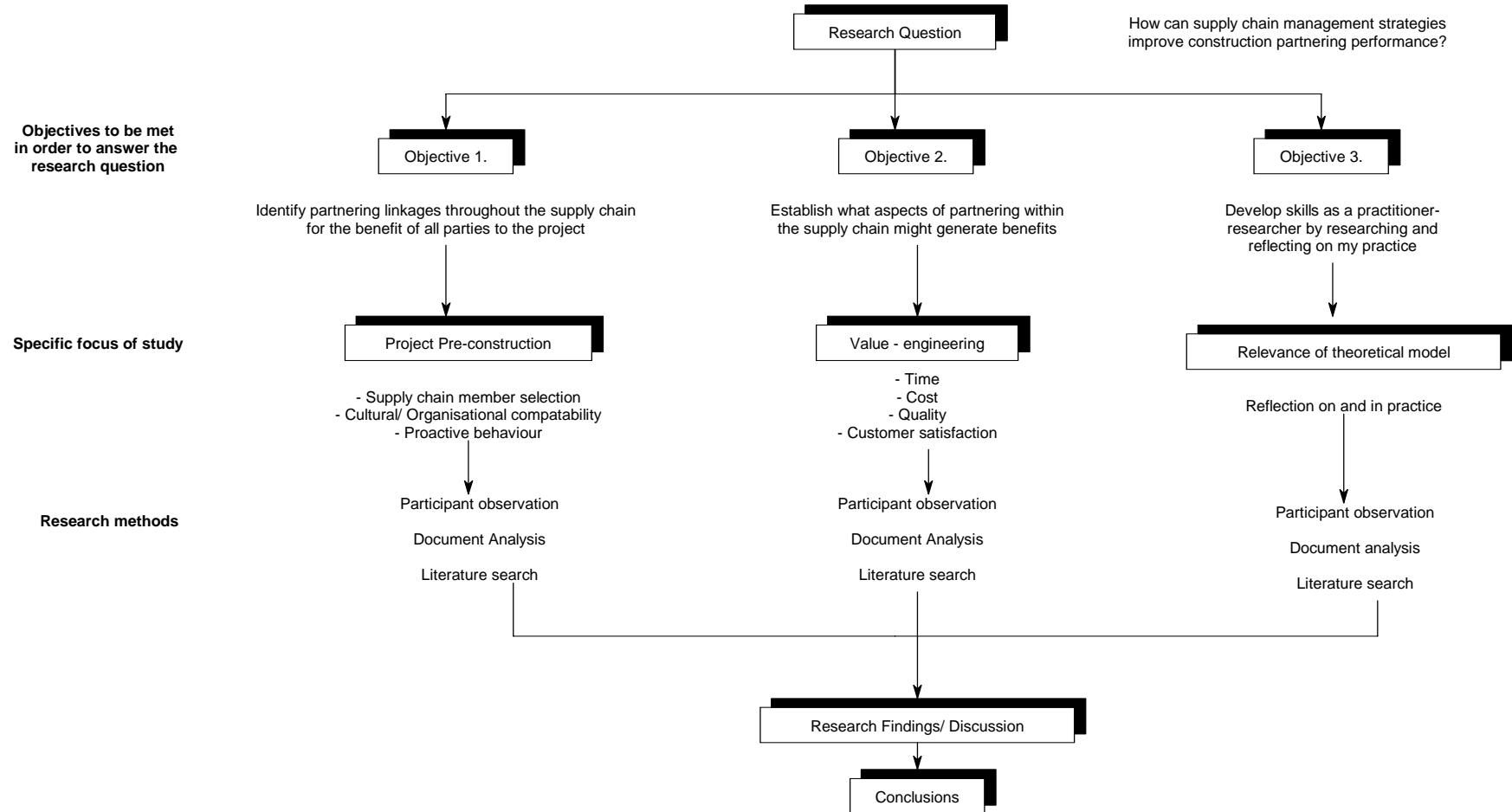


Figure 3. Research Structure

4.0 FINDINGS

4.1 Background to the project

The project involved the construction of a multi-use, large format, retail centre called The Hub. The development consisted of three major parts being the frontier precinct, lifestyle block and auto-mall. The frontier precinct included the following stand-alone buildings; KFC, Blockbuster Video, Wendys and Sea Mart. The life-style block consisted of sixteen tenancies which included a bank and major furniture and home goods outlets. The auto-mall consisted of a vehicle testing station, a motor-parts and accessory outlet, a tyre outlet and service and lube centre. The project adopted alliance partnering concepts that drew on the collective skills of all partners for maximum cost-efficiency, innovative design and construction solutions and sensitivity to potential areas of dispute or conflict.

The overall project was developed over a land area of 6.5 hectares and had a development cost value in excess of \$25 million dollars.

The magnitude of the site can be appreciated by viewing an aerial photograph attached as appendix E.

The project began in January 2001 while the writer was studying for the MBus at AUT. Full diary notes were kept by the writer for the duration of the project, in the form of a daily site diary (refer appendix D for example). Other documentary evidence is held on company files.

4.2 The Proposed Partnership/Supply Chain Members

The Principal	Hub Investments Limited
Project Management	Willis Bond & Co
Architectural Services	Ignite
Civil/Structural/Electrical	Stephen Mitchell
Quantity Surveyor	Project Economics
Legal Advisors	Chapman Tripp
Civil Engineers	Bruce Wallace & Partners
Mechanical Consultants	Thurston Consulting
Planners	Bentley & Co
Construction Contractor	Haydn & Rollett Limited

Additional Supply chain members included into the partnering arrangement;

Key Subcontractors

- McKenzie & Parma**
- Auckland Steel**
- Allied Concrete**

Builders Merchants

- Carters Building Supplies**

These additional supply chain members were introduced by the focal company (Haydn and Rollett) of the supply chain. Their inclusion and the perceived benefits of their inclusion, is the focus of this study.

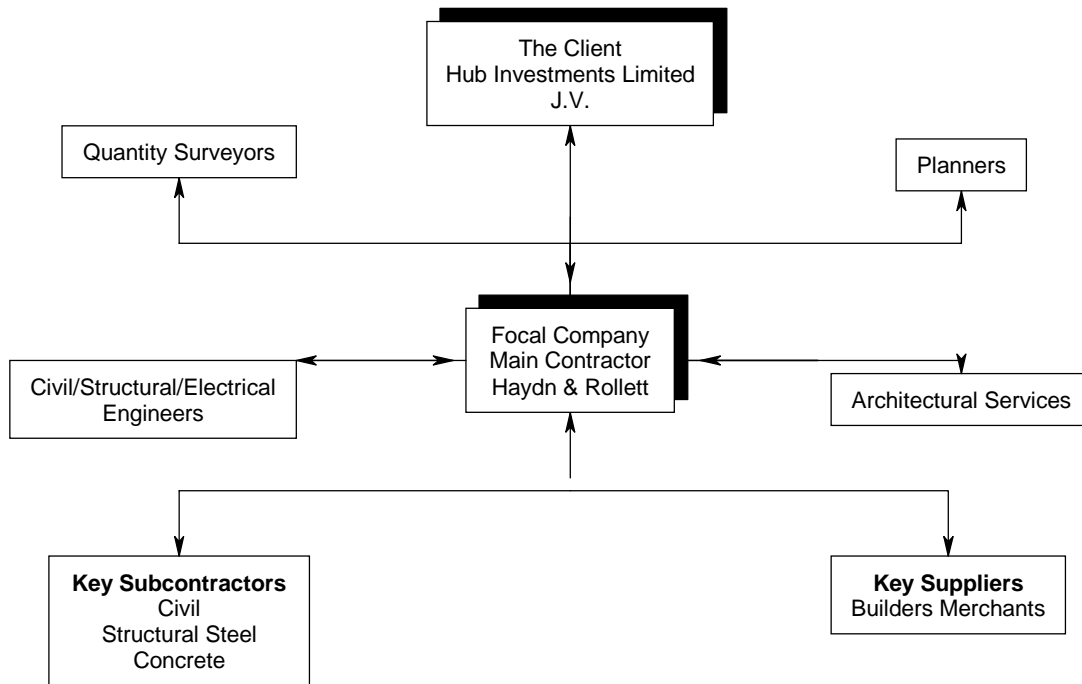


Figure 4. The Hub Project Supply Chain Alliance

4.3 The Structure of the Contract

The intent of the project was to utilise the main contractor as the focal company within the supply chain. Lambert and Cooper (2000) state that focal companies are often responsible for the shape of the supply chain as they are the decision-point, deciding what organisations will be included in SCM initiatives. This meant the main contractor co-ordinated the entire planning and design phase of the project in conjunction with the client's nominated consultant team. By nature, this was not a design/build project as ultimate design liability was maintained by the architect and engineer. The main contractor was appointed at the concept phase of the development for the

purposes of providing buildability and alternative design options in order to bring the overall development in-line with the client's initial feasibility.

The form of contract was a guaranteed maximum price (GMP) with fixed preliminary and general costs and a fixed margin based on the GMP budget. A GMP contract assumes that any cost over-run is borne by the contractor. The client therefore enters into a construction contract knowing what the worst-case financial outcome will be. The risks to the contractor are normally ameliorated through an opportunity to enhance the original construction margin.

4.4 Past Issues

In the past, partnering relationships have normally been restricted to the client and the main contractor. Other supply chain members (subcontractors, suppliers, consultants) have approached the project in a traditional manner, which has done nothing for a collaborative team approach to the project. The shortfalls of a single link approach (Client-main contractor) are highlighted in the literature review. In section 2.2.2 Bresnen et al. (2000) describes how if one party is suspicious of the motives and actions of the other, successful project completion may be jeopardised.

Previous partnered projects have often espoused shared goals but have frequently resulted in a lip-service delivery. Some types of projects have not leant themselves to a partnered arrangement. This would be typical of

contracting with large public companies and Government Departments, where corporate governance dictates that the project needs to be competitively bid on the open market. In order to do this the design documentation needs to be fit for construction purposes; this means the design process is at its conclusion which eliminates the opportunity for innovative design and building methodology. By excluding the main contractor from the design phase, the client foregoes the benefits that are generated by value engineering and pre-construction planning. Subsequent project outcomes from inadequate partnering arrangements have been less than satisfactory for the client the main contractor and for all members of the supply chain. Financial reward has often been a primary focus at the expense of quality and client satisfaction. Matthews et al., (2000)

4.5 A New Approach

The new approach, as used for the Hub project, included:-

- A thirty percent share of any savings made to the original feasibility budgets through value engineering was offered as an incentive to the focal company
- The client empowered the focal company to effectively and efficiently alter the design and introduce alternative construction methods and products which resulted in added value to the project. This was part of the project brief, and the selection of the focal company was made partly on the basis of a proven track record of value engineering achievement

- The inclusion of key subcontractors and material suppliers into the project alliance, which provided an additional level of expertise and value engineering opportunities, was initiated by the focal company.

4.6 Research findings

The findings of the research are detailed below in relation to their relevance in addressing the research objectives and informing the theoretical model, to the extent of their influence on pre construction and value engineering outcomes.

Objective 1. Identify partnering linkages throughout the supply chain for the benefit of all parties to the project.

Partner linkages from the focal company to the selected subcontractors and material supplier for this project were identified during the preconstruction phase and made on the following basis;

- Core construction elements representing significant work scope, value and risk.
- A history of working relationships. (Trust)
- Cultural / Organisational compatibility

Scope, value and risk

The selection and inclusion of the key subcontractors and suppliers in the supply chain was made by the focal company on the perception that they were key players in the project collectively representing 70% of the value, and also the risk, on the project (refer appendix C). Wright and Race (2004) state that it

is important to identify those trading partners within the supply chain that are key to integrate with. This is because the investment in establishing connectivity with parties that occupy a small portion of an organisations transactional volume may neither be strategically important nor financially justifiable.

In section 2.1.6 of the literature review Chandra et al. (2001a) expound the idea that supply chains should be Pareto-optimal (the 80/20 rule) or satisfying rather than optimising. As discussed in chapter 2, the idea expressed by this concept is that it is seldom possible that a decision made to optimise one organisation within the supply chain will optimise others in the supply chain simultaneously. Wright (1999) explains the same phenomenon has often been found in business, where for example 80% of the sales come from 20% of the customers.

The key subcontractors were selected because of past performances, existing levels of trust, cultural compatibility and a proven track record in safety and value engineering ability.

The criteria of sub-contract award were on the basis that:-

- Budgets established for each definable section of work by the client's cost consultant were acceptable to the subcontractor
- The subcontractors accepted that, based on preliminary design details, they could deliver their scope of work within the defined budgets

- That each definable section of work was subject to rigorous review with an emphasis on smarter design which would add value by way of time and cost savings
- That target programme dates for project milestones were achievable

During the negotiation phase with the key subcontractors a high level of commitment and buy-in to the partnering concept was observed by the focal company. However it is worth noting that discussions were held only with the senior managers of the respective companies and not the site management team who had day to day responsibility for the progress of the project.

Trust and working relationships

Prior to this project, the selected supply chain partners had worked with the focal company on numerous projects over several years and have each built up a positive working relationship. A trust based relationship is seen as important in the development of an integrated supply chain, Kumar (1996).

As discussed in the literature review, section 2.1.5, Chopra et al. (2001) see two different ways by which trust can be invoked in a relationship. One is the deterrence-based view where trust and cooperation are enforced through the use of formal contracts that discourage negative behaviour. The process-based view speaks to the scenario where trust and cooperation are built up over time as a result of positive interactions between parties. The deterrence view is often predominant in the early stages of relationships and as trust develops the process-based view becomes more important.

This study saw a combination of the process- based and deterrence view, as whilst there was an established working relationship in place, each subcontract and supplier was contractually committed to the terms and conditions of the head contract.

Organisational and Cultural compatibility

Good initial cultural linkages are seen by many authors as prerequisites for the development of closer relationships between trading partners. Lambert et al., (2000) state that the meshing of cultures of trading partners can be time consuming and the differences in the management methods of organisations in the supply chain can hinder integration efforts. Whilst the supply chain partners shared a common desire with the focal company to approach the project in a collaborative manner, and there was an existing level of trust between the parties, during the course of the project it quickly became apparent there was a significant gap in management processes between the subcontractors and the focal company. Most notably was the inability of the subcontractors to participate in the electronic document management system. However, this was largely overcome by regular co-ordination meetings. (refer appendix B) Chandra and Kumar (2001a) make reference to the need for good communication to enable effective collaboration. Regular communication is important because it helps with the development of shared goals and conflict resolution.

Objective 2. Establish what aspects of partnering within the supply chain might generate benefits.

Benefits were measured in the following ways;

- Financially, through activity based costing (Cost) (note: due to the commercial sensitivity surrounding the financial information obtained from this study, all reference to financial gain is expressed as a percentage gain against original budgets) refer appendix C
- The timely completion of the sectional portions of the project which saw numerous tenants commence trading prior to the targeted Christmas deadline (Time) refer appendix A
- The level of defective work identified at project completion by the architect (Quality) refer appendix B & D
- Customer satisfaction feedback

Findings through value-engineering

- Time – approximately 3500 man hours saved. (refer appendix A & D)
- Cost – approximately 12% savings to the client and approximately 50% margin enhancement to the focal organisation and supply chain partners. (refer appendix C)

- Quality – The majority of defective work was related to the roof due to services penetrations. Given the size of the project and the authors past experience, it is contended that there was a less than average defects list for the project, which is a good indicator to the level of quality.

The findings of this study are generally in line with the findings from prior research. In section 2.2.7 of the literature review, benefits are identified in relation to the client and the contractor as described by Smith and Tonks (1995)

**Objective 3. Develop skills as a practitioner – researcher
by researching and reflecting on my practice.**

The findings for objective 3 are linked to the process and outcomes of the Action Research for this study, and are further discussed in the reflective report, being part of chapter six.

Findings:

- Developed personal theory that was tested in practice.

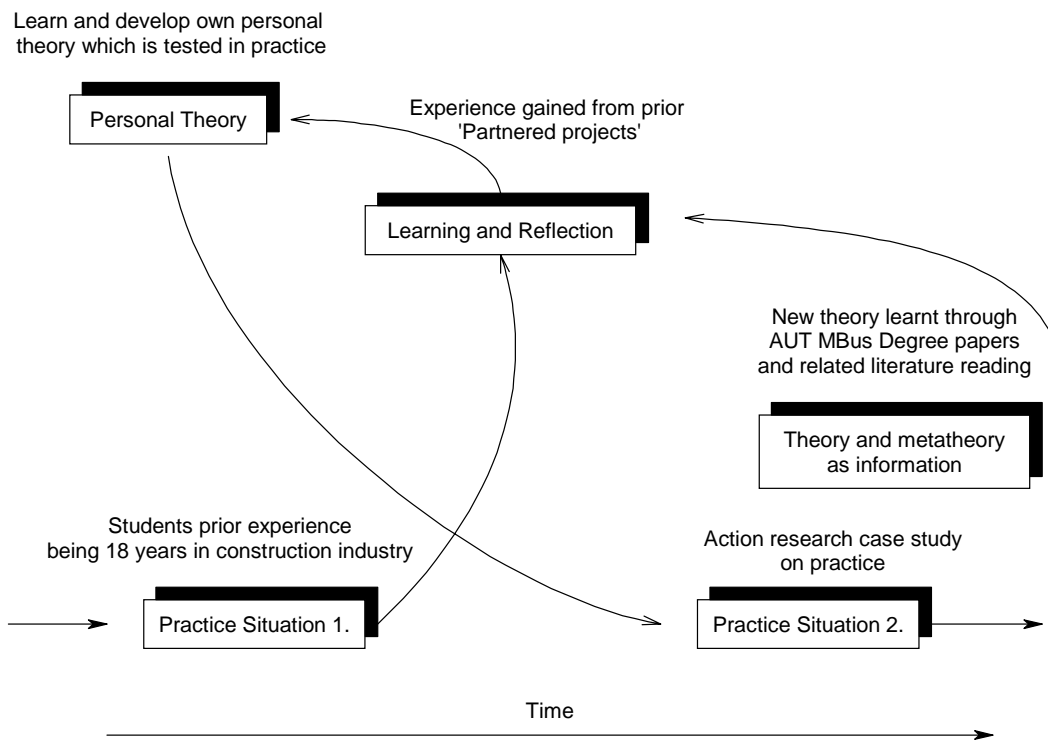
Practitioner-researcher's attempt to research practice and practical knowledge and report on the aspects they have researched. (Jarvis,1999).

Practitioner's practical knowledge is dynamic, because according to Jarvis, (1999) they continue to learn in their work situation.

Figure 4. shows the learning and development stages.

1. Practice situation 1. Represents my prior experience being 18 years in the construction industry.
2. I then reflect on my practice.
3. I then incorporate into my reflection new theory learnt through industry related literature and MBus degree papers.
4. Learn and develop my own theory which is then tested in practice – being this research paper. The loop is then repeated continuously in practice.

According to Jarvis, (1999) it is the ability to impose ideals about imperfect situations and endeavour to change them that result in practitioners' improving their practice and moving upward along the path to expertise. It is reflective learning (Jarvis, 1992), or double-loop learning Argyris and Schon, (1992) – basically the same concept, that leads to improved performance and new knowledge about practice.



The Practitioner-Researcher's Research
 'Double - Loop' learning (Argyris & Schon, 1992)
 Cited by Jarvis (1999)

Figure 5. Relationship Between Practice and Personal Theory

4.7 Discussion on findings

4.7.1 Project pre-construction

At the project inception the development had no pre-committed tenants. The planned roll-out of the development was constrained by limited available funding. The challenge presented to the focal company was to maintain construction progress within the parameters of the available funding limits. Optimisation of site coverage (maximum leaseable floor space) was identified as part of the resource management planning, which meant the overall building footprints were known but the internal layout, and number of individual tenancies, were always subject to market demand. Given the necessity of all parties to the project to maintain a large degree of flexibility, it was paramount to the success of the development that the selected supply chain members were willing to embrace the proposed partnering concept.

4.7.2 Value engineering

In the true sense of the phrase, value engineering provides an opportunity for experts within their respective fields to offer alternative design methodologies, construction techniques or products that maintain or enhance the aesthetic, structural and functional integrity of the original design at a reduced cost to the client.

It is during this stage of the project that potential gains are to be made. During the Hub project, value engineering was an iterative process due to the nature, size and phasing of the development.

The significant gains made by the key subcontract partners were as follows:-

Civil Works Subcontractor – McKenzie and Parma

By providing a full-time in-house field surveyor and engineer, all infrastructure design work was managed on-site. This enabled earthworks changes to be managed and implemented without the necessity for the typical prolonged delays common in traditional contracting, whereby any and all changes need to be referred to the client's Project Engineer, which can often take the course of a week to get a response. This benefit was further enhanced by having the ability to liaise directly with local authorities and utility agencies in providing as-built drawings for record purposes. This service provided the client with reduced costs associated to professional engineer design fees and consequently added value to all members of the supply chain by reducing programme durations. By enabling the subcontractor to be in a

position to provide these services, it was observed that the subcontractor took ownership of the civil design process and showed a high level of commitment to the success of the project.

Structural Steel Subcontractor – Auckland Steel 2000

The preliminary design of the major retail blocks had specified timber framed external walls. This was primarily chosen because the architect required numerous steps in the building facade. It was recognised that this method required a significantly large labour input. After agreement with the design team the challenge was put to the structural steel sub-contractor (Auckland Steel 2000) to provide a prefabricated steel-framed external wall option. A re-design process was undertaken by the subcontractor over a two week period and an acceptable solution was found which resulted in approximately two thousand man-hours saved within the carpentry budget and approximately seven weeks savings made on programme duration.

Concrete Subcontractor – Allied Concrete

Typically on most construction projects in New Zealand concrete is supplied by one company and placed by a separate entity. In the past this has created a situation where if anything goes wrong with the concrete finish, one party blames the other with the resultant cost and time delays in rectification work being borne by the main contractor. Further, this situation is compounded when cracking appears sometime after occupation of the facility. By teamwork an alternative procurement method was adopted whereby the concrete supplier

became a single source subcontractor responsible for the supply and placing of all concrete work and providing a ten year guarantee on all floor slabs. This arrangement aided the project not only in client satisfaction but also alleviated resource constraints as the main contractor normally places the concrete and again the subcontractor took ownership of the total process.

Builders Merchants – Carters Building Supplies

An informal partner arrangement was established with Carters whereby all builders' materials were purchased exclusively through the Carter Holt Harvey network. Significant discounts were offered on the proviso that Carters were able to display road-frontage signage. This partnering arrangement provided the secondary benefit to the entire supply-chain of having exceptional service and prompt delivery of all materials on a just-in-time basis which reduced the requirement to store materials on-site and further provided the benefit of a more accessible site and reduced the risk of stolen materials.

4.8 Motivations

Motivations of the focal company were to provide an end facility that was recognised as being a quality development that they could be proud of, to ensure client satisfaction with the aim of repeat business, to enhance the budgeted financial return to the company and to reduce unnecessary risk during the course of construction.

Motivations by the client were to employ a reputable main contractor, to ensure the development was managed to the planned feasibility without

compromising quality, to eliminate financial risk through the uncertainty of unforeseen changes during the course of construction and to provide the finished product to the prospective tenants in a timely manner.

Motivations of the key subcontractors were the benefits of negotiating the project in the first instance – thereby eliminating competition, being party to a large-scale project which carried the perceived benefits of on-going work, the opportunity for margin enhancement and intrinsic value associated to being part of a team of contractors sharing the same goals.

4.9 Monitored Progress and Behaviors

During the course of this study the behaviours of the additional supply chain members were monitored in two ways; firstly through my role as a participant observer whereby I had a management role on a daily basis and maintained a daily site diary, in which I recorded daily actions and key issues. Secondly, through document analysis, in the form of a series of formal meeting minutes. The meetings took the form of; project control group (PCG) meetings, which were attended by the client's representative, the design consultants, the client's quantity surveyor and the site management team of the focal company. Secondly, Subcontractor Co-ordination meetings, which consisted of the focal company representatives and the site managers of the respective subcontractors. Thirdly, from the focal company's formal monthly project report.*

* Copies of all meeting minutes are held on company files and retrievable on request

4.10 Unforeseen issues

During the course of construction numerous issues impacted significantly on the overall success of the project, several of which could have been avoided. With the benefit of hindsight and the knowledge gained through the research process for this study, the author believes a number of these issues could have been avoided through more in-depth planning. The following list identifies several key issues:-

- The project would have benefited as a whole if the partnering relationship could have been extended to include local building authorities and utility agencies. This inclusion could simply have been attendance by the building/planning officers at the PCG meetings. Because of the phased nature of the project each individual tenancy required individual building consents. This process on average took up to eight weeks to procure for each tenancy which in several cases was longer than the construction duration. Significant time savings would have been achieved by establishing a trust based relationship whereby construction could have commenced and inspections by council authorities could have taken place as and when required with the necessary paperwork processing following on behind.
- The late decision by the client to split the multiple tenancies into unit titles created the necessity for significant fire rating to inter-tenancy walls. This work comprised an additional layer of gib-board linings on both sides of the tenancy walls as well as relocation of water pipes and electrical cabling. This process took approximately twelve weeks with an added cost in excess of \$1.5 million. Given the size of the

development the project leaned itself to unit titling from the outset. This provided the opportunity for numerous investors to purchase individual units as opposed to putting the entire development on the market as one complex and excluding small to medium sized investors.

- Buy-in to the partnering concept was embraced by the key subcontractors at a senior management level, however this collaborative approach did not always transfer to the site based personnel. There were occasions when various subcontractor foremen demanded variation orders before they were willing to undertake what they believed to be work outside of their contracted scope. These issues were overcome following discussions with their superiors. Unfortunately this created unnecessary delays and halted the flow of progress.
- Lack of subcontractors' administrative tools and processes caused numerous delays with document management and the inability to correspond electronically. Administrative processes were established by the focal company however several subcontractors either did not have the knowledge or tools to work within the focal company's system.

4.11 Relevance to the theoretical model

In relating the literature and action research to the construction supply chain model shown as figure 2 (page 58) in the literature review summary, it is apparent that the models key constructs accurately portray the main elements necessary in adopting SCM in construction partnering. It is acknowledged that the model is a simplistic representation of business processes and strategies and that this study did not address all of the models constructs, due to the limitations of the study.

The fundamental principle of any business process improvement is that the desired change will add value. This is represented as the foundation of the SCM model.

The SCM infrastructure incorporates co-operative relationships, a network structure and a hierarchical contracting relationship.

This action research study confirms the importance of co-operative relationships as being paramount to “getting everything else right”, as mentioned earlier part of the selection process for inviting the key subcontractors to adopt a partnering role in the project was a history of good working relationships with the focal company. Kalakota and Robinson (1999) describe SCM as involving the co-ordination of material, information and financial flows between and among all participating organisations.

Change management is seen to incorporate the integration of key business processes of the supply chain members such as resource planning, information management, training and development, performance measurement, planning techniques and teamwork.

Whilst the findings of this study do not address these business strategies in detail, there is evidence within the document analysis that supports to varying levels, the necessity to integrate these processes to achieve effective change. (Refer appendix A, B &C) Lambert et al., (2000) state that business processes that are used throughout an integrated supply chain are often derived from those of the focal company as it overcomes disparities amongst supply chain members by enforcing commonality. As discussed previously, due to the lack of administration tools and techniques of the key subcontractors, the focal company often struggled to achieve total integration of information management, the processes used were those established by the focal company.

At the apex of the model it is perceived that organisational adaptation (being supply chain integration) is realised through successful change management and the implementation of human resources and organisational and cultural enablers.

4.12 Summary

Project outcomes in relation to extending the partnering relationship to the key subcontractors and suppliers within the project supply chain are discussed in respect to answering the research question:-

How can supply chain management strategies improve construction partnering performance?

The case description in Chapter 3 states that in order to address the research question and meet the objectives the study needed to specifically identify how value was added to the project by the inclusion of the key subcontractors and suppliers as partners and were benefits realised by key stakeholders.

This study was bounded with a focus only on pre-construction and value engineering in terms of structure, process and benefits to the project.

The findings are summarised as follows:

- The project lent itself to a partnered arrangement due to its size and complexity and the clients need to maintain a large degree of flexibility in design, due to the unknown levels of tenant demand.
- The client was willing to trust the focal company to manage the risk and provided incentives to the focal company to achieve buy-in to the partnering arrangement.

- The client enabled the focal company to maximise value engineering options by allowing the introduction of key subcontractors and supplier into the partnering arrangement.
- It can be concluded that SCM initiatives adopted for construction partnering were extremely beneficial for this project, in terms of adding value to the supply chain members.

4.13 Limitations

Any study inevitably has limitations and implications, the magnitude of which depends upon the phenomena under study and the deliberate and unconscious choices made by the researcher. Choosing to do or include something, implies choosing not to do, or include something else. The boundaries to this study were discussed in chapter 3. The objectives in this section is to highlight the limitations and implications of this study in relation to theoretical (literature) and methodological (research design and case study) constructs.

4.12.1 Theoretical limitations

There is a striking limitation on supply chain management literature, relative to the construction industry. There are a multitude of studies undertaken on construction partnering between the main contractor and the client, with frequent mention that further research should be undertaken on the benefits of including subcontractors in the partnering arrangement. The field is lacking a conceptually strong and empirically comprehensive framework of the entire construction supply chain and the benefits of integration. As a result of these

limitations, assumptions have been made throughout this study which may warrant further future empirical study.

4.12.2 Methodological Limitations

As a novice practitioner – researcher studying and reflecting on my practice and events, it is inevitable that certain assumptions will be made about the nature of these events. These assumptions are what is called a theoretical perspective and this perspective delimits what is observed and perceived by the researcher. For example, in regards to participant observation, Boote and Matthews (1999) argued that the biggest limitation is the potential bias of the researcher as an active participant, the research is subject to interpretation, or bias and therefore may not be a true representation. In regards to document analysis Yin (1994) infers that there is an element of subjectivity involved in this approach which is a potential limitation. For example, the same document can mean wholly different things to different readers, and subsequently, researcher bias can affect the reporting and analysis of documents. Therefore, with respect to the action research data collection and findings, it is important to note that the researcher's values and biases, in addition to the information actually gathered, should be considered at all stages of the research process.

5.0 CONCLUSIONS

This study explored the benefits of extending project partnering beyond client and main contractor to include additional key members of a construction project supply chain in order to ascertain whether their inclusion added value to the project as a whole.

This led to the development and implementation of an alternative partnering approach. Although this approach is not the 'purest' of ways to undertake partnering, it has, for those people involved, had numerous benefits.

Chapter 2 provided a comprehensive review and analysis of the relevant literature pertaining to this topic, a proposed model was set forth to provide an integrative and simplistic framework for exploring SCM in construction and comparing the findings of this action research study to the literature and the model constructs, as discussed in chapter 4.

Whilst this study only focused on pre-construction and value engineering aspects of the project, it can be concluded with some confidence that an integrative collaborative approach to construction procurement can add value to the stakeholders, when organisational and cultural compatibility exists. It has been widely acknowledged throughout this paper that further empirical research and conceptualisations are needed in the area of construction supply chain management. Consequently it is the researchers hope that the findings and limitations discussed in chapter four will encourage others to conduct further studies of supply chain partnering within the construction industry in order to advance the knowledge of this process.

6.0 REFLECTIVE REPORT

For the purposes of this reflective report I have adopted the framework of Moon (1999) to provide critical reflection on the research project and the benefits of the MBus degree to my own personal and professional development.

6.1 Reflection on the Research Project

6.1.1 What was I trying to achieve?

Throughout my career I have been involved with numerous projects and have oftentimes recognised the importance of key subcontractors and their role in the overall success of the project. The Hub project provided an opportunity for me to engage these key subcontractors and suppliers and observe first-hand the real benefits they provided to the project.

6.1.2 What were the consequences of my actions for me and the people I work with?

That the inclusion of these additional supply chain members may have had a significantly negative effect on the overall project, which in turn would have put additional pressure on the people I work with, the people I reported to, and could possibly have damaged the client relationship. However, results were most positive and relationships were enhanced rather than damaged.

6.2 Influencing Factors

6.2.1 What internal/external factors influenced my decision making?

Internally the influencing factors were my experiences with previously partnered projects and my view on the nature and scope of this particular project. The external influencing factors were the client's expectations on cost savings, programme duration and overall quality of the project. These expectations determined the necessity for a proactive team approach to any unforeseen issues that may have arisen through the course of the project.

6.2.2 What sources of knowledge did/should have influenced my decision making?

Through prior experience I recognised that the majority of unforeseen risk in any project is typically ground conditions, I therefore recognised the need to include the civil works contractor into the partnered arrangement. Similarly, value engineering opportunities are mostly related to structural changes which determined the inclusion of the structural steel and concrete subcontractors.

6.3 Learning

6.3.1 How do I feel about this experience now?

As a practitioner-researcher, undertaking an exploratory study in the field to which I am employed provided an exceptional opportunity for learning and deeper understanding of the nature of project partnering. This experience has highlighted the necessity for further research within the construction industry as this study has identified an apparent gap in contemporary business strategies.

6.4 Reflection on Benefits of the Mbus Degree to my own Personal and Professional Development

6.4.1 How does an MBus Benefit a Person's Career

- a. Provides an insight to a wide array of business strategies, applying concepts in management to practice.
- b. Provides the tools for reflection in practice – think about decisions and actions in practice.
- c. Provides grounding in research principles within various research paradigms.
- d. Provides analytical tools to establish best practice principles for business performance.

6.4.2 What Value will it add to my Career

- a. Construction business managers predominantly come from either a trade or technical background with little or no knowledge of alternate business strategies and performance management frameworks. Reflection on action provides a greater perspective to numerous management challenges and provides fundamental frameworks, techniques and processes to address daily business issues.
- b. It has provided the tools to consider decisions from differing view points and critical analysis.
- c. Helps me understand my business paradigm – how I view business, how I believe it works.
- d. It provides a high level of confidence in business and self actualisation on a personal level.

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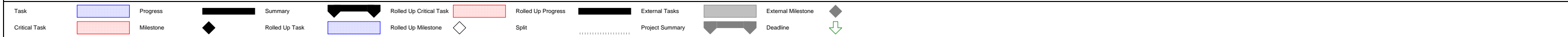
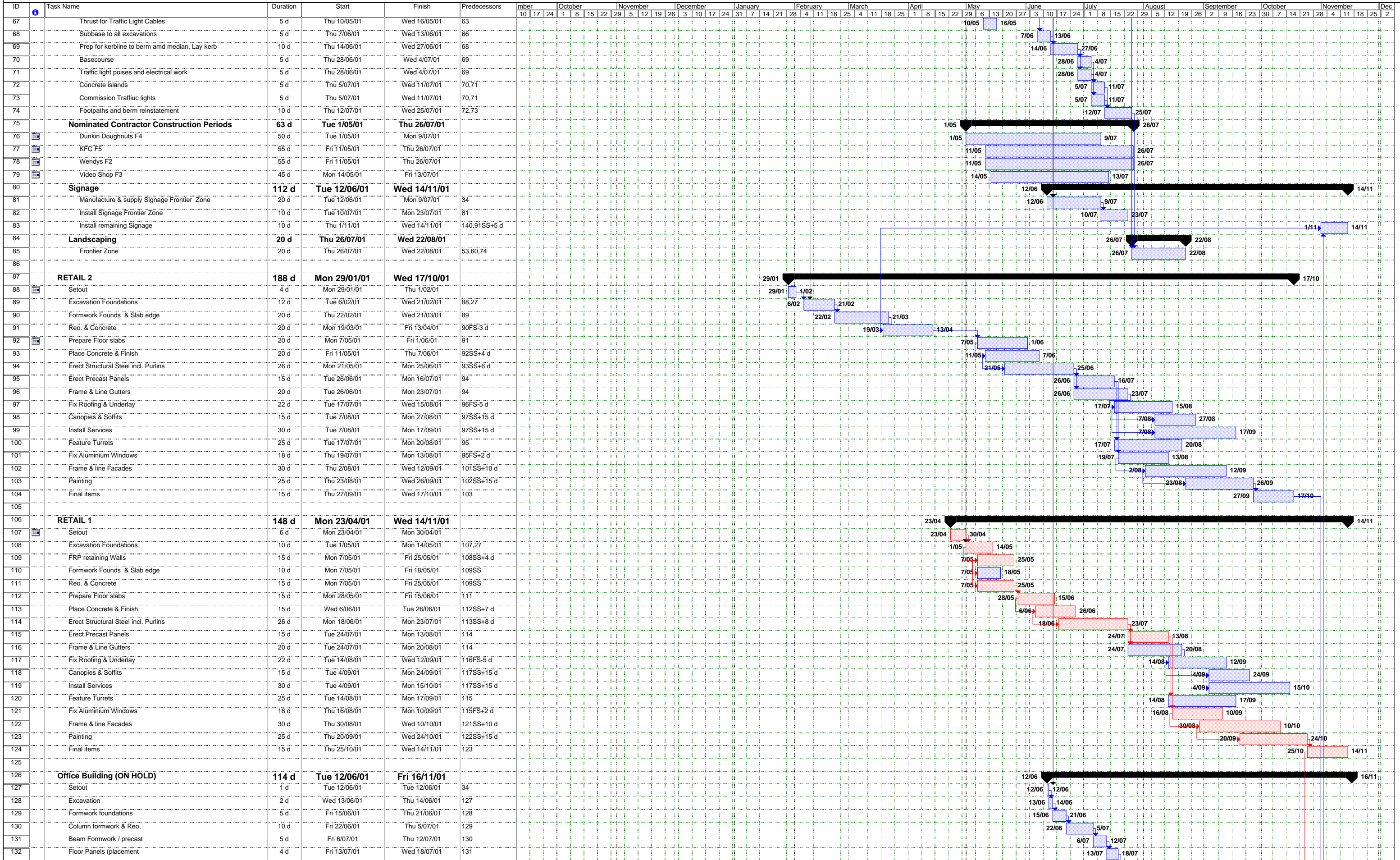
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APPENDIX A

Haydn & Rollett Construction



APPENDIX B

THE HUB
BOTANY DOWNS
Project Control Group Meeting No 10
Held Tuesday 12 December 2000
Ignite Limited Offices

Present:

			<u>Fax Nos.</u>
Elaine Wong	(EW)	Ignite Limited	522 2190
Ian Kohler	(IK)	Ignite Limited	522 2190
Jeremy Craig	(JC)	Ignite Limited	522 2190
Michael Pleciak	(MP)	Hub Investments Ltd.	303 9657
Pat Ward	(PW)	Haydn & Rollett	444 2713
Paul Masters	(PM)	Haydn & Rollett	444 2713
Craig Knox	(DH)	Project Economics	309 5201

Apologies:

Sam Bufton	(SB)	Haydn & Rollett	444 2713
Stephen Mitchell	(SM)	Stephen Mitchell	489 3956
Daryl Harvey	(DH)	Project Economics	309 5201
Nick Topp	(NT)	ECS/ENZ	579 6790

Copy minutes to:

Angie Crafer		Traffic Design Group	373 3539
Ian Todd		Hydraulic Services	520 7739
Phillip Young		Bruce Wallace Partners	520 6726
Rob Steel		Haydn & Rollett	
Mike Reilly		Haydn & Rollett	

The Design Team

1	Architect	Ignite Limited	Ian Kohler/Jeremy Craig/ Elaine Wong
2	Structural	Stephen Mitchell	Stephen Mitchell
3	Civil	Bruce Wallace Partners	Phillip Young
4	Electrical	ECS/ENZ	Nick Topp
5	Mechanical	TBA	
6	Fire	Holmes Fire & Safety	Martin Feeney
7	Landscape	Natural Habitats	Debbie Upton
8	Traffic	Traffic Design Group	Angie Crafer
9	Planner	Bentley & Co	Jim Bentley

1.0	Consents	<u>Action</u>	<u>Date</u>
1.1	Resource Consent		
1.1.2	Should get consent this week MCC have raised an issue with the individual signs on buildings. Also MCC want to put reserve path in. MP advised these issues are nearly resolved	MP MP	
1.1.3	Traffic Issues These need to be resolved with Council		
		PW	
1.2	Building Consent		
1.2.1	Earthworks/foundations Documentation for earthworks and drainage has been lodged. PW is splitting earthworks from drainage to avoid holding up the start. MCC has given authorisation to proceed with earthworks at our risk.	Note PW Note	
1.2.2	Structural. Structural consent to be lodged 18/12/00.	Note	
1.2.3	Building Consent Main. Target date for lodging 18/12/00 Note – office and frontier zone excluded PW to provide Ignite with copies of our fencing and site set up plans for inclusion with application.	Note PW	18/12
1.2.4	MP to check with MCC that there are no problems incurred with Consents due to service station change to Oceans.	MP	
2.0	Contract		
2.1	Reviewed again. Chapman Tripp issues addressed GMP confirmed. PE and HIL to finalise contract. Should be signed this week.	Note	

3.0 Programme

3.1 Critical dates as follows:

1	Earthworks & underground services all stages	Start	15/1/01
2	Retail 1 & 2 forming foundations & slab	Start	5/2/01
3	TiRakau road entries & main road works	Start	16/4/01
4	Office building (2 storey – no u/croft cpark) foundations	Start	11/6/01

4.0 Tenancy issues

4.1 MP tabled a spreadsheet showing Tenancy letting status. This spreadsheet to also note tenant implications from negotiations. MP to update on a regular basis. MP

5.0 Design

5.1 Bongo drums have been deleted. Note
May be replaced with something less significant.
Canopies may change slightly.

5.2 Canopies – PE to provide estimate to MP for soffit v PE/MP
no soffit so MP can decide if worthwhile.

5.3 Roller shutter doors added to some tenancies. Note
EW to advise which ones. EW

5.4 Glazing added to D1 Note

5.5 PW to send PY dwgs to Ignite PW

6.0 Financial

6.1 CK issued revised Cost Plan. Note
18.2m the accepted GMP.

6.2 Progress claim. EW
Ignite issuing certificate. PM
HR invoice to go to Ignite.

7.0 Construction

- 7.1 Foodstuffs have accepted conditions for shed locations but have asked that we pick up rates for that period. PW/SB to arrange this. PW/SB
- 7.2 Some site accommodation set up on site. Meeting location to remain at Ignite offices until properly established on site. Note

8.0 Services

Power

- 8.1 ENZ have instructed Vector to proceed with transformers 1&3. Meeting to be arranged by ENZ to discuss easement with Vector. NT
- 8.2 Power to site now on. Still to reticulate to sheds. NT
- 8.3 NT has requested drawing from Transpower showing easement. NT
Coordination and avoidance of any future problems to follow.

Fire

- 8.5 EW faxed through report showing there is a fire rating requirement to steelwork along back of L7,8,9 & D9 of 90mins. Note
PE to look at most efficient option of achieving this. PE
- 8.6 EW faxed request to Holmes regarding fire implications if glazing added to D9 where backs onto office. This is not an option. Note
- 8.7 Peer review – Suggested either Tony Gibson or Paul Clements for Fire Report
Option for MCC to in-house if simple or MacDonald Barnett suggested.

- 8.8 EW is reviewing fire report. EW
- Aircon**
- 8.8 TML to be negotiated with for subcontract award.
CK would like budget advice from them re
humidity control. PW
- 9.0 Siteworks**
- 9.1 Natural Habitate budget & contract to be confirmed.
PW to organise meeting. PW
IK to advise on requirement for weedmat. IK
- 9.2 We need levels from PY to establish retaining wall
height. EW
- 10.0 General Business**
- 10.1 MP arranging sign to go on Progressive site.
All approved and ready to go. MP
- 10.2 Ignite have set up a web page that will provide a
Homepage for marketing and public information
together with a password accessed area for
information/drawing distribution etc
Ignite will provide training for the rest of us.
EW will Email everyone with a password. EW
Nest year.
- 10.3 PW to discuss traffic management plan required for
site access/egress with Traffic Design Group. PW
- 10.4 Drawings from SM handed to PW for review
submission. 1st stage structural.

Next PCG Meeting

Tuesday, 19 December 2000, 4.00pm at Ignite Limited office

Xmas drinks after meeting compliments of MP

THE HUB
BOTANY DOWNS
Project Control Group Meeting No 5
Held Thursday 2 November 2000
ASA Crone's Office

				<u>Fax Nos</u>
Present:	Jeremy Craig	(JC)	ASA Crone Architects	522 2190
	Elaine Wong	(EW)	ASA Crone Architects	522 2190
	Daryl Harvey	(DH)	Project Economics	309 5201
	Pat Ward	(PW)	Haydn & Rollett	444 2713
	Sam Bufton	(SB)	Haydn & Rollett	444 2713
	Michael Pleciak	(MP)	Hub Investments Ltd	303 9657
	Nick Topp	(NT)	ECS/ENZ	579 6790
	Stephen Mitchell	(SM)	Stephen Mitchell	489 3956
Apologies:	Ian Kohler	(IK)	ASA Crone Architects	522 2190
	Paul Masters	(PM)	Haydn & Rollett	444 2713

The Design Team

1	Architect	ASA Crone	Ian Kohler/Jeremy Craig/ Elaine Wong
2	Structural	Stephen Mitchell	Stephen Mitchell
3	Civil	Bruce Wallace Partners	Phillip Young
4	Electrical	ECS/ENZ	Nick Topp
5	Mechanical	TBA	
6	Fire	Holmes Fire & Safety	Martin Feeney
7	Landscape	Natural Habitats	Debbie Upton
8	Traffic	Traffic Design Group	Angie Crafer
9	Planner	Bentley & Co	Jim Bentley

3.0	Programme		
3.1	HR developing programme on assumption all stages progressing concurrent. Draft to be presented next meeting.	PW	7/11
4.0	Tenancy issues		
4.1	Frontier zone identified as follows:		
	F.1 Oceans– Builder H&R	Note	
	F.2 Wendys – builder - H & R to be a contender. Wendys asked if Lendich can be given an opportunity to bid earthworks	Note	
	F.3 Dunkin Doughnuts – builder H & R		
	F.4 Video outlet – builder H & R. Close to being finalised.		
	F.5 KFC – builder TBA. H&R to provide Slab & U/ground services only. Pizza Hut have expressed interest in a 100M2 tenancy adjacent to F.4		
5.0	Design		
5.1	Economic layout of building platforms has been established which minimises varying floor levels and maintains tenant flexibility.	All	
5.2	Façade structure; JC exploring options of Harditex board or similar in lieu of precast panels. Preformed sign panels as above.		
5.3	Tenancy heights reviewed, decision is to proceed as per current design, no change in height.	All	
6.0	Financial		
6.1	GMP to be established asap for: Earthworks Drainage Structural Frontier scope In-ground services DH confident with structure and buildings subject to design – but is concerned with earthworks being an unknown.	Note	

- 8.4 **Aircon**
DH advised they have requested budget pricing from Breeze. PW meeting Thurstons next week. Economech and AVS to be contacted. PW
- 8.5 ECS/ENZ Design Build Contract will be managed under the H&R General Contract. Note
- 9.0 **Siteworks**

JC/EW reviewing Stevensons products for Walkways/paving.
Initial costings look favorable.
- 10.0 **General Business**
- 10.1 **Construction site signage concepts** JC advised that Peak have pulled out of advisory role due to them requiring a commitment that they would get the job. Note
H.I.L. will be putting up marketing signage. Note
Note that there are a pair of existing poles on the Ti Rakau frontage that can be used for site signage. Note

Next PCG Meeting

Thursday, 9 November 2000, 4.00pm at ASA Crone office

ASA Crone requested a change in meeting date, other than Thursday.

H&R would like to propose Monday or Tuesday, Morning or Afternoon.

**The Hub – Botany Downs
Subcontractors Coordination Meeting
Motor mall & Noel Leeming Works**

Mtg 5 – 19/8/02

Present:	Pat Ward	H&R	271-0029
	Nigel Carncross	H&R	271-0029
	Tim Watkins	AS2000	274-8858
	Parma	M&P	268-1211
	Garry Meehan	Tyco	579-6790
Apologies	Nick Topp	Tyco/ENZ	579-6790
	Neil Schumann	M/Craft	274-0251
	Shayne McKay	TML	276-3522

Automall	Target Completion Date	Action
Civil- V.T.N.Z.		
Prep. Office Slab	7/8	M&P
Kerbs & Channel	14/8	M&P
Excav. Inspection Pit	15/8	M&P
Pour Office Slab	9/8	H&R
M3		
Prep Balance of Slab	30/8	M&P
Pour Balance of Slab	30/8	H&R
M1 – 3		
Drainage	30/8	M&P
Water Main	30/8	M&P
Elec. Sevices	14/9	Tyco
Siteworks	14/9	M&P
Structural – V.T.N.Z.		
Finish All Steelwork	7/8	AS2K
Metal Cladding	30/8	M/Craft
Construct Inspec. Pit	14/9	H&R
M3		
Finish Roof Steel	6/8	AS2K
Canopy Steel	7/8	AS2K
Purlins for Outriggers	9/8	AS2K
Precast Plates	9/8	AS2K

A/C Platform details yet to be received	Note	H&R
Entry Canopy Details still outstanding	Note	H&R

M1 & 2

Structural Steel forwarded to fab shop	6/8	AS2K
Steel on site	12/8	AS2K
Erect Steel	30/8	AS2K

Noel Leeming

Civil

Drill for Bollards	28/8	M&P
Pavement	29/8	M&P
D & B Rear Road	29/8	M&P
Remark Carparks	Note	Ignite
Tidy blacktop at rear of eat asia	23/9	M&P

Structural

Completed Steelwork		
Main Entrance Cladding	24/8	H&R
Stop/Sand/Paint – Signage Frame	1/9	H&R
Metal Cladding/Soffits	28/8	AS2K

General

Roofing/Cladding/Flashings to N.L.is critical	16/8	M/craft
Target Completion Dates for Noel Leeming	30/8	All
Target Completion Date for Automall	30/9	All

Roof Shout Thursday 29th August @ 3.30pm
Personnel who have worked on the Automall
Are invited to attend.
Confirm numbers no later than Tuesday 27th
To Dan Russek 271 0962

APPENDIX C

Monthly Job Reporting
Project Managers Report

Report No. 9 September 2001

Project Name The HUB
Project No. 802500
Month Sep-01
Project Manager Pat Ward

Financial	Original Contract Value	\$18,200,000.00	Original Margin	\$685,000.00
	Variations	(\$4,495,000.00)	Variations	\$346,200.00
	Forecast Contract Value	\$13,705,000.00	Contract Margin	\$1,031,200.00
	Costs to date	\$5,793,084.00	% Complete	46%
	Costs to complete	\$6,880,716.00		
	Forecast Costs	\$12,673,800.00		
	Forecast Margin	\$1,031,200.00		
	Previous Forecast Margin	\$1,031,200.00		
	Variance this month	\$0.00		

(Ref. Financial Narrative for explanation)

Billing Status		Gross	Less Retentions	Net
	Claimed to Date	\$6,812,884.00	\$161,725.00	\$6,651,159.00
	Costs to Date	\$5,793,084.00	\$285,577.00	\$5,507,507.00
	Variance	\$1,019,800.00		\$1,143,652.00

Variations	Approved Number	0	Approved Value	0
	Pending Number	0	Pending Value	0

Labour Supervision	Man hours to date	6165	Original Man Hours	7185
	Man hours to complete	2591	Variations	
	Forecast Man Hours	8756	Contract Man Hours	7185
	Previous Forecast Man Hours	8765	Accidents	0

Direct Labour	Man hours to date	7197	Original Man Hours	17000
	Man hours to complete	10403	Variations	
	Forecast Man Hours	17600	Contract Man Hours	17000

Total	Forecast Man Hours	26356		
	Previous Forecast Man Hours	26356	Accidents	0
	Variance this month	0	Staff Numbers on site	4

Program	Contract Commenced	080/01/01	Current Status	Active
	Original Contract Duration	50wk	Forecast Duration	50wk
	Original Completion Date	20/12/01		
	Agreed E.O.T.			
	Pending E.O.T.			
	Pending Completion Date	20/12/01	Forecast Completion	20/12/01

Narrative Program

Retail 1 & 2

We have a revised programme showing completion of Retail 1 base building (excluding fit-out) by 13/12/01.

The funding for Retail 2 is in place, this will allow us to proceed with structural steel, roofing, shopfronts and the like. We have already commenced work in this area, on the verbal instruction from the client that funding had already been secured.

The positive aspect of this is we have maintained our revised program dates and are confident that Retail 2 base building from I9 to I6 will be completed by 20/12/01

The remaining tenancies L5 - L1 will be completed in the new year.

Dunkin Donuts

We have met our target completion date of 14 september for practical completion.

Dunkin Donuts

We have met our target completion date of 14 september for practical completion.
The Client is very pleased with the premises and suitably impressed with the H&R performance.
Their first weeks trading has exceeded expectations.

Financial

Retail 1 & 2

Margin Summary

Original contract margin	\$685,000.00
GMP budget variance - sub trades (1.0m * 0.33 = 330000)	\$330,000.00
Builders work budget variance	
concrete work	\$50,000.00
carpentry	\$100,000.00
Deduct office building (3.345m * 0.04 = 133800)	-\$133,800.00
Total	\$1,031,200.00

The above summary of the forecast margin is based upon the current workscope.

Client

Relationship with Client and design team remains very positive.

Labour

We have subcontracted out our labour for Concrete and Carpentry to K.T. Enterprises (Keith Tucker and his team) this has enabled us to de-risk our labour costs and see exactly how we stand financially in these trades.
Keiths team are working well.

Subcontractors

Auckland steel are not performing, the problem is with their lack of resources in their detailing department which impacts everything downstream. They have provided a recovery program that gets them back on program and substantially complete on retail 1. By mid October. Retail 2. By end October.

The following subcontracts have now been let:

Earthworks/Drainage/Siteworks - McKenzie & Parma	
Electrical	Electrical New Zealand
Mechanical	Thurston Mechanical
Landscaping	Natural Habitats
Reinforcing	Reoco
Structural	Auckland steel
Concrete supplier	Allied
Concrete placer	Wayne Wrathall
Plumber	Mcsweeny O'connel
Tanking	M.P.M.
Blockwork	Peter Veryt
Roofer	Metalcraft
Shop Fronts	Nu-Look

Health & Safety

We have had two serious accidents this month, both people work for K.T. Enterprises.
One man twisted his ankle whilst stepping down from a scissor lift.
The other shot a paslode nail through the end of his finger....and it hurt!!
Mike reilly has documented both incidents.

General

Site progress continues to move forward slowly due to the clients funding constraints.Oceans Restaurants are no longer a prospective tenant, the client is now talking to Seamart regarding the F1 site.

APPENDIX D

DAILY SITE DIARY



PROJECT: The Hub
 JOB NUMBER: 802500
 DATE: 10 / 12 / 2000
 FOREMAN: Mike Riedly

DSD NO: 53852

WEATHER: am FINE WET WINDY pm FINE WET WINDY

REASON FOR TIME LOST: NIL TO DATE

GENERAL INFORMATION: MCC Agrees To let us process Bulk E/works At our Risk - Consent Still To Be lodged.

Base Building, Design Progressing - To Be lodged 18/12

HIRE PLANT IN/RETURNED: M & P Major plant Now on Site

WHITE COPY - RECIPIENT
YELLOW COPY - OFFICE
GREEN COPY - BOOK

H & R EMPLOYEES	DESCRIPTION OF WORK	HOURS
P. Ward	MGMT. - DESIGN REVIEW	10
M. Riedly	SITE SUPERVISION	10
D. Russek	COST CONTROL - BUDGET SET-UP	10
O. Potini	SITE ESTABLISHMENT	9
LABOUR HIRE	3 x AMIUS WORK FORCE	8

SUB-CONTRACTORS	DESCRIPTION OF WORK	NO. STAFF
M & P	BULK EARTHWORKS	6

VARIATIONS / CONTRA CHARGE WORKS	ROV NO.

APPENDIX E

The Hub

Location: Corner Ti Rakau and Te Irangi Roads, Botany Downs

Client: Willis Bond/AMP

Tenants: Multiple retail

Value: \$25 million

Overview:

This multi unit bulk retail centre is a result of the rapidly developing Botany Downs area. One of the challenges of this project was to maintain flexibility in the buildings, as most tenancies were not let until after construction.

Consultants: Ignite Ltd

Referee:

Michael Pleciak (Willis Bond)
Phone 303 9652

