

INTRODUCTION

Organizations work the way they work, ultimately, because of how we think and how we interact. Only by changing how we think can we change deeply embedded policies and practices. Only by changing how we interact can shared visions, shared understandings, and new capacities for coordinated action be established (Senge, 1994, p. xiv).

1.0 Design Management

This thesis is in part fulfilment of the Master of Design Management, a programme concerned with how people can work together towards a common goal and produce creative and innovative performances.

I entered into this research as an architect who has been in practice for 14 years, with extensive experience of the traditional procurement model and who had subsequently become disillusioned with the prevalent adversarial culture. I observed the growing unwillingness and inability of members of the team to admit mistakes, the reduction in the contractor and architect working together to find solutions; all as a result of fear of potential liability. It was an environment that I did not want to be a part of, and all signs were indicating an escalation of this trend, with the NZ architectural, engineering and construction (AEC) industry dealing with the ramifications of the Leaky Building Syndrome. One response to the escalating liability issues is reflected in the changes made to the new Building Act 2004 and subsequent upgrade of the Building Code by 2007. Resulting in the introduction of the Licensed Building Practitioner, which will continue the fragmentation and blame culture prevalent in the industry.

Through studying teamwork, creativity, learning and systems thinking, four key dimensions of Design Management, I became aware of a burgeoning adoption of collaborative practice in other disciplines. I also had the opportunity to review and reflect on the patterns of behaviour typical in a traditional architectural project and question whether an alternative model might be adopted to mitigate or dissolve these compounding issues. With this came the realisation that a collaborative systemic model, whose principles, practices, procedures and policies were based on establishing trust, could fundamentally alter not only the process, but also the outcome. It was at this time that I attended an Innovative Architecture Symposium and heard Stewart Rix's presentation on Collaborative Working Arrangements (CWA). The synergy was compelling, and I wanted to learn more about CWA. This was the starting point of my thesis. As I have progressed through this project, what I have found reassuring is the number of architects, builders and others in the industry who are keen to know more about this model and their desire to adopt this alternative method as a new way of working.

My own experience supports the growing awareness of a more holistic approach to architecture, one that not only balances the needs of the direct shareholders but also of the local community and society at large. The AEC industry is under increasing pressure to develop better ways of working and managing, that not only reduces time and cost, but also aims to produce value-driven, innovative and sustainable outcomes. As a result, a systemic approach to the AEC industry is a growing area of research and implementation.

1.1 A systemic approach

Integral to a systemic approach is the growing understanding within the AEC industry that the way of working, the process, is inseparable from the outcome (Atkin, Borgbrant, & Josephson, 2003; Blockley & Godfrey, 2000). Working with this premise, and accepting System thinkers' proposition, (Ackoff, 1999; Capra, 2003; Kim, 1995; Meadows, 2002; Senge, 1994) that the outcome is influenced by the events and the events are determined by the behaviour of the people involved. They further state, that the behaviour of people is directly influenced by the structure of the system.

According to Senge (1994) it is the structure of the system that determines the outcome, rather than the specific people involved. "When placed in the same system, people, however different, tend to produce similar results" (p. 42). Donella Meadows concurs: "A truly profound and different insight is the way you begin to see that the system causes its own behaviour" (cited in Senge, 1994, p. 43). Adapting the formal and informal facets that govern an organization's behaviour, that is, its underlying structure, can change the behaviour of the people involved at a level that people's patterns of behaviour can be changed, thereby altering the outcome (Hindle, 2000; Senge, 1994). This leads to the realisation that people are part of the system, and therefore responsible for the decisions made and for the makeup of the structure in which they operate under.

A necessary step in accepting this premise, is determining the structure behind a living human system such as an organization. Senge (1994) states "in human systems, the structure includes how people make decisions – the 'operating policies' whereby we translate perceptions, goals, rules, and norms into actions" (p. 40). Checkland (cited in Banathy & Jenlink, 1999) lends support in this, by stating that the structure is composed of people, policies, agreements and procedures. The structure therefore, comprises of both formal and informal facets and how each aspect interrelates with the integrity of the whole (Senge, Kleiner, Roberts, Ross, & Smith, 1994).

The formal structure is the designed structure, or official structure of the organization. It is the set of rules and regulations that define relationships between people and tasks. It determines the nature of the hierarchy and distribution of power. The boundaries, procedures and policies are established through contractual agreements. Capra (2003) states that the informal structure is the emergent, intangible structure, made up of networks of communication and the culture.

Both Senge (1994) and Capra (2003) confirm that the structure as a whole is influential, that is both formal and informal facets of the structure are necessary for effective functioning of an organization. This implies that the greater the alignment between the contractual agreement and identified best team behaviour, or the explicit and implicit culture, the closer the organization is to achieving its defined purpose. Through observation and experience, Senge (1994) has concluded that it is ideal when the formal and informal facets of the structure change simultaneously. The ability of a living human system to adapt, learn and evolve within a changing environment enables it to not only survive, but also maintain its health. To support an organization's ability to change appropriately, extensive research has identified the adoption of the learning organization disciplines (Capra, 2003; de Geus, 1988). These being, personal mastery, team learning, building shared vision, mental models and systems thinking (Senge, 1994).

Understanding a structure of a system provides System thinkers with a powerful tool, as it enables the ability to design a 'desired future reality' (Kim, 1995). Many different system models have been created that support this process (Ackoff, 2001; Banathy & Jenlink, 1999; Kim, 1995; Wood, 2003). To create a 'desired future reality', it is important to define the vision and values that are desired, ensure that the team's beliefs and assumptions align with this, determine the appropriate patterns of behaviour and include all key performance measures that indicate the success of realising the 'desired future reality'. Kim's Vision Deployment Matrix is one such model. Part of this model is shown in the diagram below.

	LEVEL OF PERSPECTIVE	ACTION MODE
↑ Increasing Leverage	Vision	<i>Generative</i> Unlimited possibilities inspired by imagination and a sense of purpose.
	Mental Models	<i>Reflective</i> Beliefs and assumptions that are congruent with the vision that we hold.
	Systemic Structures	<i>Creative</i> Structures that are consistent with our mental models of the world.
	Patterns	<i>Adaptive</i> Patterns of behaviour that are produced by the structures.
	Events	<i>Reactive</i> Specific events that illustrate the vision in action.

Figure 1.0 Vision Deployment Matrix

1.2 An appropriate architectural project delivery system

This understanding therefore implies that it is possible for the AEC industry to generate a 'desired future reality' that leads towards the realisation of value-driven, innovative and sustainable architecture by creating an appropriate structure for an architectural project delivery system. An architectural project comprises of a group of people who operate under a formal official structure and an informal structure, such as the culture of the team involved. Spiller's (2000) 'Four P's of ethical business' model, adopts a systemic approach and includes both these formal and informal facets within its construct. It identifies the structure as inclusive of the Purpose, Principles, Practices and Performance measurements which inform and integrate the system.

Implementing this systemic approach in the NZ AEC industry requires addressing the current architectural project delivery systems and will potentially alter the way of working to achieve the desired outcome. As indicated, the 'desired future reality' can only be realised by changing the beliefs and assumptions held within the industry to ensure that they are aligned to the future vision (Kim, 1995; Kumaraswamy, Love, Dulaimi, & Rahman, 2004; Senge, 1994). The AEC industry has already commenced reviewing these processes, which are briefly addressed below, as this will be discussed in greater detail in the Literature Review.

Over the last few decades, internationally and nationally, the AEC industry has researched the effectiveness of the architectural project delivery process and its relationship to the outcome in an effort to overcome the shortcomings prevalent within the industry. The Constructing Excellence (CE) initiative in the UK "has demonstrated over the last 6 years that the procurement route is the fundamental first area to change to realise improvements in performance" (Warren, 2006, p. 32). This has resulted in significant international research, which has led to the creation of alternative models to the traditional method (CII, 1996).

Alternative methods of procurement, such as partnering and project alliance, have been adopted in the search for a better way of working (CII, 1996; Kumaraswamy & Matthews, 2000). Yet these architectural project delivery systems, whilst they begin to address the 'human' aspect by incorporating a charter that supports collaboration, are still based in the traditional paradigm of control. Underneath the charter a legal contract often contradicts and overrides the aims of the charter, creating mixed messages, and unreasonably demanding the team to trust this process. As this research demonstrates, it is important that new models become adopted, whose formal and informal structures support co-creation through collaboration within a systemic framework, that encourages the building of trust (Alexander, 2002; Blockley & Godfrey, 2000; Latham, 1994; Strategic Forum for Construction, 2002).

These holistic collaborative models integrate the technical and behavioural aspects within its formal structure. This necessitates incorporating learning organizational disciplines to assist changing current reality to the 'desired future reality' which will increase the likely realisation of the vision (Senge, 1994; Walker & Lloyd-Walker, 1999). Refer to Appendix 1, which provides a brief overview of the drive towards value-driven, innovative and sustainable architecture, and how leading experts affirm the need for a holistic, collaborative architectural project delivery system to be able to deliver on these expectations.

1.3 Collaborative Working Arrangement

The Collaborative Working Arrangement (CWA) has been established to offer an alternative procurement contractual agreement for the New Zealand AEC industry. This research demonstrates that the CWA model offers an attractive solution to the challenges faced by the AEC industry. This is because the structure establishes and facilitates teamwork, creativity, learning and systems thinking that encourages the emergence of trust; providing an ability to co-create through collaboration towards achieving an agreed shared purpose.

Stewart Rix, founder of Collaborative Management Services (CMS) has extensive knowledge and experience working with traditional, partnering and project alliancing methods. He was Chair of the 'Building Down Barriers' programme which was a pilot project for the use of collaborative working, the principles being developed as key building blocks for the Rethinking Construction initiative and more recently Constructing Excellence in the UK. He created 'The Collaborative Working Arrangement' agreement in the UK in 1997 for the Euston re-modelling project (part of the West Coast Route Modernisation programme of projects) by adopting best practice from oilrig alliancing projects and adapting these best principles to construction projects. The agreement was specifically formed to enable and facilitate change within the AEC industry from an adversarial to a more collaborative environment. Each part of the system was envisioned to be designed as a whole, interacting and interdependent to each other.

In 2001, Rix transferred the learnings undertaken in the UK through to his New Zealand company, Collaborative Management Services (CMS). He began an extensive ongoing process of engagement with the NZ AEC industry, such as the CAE Masterclass, to gain a collective understanding about collaborative practice as a way forward for the industry. Owing to the growing acceptance of this approach and the recognition of proven collaborative pilot projects in the UK-and more recently in Australia - when a large commercial project headed towards difficulty (in terms of time, cost and relationship pressures) under a traditional NZ 3910 contract, the project team were keen to explore other options. Having decided that a fundamental change of project delivery was needed to create a successful project, Stewart Rix was invited by the client, contractor and design team to create a CWA 'hybrid' model and adopt the CMS's CWA project delivery strategy. Therefore, in 2004 CMS, with the partnering support of Simpson Grierson, reformatted the UK CWA Agreement to suit the New Zealand context. The formation process included discussion and feedback with the proposed CWA Members.

This reformatting provided an opportunity to simplify and continue to improve the documentation to capture the spirit of collaboration and to make certain the legal content was in sync with collaborative behaviour and attitudes. "We thought it important to get the 'tone' and 'style' of the document to be quite different from traditional contracts... we worked to ensure that the documentation captured the spirit of the process" (pers comm. Durbin, 2006). The agreement incorporates the technical and behavioural within its structure and broadens its measure of performance, beyond time, cost and quality, to also include safety and performance.

The intention behind the CWA agreement is to incorporate polices that act as incentives to encourage a practice of collaboration rather than rely on legal enforcement of prescriptive instructions. Of significance, all

members of the team, including the design, construction supply chain and the client, are jointly responsible for the success of the project. This provides the impetus to learn to work together and establish and sustain a trusting environment.

1.4 Research Question

This research examined the capability of the CWA collaborative structure in achieving the desired shared purpose of the team; its ability to assimilate and test new ideas; stimulate learning and whether it was holistic in its approach. Furthermore, the research establishes whether by the structure's ability to include both the technical and behavioural aspects of the system, CWA is able to address the increasingly complex nature of building. The premise is that collaboration is based on trust rather than control, and provides a new way of working. A way that is necessary to consciously deliver value-driven, innovative and sustainable architecture.

This led the research question to be, *"does CWA provide a structure that helps sustain a healthy co-creative system through collaboration?"*

1.5 Benefits

The key benefit of this research is to identify an architectural project delivery system for the NZ AEC industry that will deliver value-driven, innovative and sustainable architecture. As discussed, Senge (1994), Capra (2003) and Kim (1995) affirm that the structure of a system influences the behaviour of the people involved. This is beneficial because the identification of a structure that facilitates people's behaviour towards collaboration, whose common purpose is to achieve value driven, innovative and sustainable architecture is the key to consciously realising this outcome.

Identifying a structure is the first step. Yet in order to sustain an environment supportive of these aims, research in the field shows the importance of challenging entrenched behaviours embedded in the industry. It is hoped that this will lead toward a greater understanding within the AEC industry of the benefit of adopting a more systemic approach, which embraces creativity, teamwork and ongoing learning. The identification and implementation of a model that reinforces the above practices will support the delivery of value driven, innovative and sustainable architecture.

Additionally, this thesis contributes to an improved understanding of CWA project delivery system in the New Zealand context through observation and analysis of its performance and practice. This will enable the creation of a framework that others can replicate in order to achieve the positive benefits of this way of working. Gaining a greater understanding of CWA, will inform and create debate within the AEC industry and future clients about the importance of selecting an appropriate architectural project delivery system and the subsequent implications this has on the outcome of a given project.

1.6 Overview

The thesis is based on an interpretive methodology using ethnographic techniques to elicit participants' perceptions of the CWA and its use in three architectural projects in New Zealand. This information was gathered through observation, interviews to discover people's opinions and beliefs, and the data was analysed through a structured framework. This process was based on a systemic framework that enabled each part of the analysis to interconnect and inform the other in a consistent manner.

Acting in the observer's role, I sought to engage, rather than observe the findings as separate to myself and as an absolute truth. I recognise my influence on the system I am observing. As part of this process it is important that I acknowledge my ideology and framework of values and the influence this had on my findings. This research was viewed through the eyes of an architect. It therefore is limited to the building culture in which architects are engaged.

The introduction outlines the broad themes and the general nature of the inquiry. The background section provides a contextual framework through a consideration of influences on the contemporary architectural industry. As an architect, I believe it is important to address the role we play in the delivery of the built environment. Part of gaining this understanding will involve a brief exploration on the history of architects and their changing roles in the building process. It will consider the introduction of professions and institutions and the impact this had on the AEC industry. In addition to this, the Background examines the growing complexity of projects, and reviews the rise of traditional contracts and the emergence of lump sum tenders that occurred in parallel with the loss of craftsmanship. This resulted in greater levels of drawings and specifications, less shared knowledge, the separation of design and construction and a move away from established relationships based on trust.

The Background also places the AEC industry in context of contemporary intellectual and cultural developments that have shaped traditional ways of working (CII, 1996; Davis, 1999; S. D. Green & Lenard, 1999). For example, scientific and commercial bodies have embraced complexity and whole systems rather than reductionist models. This has led to adopting collaborative holistic methods based on trust rather than fragmentation and control. This understanding emphasises the importance of re-integrating the 'human' aspects into business and science. Further reinforced by the growing realisation of the need for value-driven, innovative and sustainable practice, which again requires a holistic approach. With this information, the Background section will examine potential ways forward, which will be expanded upon in the Literature Review.

In Chapter 3, the Literature Review critically examines two main research domains: architectural practice and the emerging trends in research in the AEC industry, and collaborative working for co-creation within other disciplines. From this position it enables the opportunity to take the learning gained by others and integrate and adapt it to the NZ AEC industry. The section concludes with a summary of the findings and leads into the refinement of the research question.

Chapter 4 summarises the Research Methodology, establishing Systems Thinking as the theoretical perspective underpinning this research. The methodology, research question and methods address the nature of the inquiry. Part of the research was to investigate the impact of CWA on the AEC industry and whether it had a positive effect on the way of working. Through studying CWA's formal and informal structure, it draws some conclusions about its influence on the process and thereby the outcome of an architectural project. The premise is, to establish whether collaboration rather than control will provide a new way of working which will enable the necessary change to consciously deliver value-driven, innovative and sustainable architecture.

The Analysis Chapter is in four parts. The first part reviews the CWA architectural project delivery system's formal structure in its purity. The second part briefly provides an overview of the three projects and the client's role. The third part addresses the 'ordinary' and 'extraordinary' tangible performance measures. And the final part, reviews Projects 2 and 3, from a behavioural aspect, focussing on 'extraordinary' and 'human' aspects, through exploring four key dimensions of Design Management: teamwork, creativity, learning and system thinking. Chapter 6 concludes the findings of the research and presents recommendations, and opportunities for further work.

BACKGROUND

By continually asserting an exclusive claim to expertise, the architectural profession has isolated itself from other institutions of the building culture that have gained more control. The marginalisation of the profession will not be reversed if architects continue to ignore changes in society and the business world that have resulted in different ways of conducting business. The profession has been reactive rather than creative and proactive in responding to the whittling away of its traditional responsibilities by contracting firms, government institutions, and other entities (Davis, 1999, p. 312).

2.0 Introduction

Through the study of Design Management, and in my experience as a professional architect, I have explored how creative behaviour and sustainable practice can be actively established and sustained. Four essentially interrelated and interdependent dimensions underpin the philosophy of Design Management. These are teamwork, creativity, learning and systems thinking. Each dimension supports an organization to accept uncertainty by establishing a collaborative system that enables trust to emerge. These four dimensions work together to create an organization that is able to adapt, learn and evolve within its environment, a necessary prerequisite in today's complex and changing environment.



Figure 2.0 Four key interrelated and interdependent dimensions of Design Management

2.1 Architectural Practice

The architectural, engineering and construction (AEC) industry is increasingly under pressure to deliver value-driven, innovative and sustainable results, not only for clients, but also for other stakeholders (Coles, 1995; Rance, Muir, & Collier, 1995; RIBA, 2001; Walker & Lloyd-Walker, 1999). The dimensions of Design Management, as outlined above, would appear to provide a good basis for working. However the dominant paradigm within the industry is one of control governed by a traditional model of procurement. The model's formal structure foments fragmentation, blame and a resultant culture that is counter-productive to collaborative working relationships (Kumaraswamy & Matthews, 2000; Ross, 1999; Rowlinson, 1999).

The traditional process is a linear design and construction project delivery system that limits its focus to the 'ordinary' performance measures, such as cost, time and quality. It excludes the 'extraordinary' and 'human' aspects, such as physical safety, on-going learning and enjoyment, denying a significant reality of the delivery process. Yet, architecture is a fundamentally human process and product: its production involves people and its outcomes need to serve people. Such a people-centred view suggests that relationships between people

need to be acknowledged in the very conception of the design and building process and therefore integrated within the formal and informal structure of that process. Establishing and maintaining relationships shifts the focus exclusively from 'ordinary' measures to address 'extraordinary' and 'human' measures throughout the duration of the process, enhancing the quality of the experience (Coles, 1995; Csikszentmihalyi, 2004).

The International Council for Research and Innovation in Building and Construction (CIB) W92 cited in McDermott (1999) acknowledges the crucial need to balance the current construction research with the often overlooked but important 'human' aspect. Blockley & Godfrey (2000) support this view and reiterate that "most of the challenges in rethinking construction arise from aspects of human behaviour" (p. 86). It is important to acknowledge both the technical and behavioural aspects in the process of creating architecture as they address the whole picture. "... a large proportion of success or failure of construction projects depends on the co-operation (working as a single system) of soft and hard systems" (p. 87). Implementing a holistic architectural project delivery system, whose formal structure integrates the technical and behavioural, is crucial to the ongoing survival of the industry and its ability to deliver value-driven, innovative and sustainable architecture.

Research has shown that these three drivers provide an impetus to re-evaluate what makes a successful project and highlights a need for a structure that encompasses a wider set of performance measurements than time, cost and quality (McDermott, 1999). For the purpose of this study the performance measures are separated into three different categories: 'ordinary', 'extraordinary' and 'human'. What emerges is that each measure could be incorporated into the architectural project delivery system as agreed performance measures necessary to deliver a successful project outcome (Blockley & Godfrey, 2000; Capra, 2003; Walker & Lloyd-Walker, 1999). Expanding the definition of success has an additional advantage, as it broadens the language in which different disciplines are able to communicate and hold meaning to (Senge, 1994).

ORDINARY	EXTRAORDINARY	HUMAN
<ul style="list-style-type: none"> • COST • TIME • QUALITY 	<ul style="list-style-type: none"> • SAFETY • CLIENT SATISFACTION • RISK ANALYSIS/RISK ALLOCATION • AGREED PURPOSE • CONTINUOUS IMPROVEMENT • INNOVATION • SUSTAINABLE PRACTICE 	<ul style="list-style-type: none"> • LEVEL OF TRUST • INTRINSIC MOTIVATION • TEAM LEARNING • LEVEL OF ENJOYMENT • PERSONAL ALIGNMENT OF VISION AND VALUES • PERSONAL MASTERY • CONSCIOUS CHOICE

Figure 2.1 Examples of 'ordinary', 'extraordinary' and 'human' performance measures for success that could be included as part of the assessment in a holistic architectural project delivery system

As discussed in Appendix 1, value-driven, innovative and sustainable architecture requires a process that adopts an holistic perspective and shifts the assessment of the project to broader measures (Cole, 2006a; Coles, 1995; OGC, 2005). It is important that the industry does not deal with these drivers independently, but explores them systemically within a stated conceptual context.

Rowlinson (1999) refers to this stated context as the procurement system, which is shown in the diagram below. Working with Rowlinson's definition, this research considers the process, from its conception to the use of the building, as the procurement system. This is aligned with Walker's (1996) (cited in Rowlinson, 1999) and Alexander's (2002) systems view of the process. It involves a number of variables, which all interact and influence the success of the project. These variables include, for instance, the political, economic, environmental and legal forces acting on the project, as well as the technical and behavioural aspects within the process.

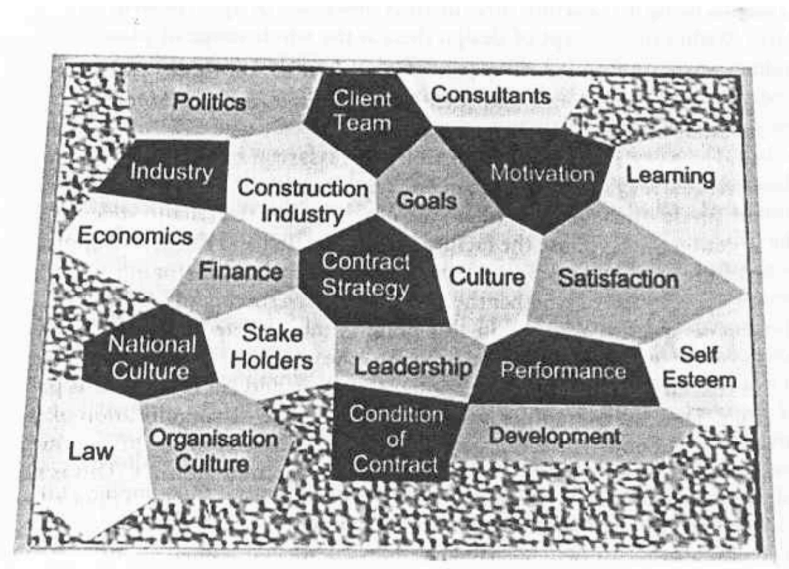


Figure 2.2 A systems view of procurement, (Rowlinson, 1999)

Whilst acknowledging that the above variables and others need to be considered in realising successful outcomes, for the purpose of this study the focus will be limited to addressing the design and construction process that leads to the outcome, as this is a key component of the procurement system (Rowlinson, 1999). The design and construction process involves the 'building project delivery system' which the International Union of Architects (UIA) defines as "the contractual relationships between the project client and the other parties involved in the design, documentation and construction of the building" (International Union of Architects, 2005, p. 2) and the informal structure. The inclusion of both formal and informal structure will be identified throughout the thesis as an architectural project delivery system.

2.2 The influence of the general culture on the AEC industry's culture

As highlighted in the quote at the beginning of this section, for the ongoing relevance of the architectural profession, it is important that the profession does not ignore the changes occurring in society and business toward collaborative practice. Davies (1999), CII, (1996), and Green & Lenard (1999) recognise that the AEC industry's culture interacts with the general culture. Thus it follows that when addressing the AEC's industry culture, it is crucial not to isolate it in a vacuum, but to understand the context within which it operates and how it has been influenced. From this systemic perspective, the AEC's culture is interdependent with the wider culture and needs to recognise the emerging trends and drivers and evolve accordingly.

According to Davis (1999) to be able to realise this, it requires the structure of the AEC industry to be generally known and understood, which further allows the people involved to have the ability to change it as needed. Davis believes it is crucial that the current AEC's industry adopt innovation and sustainability into its normal practice, yet he argues instead the industry has steadily removed itself from what he defines as a 'healthy building culture'.

For the AEC industry to be healthy, it is necessary that "knowledge is shared among many people, inside and outside the culture. This requires that the knowledge and process be 'transparent'. This understanding and sharing of knowledge helps to maintain individuals' connections with each other and thereby helps the culture itself to maintain its integrity and definition" (Davis, 1999, p. 14-15).

The current AEC industry's prevalent unwillingness to share information and be transparent limits the AEC's ability to respond to the necessary changes and reflects its entrenchment within the reductionist paradigm.

2.3 An alternative paradigm

If we are to accept that the AEC's culture is influenced by the general culture and vice versa, it therefore becomes important to briefly review the general culture and emerging trends that are occurring within it. The Western world-view and value-system is still predominantly based on a reductionist paradigm that assumes that all things, including people are predictable and therefore can be controlled. This mechanistic view has significantly informed and influenced every aspect of our society (Capra, 1983; Gharajedaghi, 1999; Hawken, Lovins, & Hunter Lovins, 1999). The Cartesian division, separating mind from matter, epitomised by Descartes' 'Cogito ergo sum' – 'I think therefore I am' encouraged the emphasis placed on the tangible at the expense of human, intangible aspects. This led to the acceptance that all aspects of complex phenomena could be understood by reducing them to their separate parts (Capra, 1983).

However, a growing movement has been occurring within all disciplines, including science and business, over the last few decades. People are realising the limitations of the reductionist paradigm and are seeking alternative approaches. One approach, is a systemic perspective that appears to address complexity and collaborative practice. This systemic model is based on whole living systems, and sees humans as part of a world system rather than separate and dominant (Capra, 1983). This understanding accepts that uncertainty and change is a necessary process in a living system. Therefore, rather than striving to obtain certainty, a living system naturally progresses to finding ways to be able to adapt, learn and evolve within its framework at any given moment (Capra, 2003). This means shifting the focus from control and linear progression to a more collaborative and sustainable model based on encouraging trust and empowerment (Csikszentmihalyi, 2004; Hagel & Seely Brown, 2002). Shifting the perspective from linear thinking to seeing whole 'rich pictures' helps gain insight into complex living human systems such as organizations (Davis, 1999; Meadows, 2002).

Comprehensive research has been undertaken into organizations and the different world-view models they operate under. From the reductionist world-view the metaphor of the organization is a machine that is made up of the sum of its parts. This results in progressive detailed analysis of independent parts to try and understand the whole (Ackoff, 1999; Gharajedaghi, 1999; Meadows, 2002). Typical of this world-view is the fragmentation and isolation of different divisions within an organization (Capra, 1983). The organization is seen as inert and therefore controllable by management through rules, policies and procedures. The purpose and makeup of the organization is designed by a select few and is enforced. Successful outcomes are seen as determined on the basis of the ability to control. The focus is on obtaining the highest level of efficiency from each part. Compliance towards predetermined procedures is crucial, and therefore people are told what to do and how to think. Decision-making is assumed to be rational and intuition is vetoed. As this type of organization operates under control and hierarchy it is difficult to adapt and interact with its surrounding context (Capra, 1983, 2003; Gharajedaghi, 1999; Hagel & Seely Brown, 2002; Senge, 1994; Steele & Murray, 2004).

The traditional model of the building project delivery system has been formed within this reductionist paradigm. Research has shown that people's mental models, implicit or explicit vision influence the structure of a system, whether they are aware of it or not (Kim, 1995). The traditional model reflects the era in which it was created. It is the contention of this thesis that the process associated with this model is no longer appropriate for our society today and in the future.

At the other end of the spectrum, organizational and management theory has adopted and developed the systems thinking approach, which models human systems on living organisms in the search towards sustainable practice (Capra, 1983; de Geus, 1988; Jackson, 1991; Senge, 1994). Viewing an organization as a living entity radically shifts the perspective and construct of an organization away from one that is inert. This systems thinking view of the organization takes into account all the aspects of the structure of the system and how they work together as an integral whole. "Living systems have integrity. Their character depends on the whole" (Senge, 1994, p. 66). This infers that there can be no disparity between the formal and informal structure of the system. Being aware of the formal and the informal structure provides meaningful understanding of the whole system (Capra, 2003; Meadows, 2002; Senge, 1994).

Basing the model of the organization on whole systems, allows people to be seen as part of the system rather than separate and dominant. It shifts the focus from compartmentalised, explicit roles and pre-determined behaviour to a re-integration of the 'extraordinary' and 'human' aspects within the policies, procedures and practices (Capra, 2003; Csikszentmihalyi, 2004; Hagel & Seely Brown, 2002). Incorporating the 'extraordinary' and 'human' into the formal structure, acknowledges the importance of people. Rather than seeking to control, the structure aims to empower people through personal alignment and thereby commitment to the outcome (Csikszentmihalyi, 2004; Senge, 1994). This in turn leads to the development of unity of purpose and a blurring between the interfaces of a multidisciplinary team (Davis, 1999).

Studying organisms has shown that their systemic structure creates patterns of behaviour that go beyond survival. Organisms are able to adapt, learn and evolve and are integral with their environment. This integral relationship is crucial, because if they behaved separately from their environment this would lead to the environment's destruction, which can ultimately lead to the destruction of the organism itself (Capra, 1983; Senge, 1994). This separation from the environment is the predominate behaviour of people today and there is little doubt that this reductionist model is causing stress on the natural environment (Capra, 1983; Hawken et al., 1999). Yet, through observing eco-systems, studies have shown underlying principles of cooperation, dependencies and relationships rather than the more commonly held notion of survival of the fittest. Further, even though competition exists within these systems, it operates in a secondary role. Collaboration has been identified as the primary motive for the on-going balance of the eco-systems (Capra, 1983).

By mimicking a system in nature, cooperation and collaboration are the guiding principles that underline the formal and informal systemic structure in a healthy human system (Capra, 2003). De Gues, head of planning for Shell, studied successful organizations and concluded that they emulated living systems that supported on-going learning and the ability to adapt to change (de Geus, 1988). He further stated that the key characteristics were "sense of community and collective identify around a common set of values; a community in which all members know that they will be supported in their endeavours to achieve their own goals. The other set of characteristics is openness to the outside world, tolerance for the entry of new individuals and ideas, and consequently a manifest ability to learn and adapt to new circumstances" (cited in Capra, 2003, p. 92). This understanding has led to the creation of learning organizations (Senge, 1994). "A learning organization is one that encourages reflection on lessons learned, attempts to understand the dynamics of its operating environment and anticipates likely changes to that environment so as to cope with opportunities and challenges" (Walker & Lloyd-Walker, 1999, p. 121).

It is beneficial to take the learning gained by other domains and implement best practice into the AEC industry.

2.4 A brief overview of the contextual framework of the AEC industry

The AEC industry did not always have the form that it has today, and it is of particular interest to note that what is identified as the traditional way of working in architecture has only been around since the 19th century (Davis, 1999; McDermott, 1999; Muir, 1995b; Strogoff, 2005). A brief overview of the contextual framework of the AEC industry will address this point and the impact this has had on the industry as a whole.

From medieval times through to 18th century only minimal shifts to the overall AEC industry occurred. The basis of the building process centred on a collaborative model (Davis, 1999; DPR, 2005). Skilled craftsmen, typically from guild organizations worked "together toward a common goal with a shared sense of ethics, responsibility and respect" (DPR, 2005, p. 1). Roles were more generalised and the process was based on tacit knowledge, methods and long-term relationships. Agreements were typically informal and only in very large projects were written agreements used (Buntrock, 2001; Davis, 1999).

Yet the stage was being prepared during the 18th century for what we now understand as the traditional process, with the introduction of alternative building types, industrialisation and the rise of professionals amongst the trades (Davis, 1999). Further, municipal authorities started to play a greater role in building regulation. Architects started to expand their influence, especially for large buildings, where contracts were becoming increasingly detailed.

Industrialisation and the loss of long-established communities, resulted in a reduction of common knowledge and trust, according to Davis (1999). The reliance on science as a means of establishing certainty, and the apparent efficiency of the production line, shifted most processes towards control and hierarchy. Roles and responsibilities were explicitly defined to determine appropriate behaviour (Davis, 1999).

By the end of the 19th century the resultant outcome was the widespread adoption of control rather than trust in the building process, reflected in the explicit and detailed agreements between the parties. This was compounded by the growing complexity of the building projects, materials, and number of new disciplines introduced into the industry. The disciplines within the industry began to separate from each other and create more formal channels of communication (Buntrock, 2001; Muir, 1995b; Smith, O'Keeffe, Georgiou, & Love, 2004). The interfaces between the various disciplines became barriers and resulted in less collaboration and the uptake of more divisive policies incorporated within the traditional building project delivery system (Baird, 2002). One such practice was the separation of the design and construction process (Smith et al., 2004).

The formation of professional institutions and other regulatory bodies exacerbated this, as each asserted their need to exist by ensuring that standards and additional procedures were adhered to. Professional bodies started to proclaim their own importance and gain as much territory as possible within the building process (Davis, 1999; Muir, 1995b). Architects formed the Royal Institute of British Architects (RIBA) in 1837, the American Institute of Architects (AIA) in 1857, and the NZIA in 1905. "The architectural profession was emerging as an independent set of institutions from those of builders, building developers, banks and government regulators, each of which had its own identity and asserted its own authority" (Davis, 1999, p. 66). Surveyors and Civil Engineers also established institutions around this period.

In the sector of building work that the architectural profession was involved in, the architect's role became pivotal in maintaining control over all aspects of the design, contractual agreements and construction under the traditional method. The architect was nominated as the leader of the team (Peters, Whitman, & Hampson, 2001; Smith, Love, & Jackson, 1999). Client involvement in decision-making in the design and construction

process were kept to a minimum (Smith et al., 1999). The contractor became contractually bound to build according to the drawings and specifications and to the satisfaction of the architect, rather than to an agreed performance. The formal structure governed the nature of the relationship and influenced the informal structure (Davis, 1999). The traditional contract dictated the basis of the traditional way of working.

The architectural profession encouraged the notion of the hero architect and leader of the team through its embedded culture. This influenced the education and training of new architects and through the institution endorsing this type of behaviour, the cycle continued into practice. "Collaboration has been seen by many architects as the greatest single threat to their long established position as the 'natural leader' of the team..." Nonetheless, Muir reflects that this is often proven to be untrue "...not only in functional and aesthetic terms, but also in technical, management and cost control aspects" (Muir, 1995b, p. 15). Yet the architectural profession has a strong reluctance to let go of this leadership role (Peters et al., 2001), even though alternative methods other than collaborative ones have increasingly marginalised the role of the architect, who has often been replaced by emerging roles, such as the project manager (Davis, 1999; Smith et al., 1999).

The idea of the architect's separateness and superiority over those that build, perpetuated by the traditional methods clear hierarchy of control, has created a growing schism between architects and the rest of the AEC industry (Peters et al., 2001; Smith et al., 1999; Smith et al., 2004). This has been intensified by the architect's inherent belief that the notion of design was "an intellectual activity separate from craft and building" (Davis, 1999, p.118).

This need for supremacy amongst architects and others within the industry has exacerbated silo behaviour and disparate agendas between the different disciplines (Rance et al., 1995; Saxon, 2001). "The social, cultural and legal gulf between professionals and trades became a barrier to collaboration" (Saxon, 2001, p. 8). The outcome has been a lack of communication, transparency and trust, far removed from what Davis (1999) defines as a healthy building culture, and has subsequently resulted in a rise in litigation (Kumaraswamy & Matthews, 2000). Fragmentation and blame happened within the industry at a time when collaboration was needed more than ever due to the growing complexity of the building process (Buntrock, 2001; Davis, 1999; Muir, 1995b).

2.5 The ongoing role of the professions

This long-standing fragmentation within the AEC industry has become a barrier to collaborative working between the different disciplines. "For at least the last 70 years, reviews of the construction industry have relentlessly criticised its fragmentation and adversarial attitudes" (Holti, Nicolini, & Smalley, 2000, p.10). As shown, this fragmentation arose not out of efficiency, but out of each disciplines' desire to increase their positioning and importance within the industry (S. D. Green & Lenard, 1999; Kumaraswamy & Dulaimi, 2001). In fact, these boundaries have led to inefficiencies and delays (Cave, 1995) and have resulted in undermining trust and establishing more divisive means of procurement (Baird, 2002). What is now emerging as Rance et al.(1995) suggest is the view "that traditional professional demarcations are untenable and new collaborative team work approaches are required involving partnership between all interested parties" (p. 160). AEC industry leaders have realised the limitations of separating the disciplines and are taking steps towards breaking down these barriers and adopting new ways of working (Strogoff, 2005).

Over the last couple of decades, many architects have begun to adopt alternative methods of procurement (Strogoff, 2005). Yet, by adopting an alternative method the architect steps outside what is deemed as 'appropriate behaviour' by the professional institution and places themselves at a perceived greater risk

(Rance, 1995). If an architect is to provide services outside the traditional mould it is important that they understand the roles, responsibilities and risks associated with the different delivery systems and how it will impact on the final outcome. In recognition of this, the International Union of Architects, (UIA) have created a policy on Building Project Delivery Systems, which outlines how architects can assist clients in selecting the best building project delivery system to achieve the desired outcome. It states, that

The education and training of architects has, until recently, been orientated towards the traditional relationship between architect, project client and builder, and the lump sum contract....However, this traditional method has regularly been challenged....and when other methods are used the role of the architect may change.... Alternative building project delivery systems have evolved, which can, in some cases have advantages over traditional methods... (International Union of Architects, 2005, p. 2).

The NZIA, whilst it accepts that architects engage in alternative methods, adheres to the superiority of the traditional process. It ignores the consequences of the prevailing trend towards collaboration and the UIA's determination to inform architects of alternative methods and responsibilities. (UIA, 2005). The NZIA as a member of the UIA, and to keep abreast of the trends within the international AEC industry, need to examine its current policy towards solely promoting traditional practice. Currently all types of contracts provided by the NZIA are traditional, its promotional material, the Good Architectural Practice Guide and Practice Notes support traditional methods of building project delivery. Considerable focus and investment is spent on updating and advocating the traditional method and contracts. However, leading experts believe that the traditional method is at least 10 years out of date and "we should not let our documents, our own processes shut us out of an increasingly flexible and competitive world" (Sutherland, 2000).

Paradoxically, whilst the NZ architectural professional institution holds on to the traditional paradigm, change towards alternative methods continues to occur within the AEC industry, where many large architectural firms are engaged in alternative practice. The majority of these alternative methods challenge the architect's role as leader, where often the architect becomes marginalised. It is important that architects have a voice in determining best practice and avoid being sidelined. Athfield (2006) was elected president of the NZIA in 2006. He has perceived this trend and identified it as important and states "that we start talking more about the framework rather than the object, which will widen the role of influence on the one hand and diminish the role of design control on the other" (p. 3).

On a positive note, change is beginning to occur amongst other architectural professions. The Royal Australian Institute of Architects (RAIA) have begun to make overtures towards recognising the potential of collaboration into their policy documents, even though there is still reluctance towards collaboration in the fear that it reduces the architect's leadership role. The AIA and the RIBA are addressing issues of process and recommend alternative methods of procurement that encourage collaborative practice (Buntrock, 2001; Davis, 1999; RIBA, 2001, 2002; Strogoff, 2005). Prasad (1999) challenges the architects profession in the UK as a collective, to embrace the change that is occurring, especially in light of the obvious benefits to the quality of built environment. This acceptance is particularly vital if the profession claims to be among the leaders in the AEC industry. Prasad (1999) states therefore, that it is imperative that the profession not resist collaboration and the integration of design and construction raised by the Egan report, but rethink how to improve their role in the procurement process. Other architects lend support to this by arguing that a collaborative approach is not only required, but has the ability to improve the end result (Alexander, 2002; Buntrock, 2001; Davis, 1999; MacMillan, Spence, & Kirby, 2001).

Alexander (2002), Buntrock (2001), Prasad (1999) and Spence (2001), who are all architects, recommend that we expand beyond the damaging myth of the isolated, hero architect and reverse the growing isolation of

architects that generally causes designs to become “more conservative, and our profession less essential” (Buntrock, p. 175). Robert Gutman, author of *Architectural Practice: A Critical View* (1988) predicted that “architects will have to learn to share responsibility with other professions and organizations in the building industry” (cited in Buntrock, 2001, p. 80). To achieve this, the profession needs to reengage and value their relationship with the process of building, and view each disciplines role as important to the whole. Part of this involves a change in perception to realise the importance of the process to the final outcome. This requires the different institutions within the AEC industry to become more open and transparent to enable them to work together (Davis, 1999; Rance, 1995). This can be supported by open dialogue, exchange of information, and organising joint initiatives between different disciplines within the industry, such as the Construction Industry Council (CIC) in the UK, and the recently formed NZCIC.

What is certain, is that changes from the traditional project delivery strategy to other alternative strategies, especially collaborative ones is definite and is happening now (Strogoff, 2005). It is important that the NZIA play a part in this rising momentum towards collaborative practice and be proactive in endorsing alternative methods of project delivery that maintain the value and respect of the architectural profession. This will require a cultural shift not only from the architectural profession but also within the whole AEC industry.

The question is whether the NZIA and other bodies within the NZ AEC industry are flexible and willing enough to change and evolve to redefine the roles and the process of creating architecture towards a more collaborative framework. Part of the Literature Review will examine a holistic collaborative model that encourages and supports creativity, on-going learning and teamwork within a systemic framework, four key dimensions that underpin Design Management. Prior to that, the Literature Review will address the burgeoning pressure to deliver value-driven, innovative and sustainable architecture, which leads the AEC industry to question the effectiveness of the traditional model and assess a new way forward.

LITERATURE REVIEW

A shift of paradigm can happen purposefully, by an active process of learning and unlearning. More commonly, however, it is a reaction to frustration produced by a march of events that nullify conventional wisdom. Faced with a series of contradictions that can no longer be ignored or denied, and/or an increasing number of dilemmas for which prevailing mental models can no longer provide convincing explanations, most people accept that the prevailing paradigm has ceased to be valid and that it has exhausted its potential capacity (Gharajedaghi, 1999, p. 8).

3.0 Introduction

There is an extensive body of literature arguing that the traditional building project delivery system, under the influence of the predominant reductionist paradigm has been unable to consistently deliver in achieving value driven, innovative and sustainable architecture (Buntrock, 2001; CII, 1996; S. D. Green & Lenard, 1999; Kumaraswamy et al., 2004; Latham, 1994; Rowlinson, 1999). The research undertaken, verifies the many reasons why the traditional method is unable to constantly deliver on these expectations. Worldwide research within the industry over the last two decades has sought to understand, mitigate and reverse the adversarial patterns underpinning the industry.

Kumaraswamy & Dulaimi (2001) affirm the point made in the above quote from Gharajedaghi, that the AEC industry has indeed reached a critical turning point. Rowlinson (1999) reiterates this view and writes that "factors have combined to force the construction industry into the position where it has to change to survive" (p. 36). Turner (1994) further states that "it is necessary to embrace an alternative to existing practice; a technique which will offer an opportunity to revive the industry and restore confidence in it" (cited in S. D. Green & Lenard, 1999, p. 75). Davis (1999) further argues that even though the traditional method was well-intentioned, the complexity of architecture and the growing changes the industry faces, requires the industry to either evolve willingly or out of necessity, or else take the risk that it might be left behind. "...a building culture that attempts to exist only by its own rules, paying no attention to the culture around it, will become irrelevant" (Davis, 1999, p. 89).

3.1 Why the traditional building project delivery system does not work

As raised in the background, particular practices and separations within the AEC industry have developed for historical, economic and cultural reasons. They have become entrenched and have produced negative consequences, sometimes exacerbating the very problems they were supposed to address. This is because the traditional building project delivery system is based on control and is unable to deal with the innate complexity in the design and construction process (Latham, 1994). It does not consistently work because its formal structure, that is the contract, policies and procedures, inherently reinforce adversarial behaviour (Kumaraswamy & Dulaimi, 2001; Smith et al., 1999). Thereby, impeding trusting relationships to develop between the people involved. Identified below are some of the common themes that support this premise.

3.1.1 Relationships

In the traditional building project delivery system formal structure, relationships are rule-bound, authority based and closed. Under this method, these relationships create a master-servant culture, where the 'servant' to the client becomes 'master' to the supply chain, forming a hierarchical pyramid (Ross, 1999). Formal relationships between all players lack trust and respect which led to claims, litigation and ultimately client dissatisfaction (Kumaraswamy & Matthews, 2000; Ross, 1999). Langford, Kennedy and Sommerville (1992) affirm that the adversarial attitudes between members of the team exist because teamwork is inhibited by the contractual agreements between the parties (cited in C. Green & McDermott, 1996, p. 469).

The separate contractual relationships between client and architect, and client and contractor, reinforce the lack of integration between design and construction. This can often lead "into destructive conflict between organizations separately accountable for two set of priorities" (Holti et al., 2000, p. 15).

This is not to imply that every traditional building project delivery system ends up in an adversarial situation, but as Holti, Nicolini, & Smalley (2000) suggest, this "is all too often in spite of the system of procurement, rather than because of it" (p. 10).

3.1.2 Separation of design and construction processes

The traditional way of working separates the design from construction (Davis, 1999; Muir, 1995b). This separation between design and implementation is unique to the AEC industry (Wearne, 1997). It creates a linear progression of the design and the construction process, where each part is performed sequentially and independently from another (Rowlinson, 1999). It therefore limits the opportunity for contractors and supply chain to participate and add value to the design and documentation (Blockley & Godfrey, 2000; Holti et al., 2000; Rowlinson, 1999), often resulting in a lack of practical design solutions (Smith et al., 1999). The inability or willingness to participate and provide feedback is further reinforced by potential legal ramifications under the traditional contract (Buntrock, 2001). Holti et al., (2000) sums up the limitations of this separation and states that "this largely sequential approach typically results in a lack of integration between design, construction and maintenance methods, leading to a host of inefficiencies and inferior value, as well as poor margins" (p. 28).

The separation of design and construction, perpetuates the rigid divisions between the different disciplines (Rowlinson, 1999) which has been perceived as inhibiting innovation (Kumaraswamy & Dulaimi, 2001). As discussed in the background, these divisions have led to fragmentation and silo behaviour between the disciplines, promoting positional strongholds. What this implies is a reduction in the understanding of the whole, and a decrease in each discipline's realisation of being responsible for the whole outcome, reducing the willingness to collaborate with others (Senge, 1994). Furthermore, this practice hampers the ability to deliver efficient and quality architecture (Construction Task Force, 1998). A growing number of clients have realised the shortcomings of this separation, resulting in their reluctance to adopt the traditional building project delivery system (Smith et al., 1999).

3.1.3 Team selection

Under the traditional method, the contractor is generally selected on competitive tendering and is typically chosen on lowest price rather than on value (Rowlinson, 1999; Smith et al., 1999; Warren, 2006). This process of selection also includes the supply chain who produce a significant amount of the work (Holti et al., 2000). The RIBA (2001) states that this method does not provide a guarantee that the team is aligned to the client's purpose and objectives, or if they have the right level of skill, as these aspects are not included as part of the selection process. It further exacerbates the contractor's desire to contribute as "fixed lump sum contracting awarded to the lowest bidder has promoted an adversarial approach to establishing a contract.... It misses the point that it tends to eliminate the contractor's incentive to add value through his ability to work with the owner to meet his objectives" (Blockley & Godfrey, 2000, p. 242). Sir John Egan requests "to see an end to lowest cost tendering as the main procurement tool of this industry and to replace this wasteful and unpredictable process with one where clients procure value for money against world class benchmarks..." (Strategic Forum for Construction, 2002, p. 7).

3.1.4 Communication

Under a fixed lump sum tender the entire project requires to be resolved in advance (Davis, 1999; McDermott, 1999). Consequently, this has created the need for completely specified documentation prior to commencement of the work. The drawings and specifications have become central to the contract, and over the last two centuries have become increasingly more detailed and extensive (Davis, 1999). Subsequently, the traditional method relies heavily on the documentation as its main source of communication (Davis, 1999). Documentation, on its own, can never impart all necessary information or concerns. What often results is that the contractor, when pricing, adds significant risk margins to cover unknown or grey areas (Buntrock, 2001).

Another problematic area is the ineffective communication and resolution between the different interfaces of all those involved in the process, that is, the client, professionals, contractors and the supply chain (S. D. Green & Lenard, 1999). The lack of transparency and limited disclosure of information perpetuates mistakes and misinformation (Muir, 1995b).

3.1.5 Cost

Under the traditional building project delivery system, each member of the team instead of working to help each other profit, seeks to gain maximum profits from the other members involved (Holti et al., 2000). The contract policies reinforce this behaviour, as there is no commercial incentive to look after each other. This creates silo defensive behaviour. The Construction Industry Research and Information Association (CIRIA) describes this as 'vicious circles in construction procurement' under the traditional method of delivery (cited in Rowlinson, 1999). Refer to Figure 3.0 below. Depending on other variables, this cycle "leads to a claims-conscious behaviour and can also stimulate reductions in quality and functional performance" (Rowlinson, 1999, p. 36).

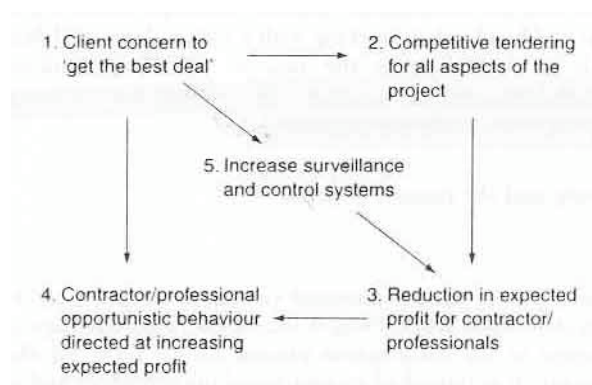


Figure 3.0 Vicious circles in construction procurement (Rowlinson, 1999, p. 35)

Whilst recognising cost as an important measure to consider, too often, under the traditional process, it becomes the primary measure that all others comply to (Blockley & Godfrey, 2000). Further, despite the assurance of the fixed lump sum tender, this rarely occurs and the cost often escalates uncontrollably through variations (Blockley & Godfrey, 2000).

3.1.6 Risk allocation

Many of the adversarial conditions are caused by inappropriate risk allocation, that is, under the traditional method the client transfers the risk to the main contractor without considering the overall implications to that decision (Ross, 1999). According to Warren (2006) clients who "attempt to totally 'transfer' risk rarely succeed" (p. 32). In addition to this, Kumaraswamy & Dulaimi (2001) state that the allocation of risk under

traditional contracts stifles the willingness to explore and engage in creative practice. Kumaraswamy et al.,(2004) reiterate this point, and state that the "separated risks allocation/management frameworks discourage innovations in design, construction and even managerial methods" (p. 323).

Risk assessments for specific projects are often overlooked and if created, are usually by one discipline rather than a collaborative effort (Smith et al., 1999), minimising the chances of collective agreement on the risks. It further reduces the ability to actively work together to mitigate risk areas.

3.1.7 Penalties/retentions

The policies under the traditional project delivery system reinforce defensive behaviour by adopting disincentives such as retentions, liabilities and penalties (Kumaraswamy & Dulaimi, 2001).

3.1.8 Person marking and paper wars

The traditional approach to procurement has encouraged adversarial, or defensive behaviour, such as 'person marking' and 'paper wars' resulting in significant time and money allocated for preparing potential and actual claims. 'Person marking' is part of traditional contracts and encourages both sides of the contract to preserve the contractual entitlements. Time spent on mitigating adversarial concerns reduces the time to focus on achieving the collective outcome (Buntrock, 2001; CII, 1996; Cockshaw, 2001; S. D. Green & Lenard, 1999; McDermott, 1999).

3.1.9 Culture of blame leads to claim culture

The traditional formal structure does not acknowledge the behavioural aspects created in the relationships between the people involved. It seeks to control the process through its practices, procedures and policies that are penalty based rather than empowering. Practices and procedures such as separating design and construction, the competitive tendering process, the win-lose cost procedure, the lack of transparency and the allocation of risk, all reinforce an adversarial culture. The result of this leads to rising litigation, cost blow-outs, delays, excessive waste and reduced quality (Buntrock, 2001; CII, 1996; S. D. Green & Lenard, 1999; McDermott, 1999).

3.2 Ways forward in the AEC industry

Blockley & Godfrey (2000) state that the AEC industry in the UK, US, Europe, Asia and Australasia is aware of the need to change, and this awareness has resulted in the industry investing significant research, time and money to forge new ways forward. From these investigations, a persuasive argument has arisen. It has led to the realisation that the traditional building project delivery system is unable to effectively deliver in an increasingly complex environment. What has been revealed is a collaborative system that nurtures trust and mutual respect is key to delivering a shared purpose, such as value-driven, innovative and sustainable architecture. While the principle focus of this study has been on the UK experiences, as they are leading this research, work has been done in other European countries and the USA in particular. Outlined below, are several key studies that have provided pivotal impetus for the AEC industry acceptance for the need to change.

3.2.1 Constructing the Team

Sir Michael Latham's report 'Constructing the Team' was a joint UK government-industry report implemented by the Construction Industry Council (CIC). In this report, Latham (1994) identifies and sets the stage for many of the resultant changes over the last decade. In it, he highlights the consequences of a fragmented and adversarial culture. As the title of the report suggests, he recommends that the way forward is by improving

the relationships between the parties through effective teamwork (Kumaraswamy & Matthews, 2000). Latham identified the need to shift the AEC industry from its adversarial behaviour towards collaboration based on the foundations of trust. "Trust was seen by Latham (1994) as the gatekeeper to any real progress in improving procurement and contractual relations in the UK construction industry" (McDermott, 1999, p. 9).

The report advocates key principles for the AEC industry to implement, to ensure delivering client objectives through effective teamwork. These principles are performance, efficiency and being fair to all. To achieve this, it was recommended that the design and construction process be reintegrated and to eliminate competitive tendering. In addition, all those involved should share incentives to motivate a unity of purpose. As a consequence, to achieve these principles, changes were required to the current procurement process. The report proposes new forms of contracts that adhere to this new set of principles rather than adding onto or amending existing adversarial contracts (Blockley & Godfrey, 2000; Latham, 1994; McDermott, 1999).

It was recognised that acceptance of this way of working required a mature client willing to remunerate fair market prices rather than lowest price, even when the economy was low. To achieve this, Latham (1994) recommended on-going training for public clients and a forum for private clients to enable them to take an active role in realising best practice in architecture.

3.2.2 Building down Barriers

Another initiative was The Building down Barriers (BDB) programme that commenced in 1997 to create a learning mechanism for establishing the working principles of supply chain integration, a key idea that continued to gain momentum in the Rethinking Construction report in 1998. The original parties involved in BDB were the Defence Estates (part of the MoD) and the two pilot projects' design and construction teams. The R&D was handed to the Design Build Foundation (DBF) in 1998/9 with a view that the DBF take the initiative forward and develop the learnings into a standardized model, which could be applied universally.

The BDB emulated best practice from other industries, especially around the benefits of supply chain integration. For effective supply chain integration, BDB identified a set of principles, policies, practices and procedures required. When applied in the design and construction process, it enabled "delivering value to the end customer and eliminating waste at all points during the supply process" (Holti et al., 2000, p. 19).

The BDB Taskforce decided upon an integrated design and construction 'single point responsibility' strategy, for the implementation of the pilot projects. They attest that many of the principles, practices and procedures can be transferred to other project delivery strategies, especially collaborative-based strategies, such as strategic partnering. Seven key principles were identified during the pilot projects. Each of these principles is interdependent and mutually inclusive. These principles formed the basis of a model that could be applied universally. The Collaborative Working Arrangement (CWA) is one such example, and is the architectural project delivery system studied in this research. The seven principles are briefly summarised below.

Principle one, 'Compete through superior underlying value' understands value for the client is both a combination of quality and price. This is achieved through continuous improvement; reducing cost by eliminating waste and inefficiency throughout the project, whilst ring fencing everyone's agreed margins. "Everyone has the security and investment that is needed to undertake the continuous improvement or innovation required" (Holti et al., 2000, p. 22).

Principle two, 'Defining client value' was a conscious decision to shift the emphasis away from focusing on price alone, to include a broader performance measure. BDB assessed the client's value through defining "client need in output terms, and design for through-life performance" (Holti et al., 2000, p.23).

Principle three, 'Establish supplier relationships' recognises that "the products and services provided by the companies in the supply chain typically account for 80% of the total costs of a construction project" (Holti et al., 2000, p. 26). It therefore becomes apparent that the supply chain involvement has a significant impact on the success of the project. The BDB conclude that long-term relationships provide the grounds for trust and collaborative practice. By establishing long-term relationships that are open, honest and fair, leads to continuous improvement and innovative solutions.

Principle four, 'Integrate project activities' adopts a process called simultaneous engineering, which is a cyclical approach that develops the design, construction strategy and costs in tandem with each other. This includes early involvement of key players, including the supply chain. On completion of the design stage, multi disciplinary clusters are formed to take "responsibility for the design and delivery of a major element of a facility, working to reduce costs, improve value and minimise waste within a defined scope" (Holti et al., 2000, p. 92).

Principle five, 'Manage costs collaboratively', where cross-functional teams, including the supply chain, work together to ensure that the design and costs are managed effectively. Target costing, is part of this process and involves determining a fair market price for the work involved. The client is actively involved in this process. The price is divided into separate components, where the margins are protected, the risk allowance is identified and the component and process costs are determined. This allows two areas to improve upon – minimising or eliminating the risks and secondly, seeking improvements to the detailing, supply and implementation of the work, without reducing the margin.

Principle six, 'Develop continuous improvement', a practice adopted from other industries, and "the vehicle for achieving long-term improvement, in terms both of what is delivered to the client and of profitability of the whole supply chain" (Holti et al., 2000, p.38). Holti et al., (2000) define continuous improvement as "the continual search for better ways of carrying out all projects and business activities. This involves multifunctional teams who understand, map and measure existing work processes, then apply problem solving techniques to reduce waste of material and labour" (p. 92).

Principle seven, 'Mobilise and develop people', is included to help those involved unlearn defensive behaviours entrenched within the industry as a whole. The other six principles are dynamically opposed to traditional approach, and people need coaching to understand the advantages of changing their behaviour and making it integral to their practice. Holti et al.,(2000) outline four key mechanisms to effectively promote change. These being, "visible, systematic commitment from the top, facilitation for project teams, training in new skills and economic incentives" (p. 41).

It is beyond the scope of this document to go into detail about the practices and procedures that were implemented, although some key points raised are the following. It was identified that the clients need to be actively involved throughout the process to ensure that their objectives are met and to understand strategic decisions. "The core of the BDB approach is to maximise understanding of client and user requirements before site work begins in order to minimise the chance of design changes being required once construction work begins" (Holti et al., 2000, p.51). And secondly, selecting the right team for the project. The BDB philosophy clearly shifts away from the traditional model. To help embrace this shift the BDB Task Force provided

workshops and handbooks clearly outlining the principles, practices and procedures required under this integrative approach.

Stewart Rix, the co-creator of CWA in New Zealand, was the Chairman for the 'Building Down Barriers' Taskforce. Through his involvement, he adopted the learnings undertaken, and implemented the principles, practices and procedures into CWA's formal and informal structure.

3.2.3 Rethinking Construction

The Rethinking Construction report was published in 1998 in the UK and was an initiative undertaken by the Construction Task Force, to investigate how to deliver quality buildings that achieve maximum value for clients and the end-users. It assessed and continued the work undertaken since the Latham report in 1994. Sir John Egan, who chaired the Task Force, challenged the AEC industry "to commit itself to change, so that, by working together, a modern industry could be created, ready to face the future" (Strategic Forum for Construction, 2002, p. 7). To do so, the report concluded, key areas needed to alter. These were: recognising that the AEC industry as a whole needed to improve rather than shifting the blame; acknowledging the crucial role the client had in the process; eliminating the lowest price tender to promoting instead a value and quality driven price; integrating the design and construction process, (including the supply chain); establishing long-term relationships and thereby incorporating measures that reinforce its commitment to people; implementing continuous improvement procedures; extending the performance measures to include health and safety and reduction of waste from construction sites, as well as predictability, cost, time and quality; and highlighting the concern for the low research and development by the industry, which included insufficient training and skills within the workforce (Blockley & Godfrey, 2000; Construction Task Force, 1998).

These key areas of change clearly indicate a departure from the traditional method. Overarching these changes was the willingness to nurture healthy relationships between all those involved in the project, as people were recognised as fundamental to the process (Construction Task Force, 1998). This shift in thinking clearly supports the ideas expressed in the background, in that relationships between the participants need to be acknowledged within the formal structure of the project delivery system. For this to realistically occur, it was identified that the building project delivery system's practices, procedures and policies require to be fair and respect "all participants in the process, involving everyone in sustained improvement and learning, and a no-blame culture based on mutual interdependence and trust" (Construction Task Force, 1998, p. 14).

To realise these key areas of change, targets were set against them to monitor improvements towards delivering improved quality and value-driven architecture. Blockley & Godfrey (2000) in their summary of Rethinking Construction, reiterate that "to achieve these targets the industry will need to make radical changes to its processes. These need to be explicit and transparent to the industry and its clients"(p. 6). They suggested the process required a holistic delivery system to achieve these targets. This reinforces the move towards the formal structure of the project delivery system to include technical and behavioural aspects to be able to deliver on these changes.

To help the industry 'rethink construction' and execute the necessary changes, the UK's Office of Government Commerce (OGC) launched a three year initiative in 1999 "Building on Success: The Future Strategy for Achieving Excellence in Construction. The programme identified 10 Achieving Excellence Guides. Achieving Excellence Guide 5 clearly states that only through fully integrated project teams can they reach the Achieving Excellence targets in construction agreed by the UK Government (OGC, 2003b). It reads as follows:

The integrated project team. This guide explains how to work together as an integrated project team. The principle is simple: client and suppliers working together as a team can enhance whole-life

value while reducing total cost, improve quality, innovate and deliver a project far more effectively than in a traditional fragmented relationship that is often adversarial. Collaborative working should be a core requirement for each element of every project. Putting it into practice through team working and partnering requires a real commitment from all parties involved, but brings benefits that far outweigh the effort involved (OGC, 2003a, p. 2).

The above guide is an explicit signal that collaboration is the way forward in realising this paradigm shift.

By 2002, over 1000 construction organizations in the UK actively supported this initiative. A large number of demonstration projects were implemented to measure and evaluate the performance of these key areas of change. To measure and evaluate the wider set of performance measures, 12 Key Performance Indicators (KPIs) were created. "Taken together, these projects substantially outperform the average of the UK industry against the key indicators.... demonstration projects are consistently exceeding the targets in 'Rethinking Construction'" (Strategic Forum for Construction, 2002). This indicates that the shift towards a collaborative model not only creates a better working environment for people involved, it also outperforms the 'ordinary' measures, emphasising the limitations of non-collaborative building project delivery systems.

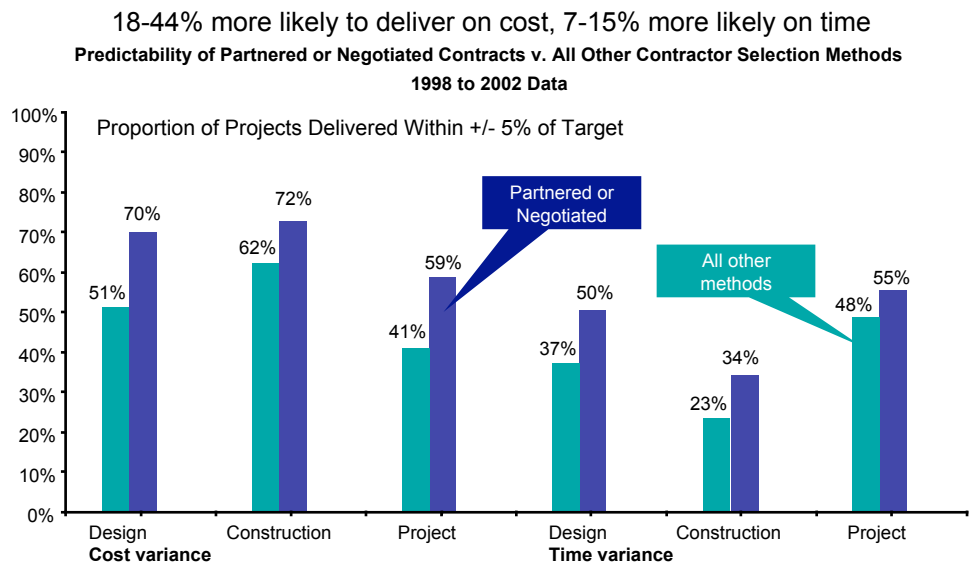


Figure 3.1 The business case (Source: Constructing Excellence, UK, 2006)

From an architectural perspective, it is to be noted that design was considered a vital aspect in delivering these outcomes, as highlighted in a quote by the Deputy Prime Minister, Rt Hon John Prescott (1999) in the UK at that time. He states that

...good design is an integral and essential part of 'Rethinking Construction'. It is a key to many of the performance targets; it is a key to reducing construction time and defects; it is a key to sustainability and to respect the environment. In the broadest sense it is the key to respect people, whether they be users of a building or passers by.... (cited in MacMillan et al., 2001, p. xiv).

3.2.4 Accelerating Change

The Accelerating Change report, launched in 2002, continued the ideas and implementation strategies already undertaken as a result of 'Rethinking Construction'. The four key issues that the Strategic Forum for Construction (SfFC) nominated to focus their attention on to help the AEC industry realise these changes, were the need for:

- client leadership

- integrated teams and supply chains
- to address 'people issues', particularly health and safety during construction
- and enhancing the value of the product (Strategic Forum for Construction, 2002, p. 19).

They recognised that these four issues were mutually interdependent, and that one could not progress to the detriment of the other. This indicates a shift away from the prevailing reductionist paradigm to adopting a systemic understanding of the whole. The diagram below articulates the interconnected relationships of an integrated team and specifically includes the client within the team model.

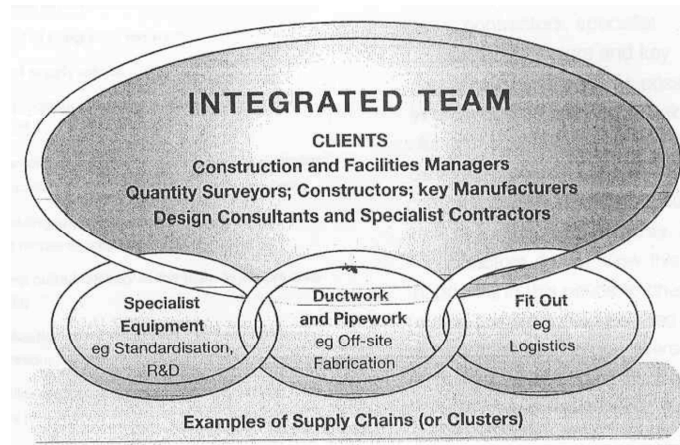


Figure 3.2 An integrated team (Strategic Forum for Construction, 2002, p. 25)

Flowing on from the overwhelming success of the initial targets set under 'Rethinking Construction', new targets were established. One example being that by 2007, 50% of construction projects in the UK, are expected to be undertaken by integrated teams (the integrated team includes the supply chain) (Strategic Forum for Construction, 2002). Leading by example, the Strategic Forum for Construction (SFFC) have formed a 2012 Task Group "to establish a single over-arching strategic group to focus on ensuring the early adoption of best practice across Olympic projects to apply across the whole spectrum of activity (effective leadership, supply chain management, industry improvement, respect for people, innovation) and concerned with the procurement processes, project delivery and the crucial issues of post-2012 legacy" (SFFC 2006, p. 1). This has been endorsed by the Olympic Delivery Authority (ODA) who in their draft policy "subscribe to integrated/collaborative procurement approaches and to the principles of the Egan and Latham reports and OGC's Achieving Excellence in Construction Initiative" (ODA, 2006, p. 2).

These initiatives and practices reinforce the movement away from traditional delivery strategies, to the extent where the UK Government, in its Office of Government Commerce (OGC) Procurement and Contract Strategies Guide, states that it will rarely approve funding on projects that use the traditional method (OGC, 2003b). This is reiterated in SFFC's report where it states that "traditional non-integrated strategies will only be used where it can be clearly shown that they offer the best value for money which means in practice they will seldom be used" (Strategic Forum for Construction, 2002, p. 24).

3.2.5 Ways of working in Japan

Other AEC industries beyond the western AEC industry understand the benefits of collaborative working. Japan's AEC industry has typically operated under collaborative models and did not adopt the traditional method undertaken by the western AEC industry during the Industrial Revolution. Only in the last couple of decades, under the pressure of USA industry working in their country, has Japan been forced to begin to adopt the traditional project delivery system, and as a result has become more adversarial. Aside from that, Japanese architecture has often been noted for its consistent ability to produce innovative and quality work

(Buntrock, 2001; Cockshaw, 2001; Davis, 1999). For this reason, Buntrock (2001), a practicing architect, studied the Japanese AEC industry's typical way of working, as she realised that their process was different to the prevalent traditional method undertaken in the Western AEC industry. Some of her findings do not reflect the pure notion of collaboration, yet predominantly the principles, practices and policies typical of the Japanese building project delivery system reflect a collaborative approach and confirm the advantages this has for achieving innovative architecture.

Whilst it is important to acknowledge the impact the Japanese culture and other variables, such as political influence, has had on the success of collaborative work under their system, several key collaborative practices are identical to the trends emerging in western AEC industry. Understanding Japan's way of working reinforces the advantages of the western AEC industry in adopting best practice and ensuring that the destructive aspects are not incorporated. The best practices are identified below.

The first being, the recognition that Japanese architects and the rest of the team place on the influence the process has to the outcome. Understanding the importance of process, leads to the integration of design and construction, providing many opportunities for the design to evolve during construction. Documentation and drawings are typically not legally binding and therefore seen as secondary to the design intent, which is articulated between the team. Details are resolved during construction, resulting in variations, prototypes and experimentation being seen as necessary and accepted as part of the process. To help this, shared working environments usually at the construction sites between different disciplines, is the norm.

Secondly, leadership is shared amongst the team. The architect's role, whilst honoured, is seen as part of the whole. Everyone's role is valued. The roles are defined, yet the demarcation between each discipline's boundaries is flexible, resulting in an expectation to contribute beyond one's domain of knowledge. Innovation is often a common objective for the whole team, including the contractor. A strong collaborative model shapes the procurement process, where everyone involved has an opportunity to play a significant part in informing the design and construction. This process draws on the diverse knowledge, complementary skills and expertise of everyone involved. Management emphasis is on trust rather than control, supported by responsibility being delegated to each tier of the team.

Long-term relationships are typical in Japan's AEC industry, the *keiretsu*, can be translated as "grouped corporate alliances, both those that involve subcontractors and others" (Buntrock, 2001, p 91). Whilst these relationships have sometimes been abused, when operating under the principles required under a true collaborative model, they have shown many benefits. The "individuals develop an awareness of the values, tacit knowledge and opportunities offered by their counterparts" (Buntrock, 2001, p. 55). The process naturally incorporates learning as part of practice.

The interdependent nature of collaborative relationships leads to a more trusting environment and a greater disposition towards introducing innovative practice. Buntrock (2001) saw the significant impact trust had on teamwork. Communication based on respect, openness and honesty, and the attitude to focus on the situation rather than personalities were part of establishing high levels of trust. Further, when mistakes occurred, she generally witnessed collaborative resolution rather than assignment of blame. One procedure that reinforces this premise is the team undertaking a site visit of the project, one year after completion, to learn and improve on the long-term performance of building.

Buntrock's (2001) research is aligned to current research and practice being endorsed by western AEC industry and indicates the likely success of achieving an agreed purpose through collaborative practice.

3.2.6 Key trends in the NZ AEC industry

The New Zealand Construction Industry Council (NZCIC), a multi disciplinary body was formed in 2003 to work together for the betterment of the whole industry. They published the Design Documentation Guidelines for the management of the design process in 2004. They recently published a draft document for discussion; on Best practice Guidelines for Construction Procurement heavily based on international research. Additional to this, the recently formed Constructing Excellence (CE) NZ formed the Construction Clients Group in 2005 and the Partnering Network in 2006. The Partnering Network is aimed at educating the NZ AEC industry in alternative project delivery systems such as collaborative working, to enable best practice.

The Key Performance Indicators (KPI's) that have been identified by Constructing Excellence UK (CE) to deliver best practice in the UK AEC industry have been literally transferred by the NZ Centre for Advanced Engineering (CAE) to the NZ AEC industry in 2005. These performance measurements aim to inform the industry whether a project has been successfully delivered and to provide valuable feedback for improvement. The KPI's introduced, predominantly lie within the 'ordinary' aspects, but also include 'extraordinary' aspects, such as client satisfaction and physical safety during construction. By measuring other aspects beyond price, the aim is to shift the prevalent lowest price mentality that prevails in NZ AEC industry, which supports adversarial behaviour and is thereby detrimental to innovation (CAE, 2004).

Warren (2006) warns the disadvantages the NZ AEC industry faces as it continues to fall behind developments and trends towards better practice overseas. In the BUILD April/May 2006 journal the NZ CAE has referenced the need to extend the KPI's to measure human resource management and environmental performance (BUILD, 2006). This is in keeping with the emerging AEC industry's acknowledgement of the need to incorporate the 'human' aspects, and the environmental aspects within the building project delivery system (Blockley & Godfrey, 2000; Cole, 2006a; Strategic Forum for Construction, 2002).

Sustainability is also becoming accepted as integral to NZ architectural practice. Identified below are key strategies and groups that have recently formed in New Zealand over the last few years. These are the strategy to include sustainable development in the New Zealand Building Act 2004 and therefore the new Building Code, to be introduced in 2007 (Robertson, 2006); the Government 2003 Sustainable Development Programme of Action and the Govt³ programme; BRANZ commitment to sustainability, indicated by the number of articles on sustainability in the BUILD journal over the last few years; plus the recent release of the Sustainable Foundations Toolkit; the formation of the Sustainable Building Cluster in 2005, part of the Sustainable Building Network; the creation of Beacon Pathway in response to NZ agreeing to being part of the Kyoto Protocol; and the establishment of the NZ Green Building Council in 2006. Beacon Pathway conclude, that for sustainability to be realised there needs to be a change from the traditional design and construction practice to adopting a collaborative model (Beacon Pathways, 2006). Refer to Appendix 1 for more information.

3.3 In summary

In summary, the prevailing traditional paradigm has ceased to be valid and collaborative practice is endorsed for the ongoing survival of the industry. The research advocates that "...modern collaborative practice is necessary to respond to current challenges facing the construction and development industry..." (Muir, 1995a, pp. 49-50). Many AEC industry leaders agree that there is a trend towards collaborative project delivery systems (S. D. Green & Lenard, 1999; Strogoff, 2005). Collaboration does take time and initial capital, but research has shown that this commitment is invaluable to its long-term success. Von Hippel, in *The Sources on Innovation* (1988), cites an example "where the costs of teamwork on a \$30 million engineering project were assumed to add \$50,000 to implement – but to have resulted in savings of close to \$1 million" (cited in

Buntrock, 2001, p. 50). Further, collaboration reduces the likelihood of litigation, which is always an expensive option (S. D. Green & Lenard, 1999).

The overriding message; for collaboration to occur there needs to be a trusting environment. To achieve a trusting environment, the governing principles, practices and procedures are based around being open, honest and fair to everyone involved (Blockley & Godfrey, 2000). Blockley & Godfrey (2000) state that they also need to be mutually inclusive. They suggest that if the culture of the AEC industry “is to move from one of confrontation to co-operation... then there has to be a much greater emphasis on understanding how teams work across organizations” (p. 219). Long term relationships, integrated design and construction, (including the supply chain), client involvement in all key decision-making, transparency of information, allocation of risk and incentives are steps towards realising a trusting environment. This is in line with establishing a ‘healthy building culture’ as described by Davis (1999). The practice, procedures and policies are described in more detail in Section 3.5. Prior to that, there is a brief overview of the AEC’s endeavour in realising this shift towards collaborative practice.

3.4 Selecting an appropriate project delivery system

In an attempt to resolve the inefficiencies under traditional practice, often from the pressure exerted by clients, many other types of building project delivery systems have been created over the last few decades (Kumaraswamy & Matthews, 2000; Smith et al., 1999). The majority of the systems’ structures still contain principles, practices and procedures that are based on control and fall short of total co-operative principles that establish trust. Partnering alliances, were initiated by Colonel Cowan of the US Army Corps of Engineers in the 1980’s, in the search towards a better way of working and is a step towards a healthy collaborative process (CII, 1996; Kumaraswamy & Matthews, 2000; Ross, 1999).

The aim of partnering is to mitigate adversarial behaviour by agreeing to work collaboratively with a selected team involved in the building project delivery. Relationships are recognised as important in both the initial stages and throughout the process to enable delivering success (Blockley & Godfrey, 2000). The diagram below illustrates the Collaborative Working Continuum and identifies the Partnering Alliance model as half way between the traditional and collaborative (such as CWA) models.

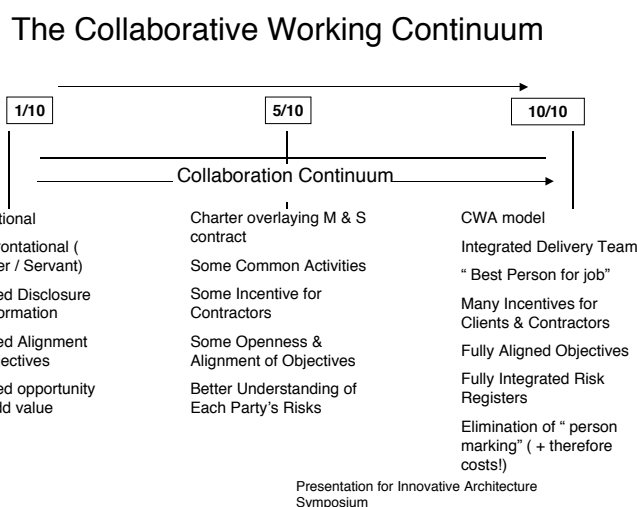


Figure 3.3 Collaborative Working Continuum, Courtesy of Advance Consulting and presented by CMS at the Innovative Architectural Symposium 2005

Many of the benefits and practices adopted under Partnering Alliances are aimed towards obtaining a trusting environment (CII, 1996). Turner (1994) cited in (CII, 1996), sums up the advantages of the partnering process by pointing out that for "all project participants, partnering is a high leverage effort; it requires extra management and time up front, but the advantages accrue in a more harmonious, less confrontational atmosphere and hopefully, completion of a project without litigation and unexpected expense" (CII, 1996, p. 11). Studies have shown the benefits that can be achieved adopting this model, "where partnering is used over a series of construction project 30% savings are common, 50% reduction in cost and an 80% reduction in time are possible in some cases" (Construction Task Force, 1998, p.9).

Yet problems have been identified under the adoption of the partnering model. Training and on-going learning are not seen as essential, and therefore entrenched behaviours cannot be fully addressed. This lack of training extends to dispute resolution processes and the need for ongoing facilitation to help open and honest communication. Moreover, the partnering charter does not include the whole team, such as the supply chain, creating an unfair and imbalanced framework. Especially when, as Holti et al.,(2000) suggest, that the supply chain typically contributes to 80% of the work. Too often the selection of contractor is still based on lowest price rather than on realistic tender submissions, creating unrealistic and unfair starting positions. For the potential of partnering arrangements to be fully realised, early implementation is also crucial. Moreover, it is recommended that there should be no intermediaries between client and the rest of team (CII, 1996).

These issues highlight the underlying dilemma behind partnering, which is the disparity between the partnering charter and the contract. "Partnering tries to impose a culture of 'win-win' over the top of a commercial and contractual framework which remains inherently 'win-lose'. The verbal commitments during the partnering process, even if genuine at the time, are not enough to withstand the stress imposed by gross misalignment of commercial interests" (Ross, 1999, p. 5). It is difficult to maintain trust, open and transparent disclosure of communication and shared objectives within the existing framework of the contract.

The partnering model demonstrates the importance of creating a holistic model whose formal structure unites the technical and behavioural aspects involved in creating an architectural project. Whilst it is a step in the right direction, unless a model fully embraces establishing a trusting environment focussed on being open, honest and fair to all, collaborative practice cannot be assumed. If trust is the gatekeeper, the emergent property necessary to deliver a healthy collaborative human system, the question that needs to be asked, is how can trust be obtained and sustained throughout the duration of an architectural project?

3.5 A collaborative architectural project delivery strategy

Lahdenpera (1996) (cited in McDermott, 1999) and Blockley & Godfrey (2000), reinforce Latham's and Egan's premise that for trust to be sustained throughout the duration of the project, the architectural project delivery system needs to begin again as the structure is fundamentally flawed. The industry has become wary of adopting tack on approaches that only address parts of the process rather than the whole (Kumaraswamy et al., 2004). Green & Lenard, (1999) confirm, that a holistic understanding to procurement is needed to enhance collaborative practice. Rather than applying isolated improvements, the context and whole process needs to be considered. This adheres with the systemic view that focusing on improving the individual parts of a system changes or even endanger the whole (Ackoff, 1999). Tucker & Ambrose (1998) therefore recommend considering a more holistic understanding of the variables, both internal and external, and how they interact and influence each other (cited in Kumaraswamy & Dulaimi, 2001). Taking this into consideration, a successful architectural project delivery system depends on no single factor, but upon coordination and integration of all variables in alignment to project objectives.

To achieve this, Blockley & Godfrey (2000) recommend systems thinking, as it helps identify the variables and provide a holistic understanding of the context and thereby the process. It also assists perceiving how the whole and the parts work together. "Co-operation through teamwork, is at the root of our systems thinking approach" (Blockley & Godfrey, 2000 p. 63). Co-operation and collaboration are the guiding principles that underline the structure in a healthy human system, and mimic a system in nature. This differs markedly from the mechanistic model which relies on rules to dominate and control (Capra, 2003). A healthy human system, such as an organization, is a living system and is able to adapt, learn and evolve whilst maintaining its integrity (Capra, 1983, 2003; Holt, Love, & Heng, 2000; Walker & Lloyd-Walker, 1999). This is the hallmark of an innovative organization (Steele & Murray, 2004), and therefore, according to both Holt et al.,(2000) and Walker & Lloyd-Walker (1999) a learning organization . By becoming a learning organization, not only has it the ability to change, but also be able to change consciously, through a continuous cycle of learning and unlearning. Learning and evolution of a system adapts the structure to allow new patterns of behaviour to emerge. For evolution to occur, it requires a system to be open to new ideas and knowledge (Capra, 2003). Capra (2003) encapsulates this by stating that "the openness of an organization to new concepts, new technologies and new knowledge is an indicator of its aliveness, flexibility and learning capabilities" (p. 103). To foster collaboration in an architectural project, the organization needs to adopt a well-designed architectural project delivery system, that "enhances co-operation and a high level of trust and commitment" (Holt et al., 2000, p. 415).

For the purpose of this study, the research will address a human system, as the 'virtual organization', a group of participants who adopt a collaborative architectural project delivery system. In assessing virtual organizations from this viewpoint one can seek to determine the inherent framework of the formal and informal structure of that system to facilitate collaboration.

To achieve this, the structure addresses the well being and learning of its people as well as the success of the outcome. To maximise the learning and creative capabilities of an organization, it is important to have a continual interplay between the formal and informal structures (Capra, 2003). Collaboration addresses both the tangible and intangible aspects of the process. This attitudinal shift, requires significant changes in assumptions and ways of thinking about the importance of people and relationships (S. D. Green & Lenard, 1999). Both the informal and formal facets of the structure take into account the unpredictable nature of people and rather than minimise this trait, undertakes to tap into its greatest source of creativity and success. Whilst procedures are adhered to, they are created in such a way that they are not inflexibly controlled. It is this internal adaptability that encourages variation and movement and supports the system to adapt, learn and evolve (Capra, 1983).

The process is informed by the agreement and culture, that is, the formal and informal structure. This shapes the procedures, practices, policies and the implicit and explicit assumptions of the team. For it to be successful, the culture mirrors the commitment and intent of the collaborative agreement (S. D. Green & Lenard, 1999). According to Blockley & Godfrey (2000), trust is an important property that emerges from a collaborative culture. Holt et al.,(2000) affirm that collaborative systems, when operating effectively, cultivate a environment for on-going personal and team learning that ultimately fosters trust. Organizations comprise of people; therefore the learning of each person is translated into the learning of the organization, but only when it is feed back into the system. It is vital therefore that the organization facilitates this process, through its practices and procedures (de Geus, 1988; Hindle, 2000).

The more the structure supports informal, developed networks, and is readily able to absorb and transform the shared tacit knowledge that is generated from these networks, the more the organization has the ability to adapt, learn and respond creatively to internal and external influences within its environment (Capra, 2003).

A living human system, such as the 'virtual organization' operates as a group of multileveled subsystems, where each subsystem is part of the whole (Capra, 2003). The relationships between these subsystems can be described by a 'systems tree' (Capra, 1983). Traditional hierarchy is usually portrayed in the pyramid structure. Inverting the pyramid and representing it as a tree shifts it from a controlled and inflexible structure to one that adheres itself towards a living system. "As a real tree takes its nourishment through both its roots and its leaves, so the power in a systems tree flows in both directions, with neither end dominating the other and all levels interacting in interdependent harmony to support the functioning of the whole. The important aspect of the stratified order in nature is not the transfer of control but rather the organization of complexity" (Capra, 1983, p. 305).

Operating as a stratified system helps it undergo change through its ability to communicate openly and flexibly. Open communication requires the ability to flow through the whole system and not be confined to any particular route (Capra, 1983). It also assists in the ability to listen to each other and support effective dialogue (Senge, 1994). To reinforce this type of behaviour, it is important that the formal and informal structure of the system support the continuous dissemination of information and ideas (Capra, 1983).

The establishment of a structure that is collaborative, both in its formal and informal makeup, creates a greater opportunity for personal empowerment, motivation and enjoyment. Research has shown the benefits this has for teamwork and creativity (Amabile, 1996; Leonard & Swap, 1999).

Creativity is a process that can be managed (Leonard & Swap, 1999). When taken from this perspective, to stimulate creativity within teams, according to Amabile (1998) and Leonard & Swap (1999), it is important to have the right level of challenge, resource and stimulation within a supportive culture. The range from day-to-day continual improvements to the dramatic breakthroughs are all seen to be part of the creative process (Leonard & Swap, 1999). Leonard & Swap (1999) believe that the creative process can be effectively managed and learned by groups, through providing a structure that promotes a safe environment. Evidence has shown that people feel able to take risks and be more innovative in their work when they feel supported to do so.

Amabile (1998) asserts in her article "*How to Kill Creativity*," that creativity has three parts: expertise, the ability to think flexibly and imaginatively, and motivation. Motivation determines what people do and how effectively they do it. Amabile's (1998) research repeatedly demonstrates that not all forms of motivation are as successful in fostering creativity. Of the two types of motivation, extrinsic, from outside a person, and intrinsic, their internal desire to do something, intrinsic motivation is far more potent creative catalyst. Amabile (1998) calls this the 'Intrinsic Motivation Principle of Creativity', where people are at their most creative when they are primarily motivated by the interest, satisfaction, and challenge of the work itself and not by external factors.

Creativity within teams requires complementary skills and knowledge from a broad base of people. Leonard & Swap (1999) distinguishes the difference between creativity within teams and a team comprising of creative people. For teams to be creative, not everyone needs to have typical creative characteristics. Instead, what is important is consciously selecting a team that establishes the right dynamics and diversity that can lead to 'creative abrasion', a term coined by Jerry Hirschberg. Conflict is openly encouraged to further creativity, but rather than focussing on personalities it addresses the situation (Leonard & Swap, 1999; Senge, 1994).

Systems thinking encourages discovering relationships between the different disciplines which foster creative breakthroughs (Gharajedaghi, 1999). Research has shown that creative teams are willing to 'blur the boundaries' between the different disciplines to encourage these breakthroughs (Jonas, 1998; Leonard & Swap, 1999).

Creativity requires risk taking. How that risk is managed is crucial to the level of creativity achieved. To foster creativity the structure of the system needs to accept uncertainty and establish practices and procedures that minimise the negative symptoms that can occur as a result. The structure thereby reinforces trust and mutual support through a culture free of blame (Capra, 2003). Supporting this, integrating personal and team learning into the structure, is vital to creativity, as creativity has more to do with challenging default behaviour than adopting a tool or technique (Senge, 1994). The structure supports challenging status quo and encouraging creativity by creating a "learning culture in which continual questioning is encouraged and innovation is rewarded" (Capra, 2003, p. 107). By establishing a non-adversarial environment creates a safe space to challenge assumptions and behaviours. The culture and policies support open, honest and generous listening and communication, by valuing and rewarding these types of behaviour (Jonas, 1998; Leonard & Swap, 1999).

From reviewing the necessary variables of a healthy collaborative system, one can deduce that to achieve the desired future reality of delivering value-driven, innovative and sustainable architecture, it requires creative practice, on-going learning, effective teamwork and systemic thinking. It implies that implementing these dimensions into the structure of an architectural project delivery system whose principles, practices, procedures and policies support these dimensions, would enable people to behave collaboratively and realise their shared purpose. The next section draws from separate research and brings together a summary of what others have identified as important for collaborative practice. Whilst the purpose, principles, practices and procedures have been identified separately, it is important to remember that for a system to be healthy, they are all interdependent and cannot be considered in isolation. Each aspect strengthens the whole.

3.6 Collaborative practice, procedures and policies endorsed by the AEC industry

3.6.1 Shared purpose

Under a collaborative model, a shared unity of purpose is of primary importance. Creating a shared vision, values and objectives, creates a criteria for measuring the success or failure of a project (S. D. Green & Lenard, 1999; Walker & Lloyd-Walker, 1999). A shared purpose creates an agreed alignment and direction and remains a touchstone throughout the different stages of the process. A shared purpose is also a necessary condition for effective empowerment (Blockley & Godfrey, 2000). "Team success is best achieved through harmonising individual and collective needs" (Blockley & Godfrey, 2000, p. 228). When a team agrees on a purpose it motivates everyone to go in one direction rather than counteract each other (Hixon, 2005). This reveals that collaboration, need not reduce architectural design, it just requires that the team's shared purpose incorporates creative practice (Cockshaw, 2001). A shared purpose establishes shared expectations amongst the team, and if these are continually being met builds trust (Hagel & Seely Brown, 2002) and thereby a greater level of commitment and enthusiasm (Csikszentmihalyi, 2004; Senge, 1994). It also achieves an improved flow of information, speeds up the decision making process and minimises duplication and misinterpretation of other disciplines' work (Muir, 1995b). Clearly expressing a unified purpose informs each decision to ensure that it is integral and consistent to the intention of the project. It also helps provide a benchmark when reviewing different stages of the work (Holti et al., 2000). A greater sense of teamwork can occur which increases the likelihood of a successful outcome.

3.6.2 Long-term relationships

The Construction Industry Institute (CII) extensively studied the effectiveness of project teams and their relative importance to the overall success of the project. They concluded that relationships were fundamental to the overall success, affirming that the traditional project team relationships were a deterrent to innovation, and recommended long-term alliances as the way forward (CII, 1996).

S. D. Green & Lenard (1999) state that Colonel Cowan's methods towards long-term partnering alliance relationships continue to be relevant. These are a commitment to the collaborative approach needs to be fully supported and visible in leadership roles. On-going learning, both individually and as a team, helps facilitates this process. Long-term relationships require open, honest and fair practice that helps build trust, encourages respect and the willingness to listen to other opinions. Mutual goals and objectives are agreed upon. The structure of the building project delivery system reinforces the ability for these to occur by implementing policies and procedures that reflect the appropriate attitudinal behaviour. This leads to a supportive resolution process, where conflict is dealt with as it arises and does not require top management consultation unless inability to resolve the issue at the intermediary levels.

In long-term relationships it is important to continually introduce new members to the team to stimulate and challenge thinking, yet without impacting on the overall stability of the team (Rogers, 2001). Part of this would be to include specific procedures to actively embrace new members into the team dynamic. This ensures quicker acceptance by the existing team and connection to the team (MacMillan, 2001).

Learning from the success of other industries, adopting the practice of long-term relationships helps build trust and collaborative practice. This in turn leads to readily implementing procedures such as continuous improvement, key to the Building Down Barriers (BDB) approach. The BDB demonstrated through pilot studies the advantage this has to reducing costs, enhancing quality, reducing risk and providing opportunities to innovate (Holti et al., 2000). Lenard (1999) agrees that innovation increases substantially under this process, and further defined the benefits towards the willingness to share information and knowledge that intrinsically occurred in symbiotic relationships (cited in Kumaraswamy et al., 2004). Clients, such as governments and large organizations are starting to realise the positive impact of this way of working (OGC, 2003b).

3.6.3 Integration of design and construction

The research outlined in the previous sections highlighted the shift from the traditional separation to the re-integration of the design and construction process. With this, is the realisation that to turn an idea into reality, the integrated team comprises of the client, architects, engineers, consultants, contractor and supply chain (as shown in Figure 3.2). The growing complexity of architecture demands collaboration, as no one discipline has sufficient skills or knowledge to understand the consequences of the whole process. The multidisciplinary aspect of architecture therefore, needs to be acknowledged in the nature of the delivery strategy. If working effectively, a team comprised of different disciplines, interprets the same problem differently, and is able to integrate a wider base of knowledge and experience into providing the best solution (DPR, 2005; S. D. Green & Lenard, 1999).

It is interesting to note that the architectural profession in the UK acknowledge reinstatement of an integrative process and the resultant benefits of "improved efficiency, shorter construction periods and reduced waste" (RIBA, 2001, p. 3). They recognise that "the implementation of a fully developed design can only be developed from collaborative working of a team of designers, manufacturers and constructors bringing different skills and

disciplines to the process" (RIBA, 2002, p.5). The International Union of Architects (UIA) also endorse the integration of design and construction (UIA, 2005).

To achieve this, the design and construction process requires to be integrated into the architectural project delivery system. The Office Government of Commerce fully support this move in order to achieve the targets agreed under 'Achieving Excellence' 2002 (OGC, 2003b). It is important that the collaborative process begins at the earliest possible stage. "Successful construction projects require a collaborative team working successfully from before design begins until commissioning is completed" (Hixon, 2005, p. 3). There are many benefits associated with this. One is that people are more willing to adapt and modify ideas or approaches at this stage. Additional to this, all parties have a stronger commitment to the process and are more likely to be motivated to produce quality work (Buntrock, 2001). Further, the integration of design and construction, allows a broader range of communication to occur, such as a willingness to share tacit knowledge, and does not heavily rely on communication through documentation (Buntrock, 2001; S. D. Green & Lenard, 1999; Rogers, 2001).

The relationships required for integrated design and construction are beyond standard practice, or mere coordination. A collaborative approach is required, where all team members are respected, valued for their contribution and are willing to work closely together (Buntrock, 2001; S. D. Green & Lenard, 1999; Rogers, 2001). This requires the structure to have policies that endorse equal status for all participants (S. D. Green & Lenard, 1999). Berry (cited in S. D. Green & Lenard, 1999) claims that a shared vision is mandatory to its success. According to Green & Lenard (1999) successful examples in the U.K. and Europe of this integrated approach show the benefit towards obtaining innovative and sustainable buildings.

3.6.4 Integration of supply chain

As discussed earlier, there is growing evidence of the benefits of integrating the supply chain early in the architectural project delivery strategy. "Supply side integration has a crucial part to play in increasing quality and productivity, reducing project times, increasing cash-flow efficiency and thus minimising risk, whether in terms of the reduced costs from 'getting it right first time' or added value through ensuring that people work within 'process,' not least so health and safety risks are designed out' at source" (Strategic Forum for Construction, 2002, p. 24). Yet currently "the benefits that a carefully nurtured, financially secure and efficient supply chain can bring to improving the overall competitiveness and technological development of the construction sector are largely unrealised" (Holti et al., 2000, p. 10). This view is supported by Kumaraswamy & Matthews (2000).

The Construction Task Force, (1998) considered the supply chain as key to continuous improvement and innovation. "...the benefits of supply chain integration become much stronger when the supply chain integration moves beyond the project level to include continuous improvement activity carried out within the context of longer term supply relationships" (Holti et al., 2000, p. 81). Case studies have shown that even though this method initially takes longer and has additional costs associated with it, the overall costs can be reduced significantly (Kumaraswamy & Matthews, 2000). It is essential that the policies and procedures adopted within the structure of the architectural project delivery system apply to all those involved in the project, including the supply chain to ensure commitment to the teams purpose (Cockshaw, 2001; Hixon, 2005; Kumaraswamy & Dulaimi, 2001; Latham, 1994; RIBA, 2001). Further, the formal structure needs to include the procedure to protect the margins of those involved, so that the team is able to concentrate their efforts on reducing cost, as discussed in section 3.2.2 (Holti et al., 2000).

3.6.5 Relationships

True collaboration is achieved when the barrier of 'single point accountability' and hierarchy, typical of traditional methods, are removed, thereby creating an environment conducive to sharing intent and goals. Similar to Japan's way of working, the RIBA (2001) recommend that whilst everyone has a role to perform, the boundaries between the interfaces become blurred to enable "joint approach to problem solving and a cross-discipline commitment to achieving results" (p. 2). This approach to collaborative practice is also supported by Rance, Muir, & Collier (1995). Buntrock (2001) states this facilitates a safe, secure environment, conducive to risk taking. Risks and problems are shared, rather than isolated on one individual or discipline. This can only be achieved according to both RIBA and Buntrock (2001) when those involved are able to trust and be open. "To effectively work in collaboration requires trust, long-term knowledge of a partner's ability, and an openness to diffused responsibility" (Buntrock, 2001, p. 102).

"Von Hippel has noted that where the boundaries between tasks occur will often affect how design problems are resolved. He argues that problem solving can be improved by reducing these boundaries, allowing the team to identify potential drawbacks early enough in the process to make adjustments" (cited in Buntrock, 2001, p. 50).

Part of establishing a collaborative team is for the client to become part of the team, and be involved in key decision making (Holti et al., 2000). Supported by the RIBA (2001), who state "in an effectively run project, all the parties should be working together as a team, including the client, consultants and contractors" (p.3).

3.6.6 Client role

Latham (1994) and Strategic Forum for Construction (2002) highlight the fundamental role the client plays in the delivery of the building project. The client, states Rogers (2001) and the RIBA (2001), is key to the architectural process, as their role is crucial to the outcome of the project. Change in the AEC industry must be led by clients because ultimately they carry the risk. Without the client demanding change there could be no transformation around the process (Smith et al., 1999). According to Rowlinson (1999) it is the opinion of the clients on the performance of the AEC industry and whether it meets their expectations, that is most significant. Yet the client's role is often problematic, and not fully understood within the AEC industry (S. D. Green & Lenard, 1999). According to Green and Lenard (1999) this is of serious concern, and the AEC industry is obliged to rectify this issue.

To do so, the AEC industry needs to take steps to educate, both public and private sector clients of their role within the process. This has already commenced in the UK, where a Construction Clients Forum was created after Latham's (1994) report, which led to the UK Construction Clients' Group. A NZ Construction Clients' Group was formed in 2005, and is currently in pilot phase. Its aim is to help both public and private clients learn, share knowledge and support each other in the procurement process to deliver innovative best practice. This knowledge assists a potential client to become informed about best practices, and enable them to make decisions with greater understanding of the implications. Part of this will be to educate clients about changing their paradigm from 'lowest price tender' to value based as the first attitude encourages adversarial behaviour and discourages innovation (CAE, 2004). To help this happen, the Strategic Forum for Construction (2002) assert that "the major clients of the construction industry must provide committed leadership by implementing projects which will demonstrate the (collaborative) approach" (p. 12) put forward by the Task force. They too have instigated a 'Starter' Charter to provide and share knowledge (Strategic Forum for Construction, 2002). The potential client can be educated on understanding the implications behind client involvement, the different strategies of procurement, from traditional to collaborative delivery systems, allocations of risk, the importance

of the client brief and the selection of a project delivery strategy. These have been discussed in more detail below.

3.6.7 Client involvement in the project delivery

The client's involvement throughout the procurement process is essential to ensure that their intent and objectives are carried through each stage and are ultimately realised. Only through the client being involved can they understand the implications of all key decisions. Open communication, sharing of knowledge and learning, amongst the team, supports this to occur. "If the process is to be successful, it requires that the client be both flexible and informed" (S. D. Green & Lenard, 1999, p. 68). If the end result does not meet the client's need, then the whole process has failed, regardless of whether it is on time, value driven, innovative and sustainable. To ensure this happens, even, or especially in complex organizations Green & Lenard (1999) and Rogers (2001) stress the need for the client to be represented by "one individual in the organization, who has the authority, the vision, and the financial muscle to make that project happen"(S. D. Green & Lenard, 1999, p. 26). That person is involved in all key meetings and is a senior person, who has a team to support him/her to supply the necessary information on time. One member of the support team can take on the client's role for the day-to-day functions and report back to the senior person. To ensure that a project functions effectively it is crucial that it not be reliant on a committee.

Currently, some clients have shown a reluctance to engage in collaborative project delivery systems, often at the advice of a professional consultant. According to Hixon (2005), this is mainly because they feel an adversarial environment keeps the cost and the quality in check. Yet clients need to gain a more mature outlook and be willing to pay a fair and reasonable profit to all those involved rather than the lowest price, in order to expect a quality outcome (Construction Task Force, 1998; RIBA, 2001). A positive run-on effect will be the stabilising of what has traditionally been a volatile industry. Growing evidence obtained from the demonstration projects undertaken in the UK, show the significant benefits achieved when adopting collaborative practice, which will help clients adopt collaborative architectural project delivery systems.

3.6.8 Allocation of risk

The management of risk, according to Strogoff (2005) has become a key priority and has been acknowledged as "a complex issue and is at the heart of the consideration of appropriate contract strategy" (Rowlinson, 1999, p. 33). A fundamental decision that the client is required to make is around risk apportionment. "The client should decide how much risk to accept. No construction project is risk free. Risk can be managed, minimised, shared, transferred or accepted. It cannot be ignored" (Latham, 1994, p. 14). The UK architectural professional institute also supports this view (RIBA, 2002). A key recommendation is choosing the right risk management strategy that aligns with the project objectives (McDermott, 1999; Ross, 1999). How that risk is allocated, determines the building project delivery strategy (Latham, 1994).

Part of collaborative method is to acknowledge the need for shared risk (S. D. Green & Lenard, 1999). Sharing the risk, leads to lower costs in premiums as parties within the agreement waive the right to sue each other (S. D. Green & Lenard, 1999). "Integrated teams enable risk management issues to be fully addressed by the whole team in an open and transparent manner. Insurance is an aspect of risk management. Project insurance products should be made available to underwrite the whole team to facilitate integrated working. Such policies should embrace Professional Indemnity Insurance, and Works Contract Insurance and perhaps aspects of Product Liability Insurance" (Strategic Forum for Construction, 2002, p. 27). According to S. D. Green & Lenard (1999) professional liability is reduced as the team is incentivised to work together to resolve inadequate

detailing or documentation. Further, by being actively involved in this process, the intent of the design can be carried through to implementation.

3.6.9 Client brief

Latham (1994) and Green & Lenard (1999) affirm that the client be made aware of the benefits of preparing the client brief. "The leadership that clients should give is through making their main project requirements fully transparent and creating the right environment for the supply-side to meet those requirements in the most effective way" (Strategic Forum for Construction, 2002, p. 20). The initial client brief should be separate to the design and technical brief. Further, the client needs to initiate and be actively involved in creating this strategic brief. The client brief clearly defines the client's purpose, vision, values and key objectives. Part of the function behind this brief is for the client to understand their own organization and needs. As many organizations are made up of multiple stakeholders, realising shared vision, values, purpose and objectives, whilst difficult in the long-term, is a worthwhile process (Hixon, 2005; Rowlinson, 1999). Rowlinson, (1999) even suggests that the client objectives be tested within the client structure prior to commencement of work. The briefing process can reduce time delays and ensure that the project meets the end users requirements (S. D. Green & Lenard, 1999; Latham, 1994; Rowlinson, 1999; Strategic Forum for Construction, 2002).

An additional advantage is that the client brief can inform the decision making for the rest of the project. Currently, according to Green and Lenard (1999) more time and attention is needed on the client brief than is currently allocated.

Jennings and Kenley (1996) emphasise that the client brief can help inform the team to select a suitable delivery strategy that matches the client's purpose, vision, values and key objectives (cited in McDermott, 1999). Rowlinson (1999) reiterates this point, and further states that rather than there being one best project delivery strategy, it is important to select the appropriate one best suited to deliver the identified client key issues and common objectives of the team. "The choice of a procurement method is probably the single most important decision the client makes, other than the decision to build" (Smith et al., 2004, p. 27). The more time spent at the beginning of a project in terms of creating the brief, the choice of project delivery, design and project planning, will according to the Sir Alan Cockshaw, have the most significant impact to the final outcome in terms of quality and achieving expectations (Cockshaw, 2001). This infers that the nature of procurement system is important as it significantly impacts the success of the outcome (Blockley & Godfrey, 2000; RIBA, 2001; Rowlinson, 1999).

3.6.10 Team selection

The ideal selection of a team is one that is balanced and addresses each participants level of skill, alignment to client objectives and the ability to work together (Hixon, 2005; MacMillan, 2001; RIBA, 2001; Rogers, 2001). Collaboration requires the willingness to let go of proprietorial positions and engage in sharing knowledge (MacMillan, 2001). "Selection should be made in a fair and open manner, ... with the intention of appointing the best and most appropriate persons and companies to work on the project" (RIBA, 2001, p. 3). This leads to recognising the importance of the team's ability to deliver value driven projects rather than basing selection on lowest price (Hixon, 2005; Latham, 1994; OGC, 2003a; RIBA, 2001). Additionally, it is important under a collaborative system to select team members willing to adopt the disciplines and practices of a learning organization (Kumaraswamy et al., 2004).

3.6.11 Importance of team

Teamwork cannot be automatically assumed, it requires active engagement by all members of the team (MacMillan, 2001). "Teamwork cannot be achieved unless all sections of the process are committed to it" (Latham, 1994, p. 83). This includes the client and the supply chain, as previously discussed. Building trust and teamwork is challenging by the very nature of how teams are constantly forming, reforming and disbanding in the AEC industry (Hixon, 2005). "All people involved have their own individual agendas and all of the organizations have their own business agendas". Creating some stability or continuity that facilitates long term relationships between the organizations helps (Blockley & Godfrey, 2000). This will supports a team to become more resilient to internal and external influences (Buntrock, 2001). A team's culture that is healthy, is able to shift the focus from blame, to one that works together to find solutions (Blockley & Godfrey, 2000).

Blockley & Godfrey (2000) identify teamwork within their systems thinking model as requiring committed leadership at all levels and mutual respect. As discussed by Blockley & Godfrey (2000) and others, it also reinforces the need to apply the disciplines of a learning organization to foster effective teamwork. (Refer to Section 3.5.13)

Part of creating a successful team dynamic is that the team recognises everyone's contribution to the end result, and make transparent the different assumptions and concerns of all members (Blockley & Godfrey, 2000). This way, teamwork is effective, as it draws on a broad body of knowledge and skills. Diverse teams are often the most successful as it challenges team members to reframe their beliefs and assumptions, which can ultimately lead to new ways of working (Walker & Lloyd-Walker, 1999). Cope and Kalantzis (1997) affirm this by stating that "valuing diversity is necessary for innovation and productivity gains to be realised" (cited in Walker & Lloyd-Walker, 1999, p. 123). Yet for this to occur, the team needs to acknowledge the strengths of those contributing and be open to being challenged, prior to engaging in this process. This is made possible by the shared responsibility and the policies that encourage contribution beyond one's discipline (Buntrock, 2001).

Creating a team identity helps instil a cohesiveness and a sense of being a team. This can be realised through shared purpose (MacMillan, 2001), strengthened also through visual representation. Additionally, during architectural projects, team members change, which alter the dynamic and stability of the team unless carefully monitored. It is important to have procedures in place to bring a new team member 'up to speed' and create a synergy amongst the reformed team (MacMillan, 2001).

3.6.12 Collaborative Leadership

The style of leadership under a collaborative systemic model shifts from an authoritarian style to a facilitative leadership, where leadership is shared (Cave, 1995; Muir, 1995b). It is important therefore, that those leading the project delivery team are committed to the collaborative practice and the changes this requires in terms of leadership (Construction Task Force, 1998; Kumaraswamy et al., 2004). Leaders will be required to align their own mental models to ensure that procedures and policies are carried through with the right intent (Hagel & Seely Brown, 2002; Muir, 1995b). Under this model, it is the actions of the leaders that encourage other to emulate the appropriate behaviours. "This vision of committed leadership at all levels and throughout the supply chain is far more powerful than a command and control model" (Blockley & Godfrey, 2000, p. 224-5). It is built upon trust, a two-way process, which necessitates respect, loyalty and fairness from those in leadership and those employed. This means valuing and working for the good of all those involved in the organization (Hagel & Seely Brown, 2002). A systems method of leadership, encourages people's involvement, provides less emphasis on roles and positional power, and has its structure operating in such a way as to allow for self-empowerment amongst the team (Flood, 2001). Honouring and maintaining relationships are central to this type of leadership (Hagel & Seely Brown, 2002).

As suggested, adopting a collaborative systemic model necessitates becoming a learning organization. Under this model, leadership is more about empowering rather than controlling others. Trust based management, aims at encouraging appropriate behaviours through its policies, procedures and culture (Hagel & Seely Brown, 2002; MacMillan, 2001). It is important therefore, to have procedures in place that support team members deal with issues that arise (Senge, 1994; Walker & Lloyd-Walker, 1999). Leaders are actively committed to creating a safe environment where inquiry and challenging assumptions is part of the culture. Part of this, is for the structure to support the ability to admit mistakes without blame and is a component of active transparency (Hagel & Seely Brown, 2002). Another, is holding the shared purpose and simultaneously being honest and open about the current reality relative to the desired reality (Senge, 1994). All this supports an organization to be able to can survive challenging and confrontational situations (Hagel & Seely Brown, 2002).

3.6.13 On- going learning

Walker & Lloyd-Walker (1999) and Kumaraswamy et al.,(2004) indicate that studies undertaken in the Australia and UK AEC industry, demonstrate a low level of understanding and therefore implementation of organizational learning practices. They state that organisational learning draws upon and brings to the fore the experience and learning gained by individuals and teams and if appropriately facilitated can add significant value. According to Walker & Lloyd-Walker (1999), value can be added in two ways. One, through continuous improvement to current industry practice, which will enable efficiency gains in the project delivery process, cost, time and waste. And secondly, organizational learning will assist towards establishing a culture that encourages innovation and sustainable practice. To achieve the greatest benefits, organizational learning is best continued throughout the whole life cycle of the project, including post-project evaluation (similar to the Japanese system).

Research within the AEC industry strongly recommend adopting Senge's learning organization's five disciplines to actively support collaborative and innovative practice in an architectural project delivery system (Blockley & Godfrey, 2000; Peters et al., 2001). The five disciplines being personal mastery, team learning, mental models, building shared vision and systems thinking (Senge, 1994). McDermott (1999) advocates this view, and deems intangible aspects, such as organizational learning and the culture as important to consider during the process. An organization or a team that operates under the disciplines of a learning organization, "rewarding measurement, monitoring, critical thought and continuous improvement always outpace a corporate culture peopled by dial-watchers and button-pushers" (Hawken et al., 1999, p. 68).

Organizational learning is therefore an important tool to adopt and is most compatible with a collaborative project delivery system (Kumaraswamy & Dulaimi, 2001). Walker & Lloyd-Walker (1999) affirm that if the client desires value-driven, innovative, and sustainable architecture, they select an architectural project delivery system that incorporates organizational learning. This idea was raised in the background, as it helps teams to create their desired future reality. Blockley & Godfrey (2000) also extol the value of becoming a learning organization as they "will be the ones that excel in the future" (p. 246), by being able to close the gap between current reality and desired reality. "System thinking (the fifth discipline in a learning organization) provides us with an opportunity to understand and share the processes and skills needed for success. It provides an explicit means of understanding the key performance measure and the creative tensions – the gaps between 'where we are now' and 'where we want to be'"(p. 246).

For learning to be effective and foster improvement it needs to be both personal and within teams (Kumaraswamy & Dulaimi, 2001). This increases the ability to communicate, relate and learn from each other. Through learning, the team can become less combative, less defensive of their disciplinary domain and instead be focussed on the best outcome for the project. A structure that supports and actively facilitates on-going

learning, both for individuals and teams, creates an opportunity for this to occur (Blockley & Godfrey, 2000; Kumaraswamy & Dulaimi, 2001; Senge, 1994).

Applying organizational learning, not only improves performance and teamwork, it also supports the human system, such as an organization, to adapt, learn and evolve within its environment, a necessary prerequisite for a healthy system (Capra, 2003; Holt et al., 2000; Walker & Lloyd-Walker, 1999). It is therefore important, that the collective team, recognise the on-going need to learn and evolve within its environment (S. D. Green & Lenard, 1999). This means that by implementing organizational learning procedures and practices helps anticipate opportunities and challenges, and consciously realise the desired future reality. "Benefits to be gained from such as exercise can be lasting and significant to the client and project team members" (Walker & Lloyd-Walker, 1999, p. 135).

3.6.14 Continuous improvement

The Construction Task Force identifies a significant need for continuous improvement in procedures and practice adopted in project delivery, with the focus being particularly on quality, cost, time and wastage (Construction Task Force, 1998). "Recent studies in the USA, Scandinavia and this country suggest that up to 30% of construction is rework, labour is used at only 40-60% of potential efficiency, accidents can account for 3-6% of total project costs, and at least 10% of materials are wasted" (Construction Task Force, 1998, p. 15). Walker & Lloyd-Walker (1999) reiterate the value of continuous improvement by learning from past experiences and recommend maintaining records that inform others of processes, strategies and procedures adopted that were either successful or reduced mistakes from reoccurring. They further state that this needs to be updated and easily accessible.

There is a growing realisation amongst the industry of the amount of valuable information that gets lost each time a project ends. To minimise this, adopting review processes, post-evaluation and continuing relationships, helps lessons learned be transferred onto the next project (S. D. Green & Lenard, 1999). As discussed, long-term relationships are seen as a positive step to provide an environment more conducive to transparency and sharing of information. In addition to this, long-term relationships create a willingness to explore new ways of working and solving issues that can lead to significant innovation (S. D. Green & Lenard, 1999). Policies and incentives that are conducive to supporting continuous improvement, need to be included within the formal structure (Walker & Lloyd-Walker, 1999). Part of this, is implementing procedures within the formal structure, that support team members to admit mistakes and thereby provide opportunities to learn (Kumaraswamy et al., 2004). Collectively agreed performance measures are the impetus to continuous improvement (OGC, 2003a).

3.6.15 Team building and development

Team building and development recognises that a team needs to constantly learn how to effectively work together. Hixon (2005) suggests an initial meeting with key team members, including the supply chain to ensure a unified purpose. To sustain this alignment and develop team building, additional workshops, and post-evaluation workshops are recommended, according to Walker & Lloyd-Walker (1999). Workshops were identified as beneficial in cultivating the learning culture (Kumaraswamy et al., 2004).

3.6.16 Communication

According to Muir (1995b), "the essence of collaboration is communication" (p. 17). By consciously building common procedures and policies that are transparent, improves the flow of communication, helps decision making, duplication and avoids many mistakes. Transparency of information minimises resolution of problems

as everyone is informed and provided with the same information (Muir, 1995b). Integrated and interactive information that is up-to-date and accessible to all those on the project team helps build trust (Hagel & Seely Brown, 2002). Technology naturally facilitates collaboration, through transparency. It creates the ability to unite the project team through single point data bases to share information from design ideas, consent documents and correspondence (Kumaraswamy et al., 2004; RIBA, 2001; Saxon, 2001). These tools are implemented as mechanisms to support the overall intent of collaboration and help drive change (S. D. Green & Lenard, 1999). Collaboration is further helped by the transparency of an 'open book' policy (Rogers, 2001).

3.6.17 Conflict resolution

The ideal solution to disputes is to avoid them by adopting policies and procedures that are fair to all (Latham, 1994). If disputes arise, the project delivery system incorporates mechanisms to reduce conflict early, rather than allow it to fester and grow. The procedure should also encourage disputes to be resolved at the lowest possible level (Kumaraswamy & Dulaimi, 2001).

3.6.18 Incentives

Part of the collaborative system, encourages on-going personal and team learning. Realising that people are the greatest assets, a trust based system fosters positive behaviour through establishing incentives within its structure (Hagel & Seely Brown, 2002; Kumaraswamy et al., 2004). Proportional sharing of profits, has been identified as a major incentive for quality work (S. D. Green & Lenard, 1999). Providing incentives such as this helps deliver better performance, innovative work and leads to improvement in the final cost of the actual work. Again, it is important that incentives are fair and transparent to all involved in the project (Blockley & Godfrey, 2000; Hagel & Seely Brown, 2002; Kumaraswamy et al., 2004).

3.6.19 Performance measures

It is important to have measures as a tool to recognise the benefits of collaboration. Extending the performance measures beyond the 'ordinary' enables integrating 'extraordinary' and 'human' aspects within the architectural project delivery system (Blockley & Godfrey, 2000). Collaborative architectural project delivery systems re-evaluate what makes a successful project and shifts the assessment of the project to broader measures (Cole, 2006a; Coles, 1995; McDermott, 1999; OGC, 2005).

3.6.20 Training and education

To achieve effective collaboration amongst the AEC industry will require a shift in the prevalent AEC industry's culture. Training and education, research and development is a way of helping make that change (Construction Task Force, 1998; Latham, 1994; MacMillan et al., 2001; Walker & Lloyd-Walker, 1999). Rance et al.,(1995), Muir, (1995b), Prasad (1999), Rogers (2001), Kumaraswamy & Dulaimi (2001) and Buntrock (2001) reiterate the importance of education and ongoing training to implement these necessary changes towards collaborative practice within AEC industry. Part of education will be in providing trans-disciplinary contact to break down the entrenched stereotypical attitudes and increase the awareness of the importance each other's role in the overall success of the outcome. To do so, each institution needs to let go of their myopic determination to defend their vested interest and work together for the greater good of the industry. This is already beginning to happen, with courses such as the Master's Course on Interdisciplinary Design for the Built Environment at Cambridge, a degree launched in 1994.

3.7 Summary

The principles, practices, procedures and policies identified above reveal how diametrically apart collaborative practice is from traditional practice in the AEC industry. On a final note, the Literature Review concludes that for collaboration to be healthy within an architectural project, it is important to ensure that the "agreements and solutions to problems are mutually beneficial, mutually satisfying so that all parties feel good about the decision and feel committed to the actions agreed" (Blockley & Godfrey, 2000, p. 243). Further, the structure of a system merges the interfaces between the disciplines and facilitates communication and teamwork. This enables a coherent understanding of the whole process and provides opportunity for compatible goals amongst the disciplines (Cave, 1995; Coles, 1995; Davis, 1999; Muir, 1995b; Rance et al., 1995; RIBA, 2001).

METHODOLOGY

None of the human faculties should be excluded from scientific activity. The depths of intuition, a sure awareness of the present, mathematical profundity, physical exactitude, the heights of creative reason and sharpness of understanding, together with a versatile and ardent imagination and a loving delight in the world of the senses – they are all essential for a lively and productive apprehension of the moment. GOETHE

4.0 Theoretical perspective

Systems thinking is the theoretical perspective underpinning this research. It acts as a framework to provide a holistic view rather than adopting a particular systems methodology. Systems thinking encourages one to look beyond the daily events and examine the underlying structure and patterns of behaviour that occur as a result. It offers a means of gaining insight and richer pictures of the whole, by understanding the interconnections and relationships of the parts that make up the system (Ackoff, 1999; Capra, 1983; Meadows, 2002). Properties, such as trust, can emerge when the structure facilitates the parts to interact to achieve this goal (Kim, 1995; Nelson, 1993; Senge, 1994).

It is therefore important to understand the system's structure. In this case, the research will address a human system, the virtual organization and its adopted architectural project delivery system. This includes both the formal and informal structure of the virtual organization in the design and construction of architectural projects. In the introduction, the issue of the growing complexity of architectural projects was raised with the increasing pressure to deliver value-driven, innovative and sustainable architecture. The research explores four key Design Management dimensions: teamwork, creativity, learning and systems thinking, to determine whether they help build trust to enable creative, collaborative practice.

4.1 Methodology

Construction Management and Design Management, emergent disciplines in academic research, have shaped the methodological framework. Both have borrowed from pure science and human science methodologies. Construction Management has predominantly worked with quantitative research and Design Management with qualitative research, yet this is changing. Both recognise the need for each type of research to gain a deeper understanding of the issues. (Findelli, 1998; Loosemore, Hall, & Dainty, 1996; McDermott, 1999; Raftery, McGeorge, & Walters, 1997). Loosemore et al., (1996) argue that "the future development of construction management will depend in part, upon a willingness to see quantitative and qualitative research as complementary rather than competitive and mutually exclusive" (p. 418). Raftery et al (1997) assert the need to break up the methodological monopolies within Construction Management research and actively support researchers in the construction field to base their research on "defining the problem and then applying the most appropriate method from an unconstrained and wide range of available approaches" (Raftery et al., 1997, p 294). He further states that applying both the interpretive and on a secondary basis, the rational paradigm, has the potential to encapsulate a wider view of the context (Raftery et al., 1997). In Design Management this position is reinforced by Jonas (1998) who recommends adopting a systems thinking approach towards "the intelligent and flexible integration of the large amount of well known components and existing knowledge of methods" (p. 73).

Working with this view, removes the 'either/or' approach and embraces the theoretical perspective of systemic thinking. Capra (1983) encapsulates this ideology by stating that, "reductionism and holism, analysis and synthesis, are complementary approaches that, used in proper balance, help us obtain a deeper knowledge of life" (p. 288).

The research takes the systemic approach described above towards understanding the structure of the virtual organization by addressing the adopted architectural project delivery system. The architectural project delivery system involves the design and construction of architecture, a complex system that relies on human relationships. People are not predictable in their behaviour and by creating a structure that empowers rather than controls enables people to collaboratively co-create. This means that the focus will be on identifying the patterns of behaviour in the virtual organization, predominantly the behavioural aspects of the process, whilst at the same time acknowledging the technical aspects. This approach is supported by Green & McDermott (1996), who affirm that "qualitative research methods must be employed if we are to gain insight into the construction organization and the culture and behaviour of the human beings therein" (p. 475).

According to Burns (1997) qualitative methods are particularly useful when researching an organization's implicit and explicit policies and procedures, their culture, and in determining the informal processes. This is central to the exploration of the research question, as it will attempt to find out whether the espoused approach is in fact the reality experienced by the team. Adopting this qualitative approach will "attempt to capture and understand individual definitions, descriptions and meanings of events" (Burns, 1997, p. 292).

The research emphasis is on the study of people and therefore can be categorised as ethnographic research. "Ethnography essentially involves descriptive data collection as the basis for interpretation; it represents a dynamic 'picture' of the way of life of some interacting group. As a process, it is the science of cultural description" (Burns, 1997, p. 297). Ethnography provides a set of general commitments or orientation to research which is rather different from those of the experimental and survey styles. Burns (1997) has outlined these as:

- a) the problem of understanding social action (understanding and interpretation).
- b) the emphasis on process (process).
- c) the investigation of 'natural' settings (naturalism).
- d) the study of social phenomena in their context (holism).
- e) the assumption that there are always multiple perspectives (multiple perspectives).
- f) the use of multiple techniques, with an emphasis on participant observation and interviewing (pp. 300-301)

Whilst engaging ethnographic research, a cohesive framework was deemed necessary to best extract the data to enable a better understanding of the situation. This was in keeping with the systems thinking approach. An adaptation of ethnographic methodology was determined to create a more rigorous framework. Burns (1997) has identified this as a 'quasi-ethnographic methodology', as it takes the essential aspects, yet modifies it to best fit the purpose of the research.

As stated, the main focus of the methodology is a qualitative approach, yet it will validate its statements where appropriate. This will result in research that concentrates on the human experience yet is still logical and analytical. The emphasis is therefore, qualitative and interpretive, as it focuses on the 'extraordinary' and 'human' aspects of the organization. Yet in order to arrive at a balanced understanding of the observed pattern of behaviour engaged by those being studied, it will also address the 'ordinary' aspects.

As outlined above, this section explains the rationale of the research methodology adopted. Prior to discussing the research methods, the next stage will be identifying the research question and its progress, the chosen context, followed by the content. Banathy & Jenlink (1999) in their review of systems inquiry recommend these steps to help inform the selection of methods for the research. These are subsequently addressed below.

4.1.0 Research Question

As with any creative research, the question evolved as the literature and research continued to progress. As a process, each built on the other, to strengthen and clarify the research. A summary is provided to help inform the reader how the question was derived. The research question starting point was framed as:

"Is there a better way of working in the architectural process that allows for creativity through the systemic and collaborative design and construction of architecture in New Zealand?"

The question even though too broad started to identify key principles important to the research. It provided a way forward in obtaining relevant literature that would enable the question to evolve. It allowed factors not addressed in the question, specifically around sustainability and learning to emerge.

Initially, the aim of the research was to identify the gaps in the AEC industry's knowledge base around creativity, teamwork, learning and systemic thinking in the creation of architecture. Unexpectedly, a significant amount of research was revealed to have been already undertaken within the AEC industry, as highlighted in the Literature Review, which supported and reinforced the proposition. This allowed the aim of the question to be narrowed to focus on a particular architectural project delivery system, to determine whether it could influence a way of working for creativity, teamwork, learning, and systemic thinking. The question therefore became,

"Can Collaborative Working Arrangements (CWA) help architectural teams work in a culture for creativity, learning and systemic thinking?"

Whilst simplifying the question it still did not encapsulate the purpose behind the research: which was to identify an architectural project delivery system that could deliver value-driven, innovative and sustainable architecture. It was important that the research question evolve another step in the final stage in the process. Collaborative human systems whose structure encourages establishing and maintaining of trust was seen as key to the delivery of these outcomes. The research sought to understand key aspects inherent in the structure to encourage this type of behaviour. To do so, it aimed to explore the extent to which four key dimensions of Design Management: teamwork, creativity, learning and systems thinking assisted in the development of trust to enable co-creative practice. It further sought to study the inclusion of both 'extraordinary' and 'human' performance measures and monitor the impact to the process. The systems approach suggests that by adopting a system whose structure incorporates co-creative collaborative practice in its formal and informal makeup facilitates the people's behaviour towards the shared desired outcome.

The aim of the inquiry shifted to identify the formal and informal makeup inherent within a CWA structure's collaborative system, and its influence on the process and thereby the outcome of an architectural project. It further sought to determine whether the system was based on trust rather than control. This led the question to be,

"does CWA provide a structure that helps sustain a healthy co-creative system through collaboration?"

From this position it was acknowledged that a collaborative system does not automatically imply producing quality or inspiring work, but to an agreed standard set by the team. Yet, an assumption could be made that a shared purpose of a virtual organization could be to deliver value-driven, innovative and sustainable architecture.

4.1.1 Context

The second step in informing the applied research methods was selecting the chosen context to assist towards answering the question. The context of this research is based on the AEC industry, specifically in New Zealand. The study selected NZ building projects, involving architects within the AEC industry that adopted the CWA as an architectural project delivery system. The sample projects were chosen, as they were the first architectural projects under CWA agreement in NZ. They are of the same type of construction, of similar size, and on behalf of the same client. This helped eliminate discrepancies amongst key variables within the conceptual context, such as client, type and size of construction. It created the opportunity to have the primary study focus on the structure of CWA as a whole, rather than identifying cross comparisons between the projects.

Four building projects have been undertaken with this architectural building project delivery system. Due to the scope of this study, it was decided to primarily focus the research on two of the pilot projects, which have been labelled Project 2 and 3. Project 1 was included and considered from two points of view only. One, because it started under the traditional method but due to its imminent collapse adopted the CWA method, thereby becoming a hybrid project. The second point is that Project 2 is essentially the same design as Project 1. It involved the same key consultants and contractors and was of a similar design. What is of interest, is the quality of the review, transfer and implementation of lessons learned from Project 1. Project 4 is located in the South Island and was considered beyond the scope of this study.

Secondary data	context of AEC industry context of NZ AEC industry four key dimensions of Design Management	Literature Review
Primary data	CWA formal structure General context of the projects selected Interviews structured around the four dimensions and the 'ordinary', 'extraordinary' and 'human' measures	project specific

The third step in the systems inquiry approach to identify the best method, is to break down the main research question to reveal the content within the narrative of the defined context.

4.1.2 Content

To obtain the information required to answer the question, it was important to understand the formal and informal structure of the system. The system, in this case, is the 'virtual organization' created under the CWA construct. As a living human system it operates as a whole, therefore it is important to understand the character of CWA by analysing the whole system and how it functions. The structure of CWA is made up of technical and behavioural aspects, which comprises of both formal and informal facets and how each interrelates with the integrity of the whole. The formal structure is the designed structure, or official structure of the organization; in this case it is the agreement between the virtual organization. The informal structure is the behavioural aspect, made up of networks of communication and the culture. Together, they inform the purpose, principles, practices, procedures, policies and performance measures that combine to shape the structure.

It is important to recognise this as a process of inquiry, an exploration of CWA as a learning model. Analysing complex systems requires a description of the variables that comprise the whole, the formal and informal structure and the relationships within the system. Under a systemic thinking approach "it is argued that valid knowledge and meaningful understanding comes from building whole pictures of phenomena, not by breaking

them into parts" (Flood, 2001, p. 133). The research endeavoured to identify the structure, both formal and informal, that establishes the contractual and operational relationships between the parties.

In assessing whether CWA's structure facilitates behaviour towards trust, the research sought to identify fair, open and honest principles in practice, which were highlighted in the Literature Review as crucial for the encouragement and building of trust. It determined the type of practice, procedures and policies required for these principles to be actively maintained throughout the duration of the project.

To achieve this, the research explored the formal structure in its purity. It addressed the role the client played, and whether their expectations were met. The study also included the project's tangible 'ordinary' and 'extraordinary' measures, and intangible 'extraordinary' and 'human' measures which contributed to achieving creativity, teamwork, on-going learn and systemic thinking. It determined what performance measures were emphasised as critical to the success of the project and how successful the team was in realising them. The discussion around what is good or bad creative output is beyond the scope of this analysis. This research evaluated key indicators of creativity in performance rather than the creative output. To understand effective teamwork, it was deemed necessary to evaluate the culture of the team. It assessed whether there was a strong open culture that encouraged trust to ensure stability and sustainable practice. It also investigated whether the structure adopted learning organizational disciplines that supported personal mastery and team learning by encouraging each person to learn from their experience and adapt to changing events. It also assessed whether the model adopted a systems thinking approach by providing a coherent framework for understanding the architectural design and construction process, and its ability to adapt, learn and evolve within its environment. In addition, it identified procedures, practices and policies that encouraged the team to see the interconnections between the different disciplines and stages to help conceptualise the whole.

4.2 Research Methods

The study therefore required data that aimed to understand how people felt and why they felt that way. To extract this type of information it was important to both observe and gain insight into people's interpretation of their experiences, opinions, beliefs and feelings as to whether CWA provided a structure that facilitated a trusting environment to enable effective collaborative practice. By seeking to construct meaning out of their experiences I endeavoured to understand whether the structure provided and encouraged them towards teamwork, creativity, ongoing learning and systems thinking.

A cohesive framework was created to enable the research to be grounded in a more holistic approach, where the method logically interconnected with the data in a consistent manner. The methods used were observation, semi-structured interviews and documentary inspection, and are classified as qualitative, according to Bryman's (1992) framework (cited in Loosemore et al., 1996).

The primary research was based on 'subjective contextual judgments', through observation and interviewing, as it sought to gain knowledge based on other people's perspectives involved in the chosen context. To effectively extract this type of information required "considered, reflective judgment"(Metcalf, 1995, p. 119) within a narrative-orientated approach. Semi-structured interviewing was selected as the primary tool for this purpose.

The interviews were semi-structured to ensure a common thread of discussion whilst allowing evolution of thinking and some flexibility and flow for the interview. This was to enable greater rigour in the analysis and help determine, relationships and comparisons. This approach built a logical progression of evidence around

the four dimensions of Design Management. The focus of the research specifically looked at the intangible 'extraordinary' and 'human' aspects within the four dimensions.

The findings therefore are based on a systemic framework underpinned by a qualitative approach, which was interpretive. "An explication of 'meaning', rather than the isolation of 'truth', is identified as the goal" (Burns, 1997, p. 294). "The qualitative researcher is not concerned with objective truth but rather with the truth as the informant perceives it" (Burns, 1997, p 292). The classical view of science where the observer is objective has been challenged, particularly by quantum theory. Evidence has shown the "crucial role of the observer's consciousness in the process of observation..." (Capra, 1988, p. 416). Analysing my observations, the interviews and data collected, provided an opportunity to test my assumptions.

Verifying people's perceptions with factual data and archival evidence validated the findings drawn from the interviews. This enabled a greater insight into whether the structure impacted and influenced the way of working. This technique, known as triangulation, is often used in qualitative research (Burns, 1997). Burns (1997) defines triangulation as "the use of two or more methods of data collection in the study of some aspect of human behaviour" (p. 324). He further summarises triangulation's key contributions towards verifying and validating qualitative analysis by

- (a) checking out the consistency of findings generated by different data collection methods
- (b) checking out the consistency of different data sources within the same method (p. 324).

The 'ordinary' and 'extraordinary' tangible measures, such as cost, time, quality and safety, gained from archival data from the projects selected are compared with the findings from the interviews. The secondary data creates an interplay between the primary research, which shaped decisions on the structure of the interviews.

The research methods table below outlines the forms of data collections and identifies the reasons why they were useful for the purpose of the research.

4.2.1 Part 1 of the Analysis

	What?	Why?	How?	Questions/Information
1	CWA general background information	To gain a general understanding of the formal structure of CWA agreement in its purity	Archival information from CMS, Aon Insurance & Simpson Grierson	Study CWA agreement Analyse the principles, practice, procedures and policies that make up the formal structure of a CWA agreement

Figure 4.0

The first part aimed to analyse the characteristics of the formal structure of a CWA agreement, to gain a general understanding of the model in its purity. This assessed what characteristics, such as a defined common purpose, principles, practices, policies and performance measures are included to enable it to operate as a healthy collaborative system. These characteristics informed whether the formal structure allowed for creativity, teamwork and on-going learning within a systemic perspective.

Part two, three and four are project specific. An interview schedule was developed and three types of face-to-face, one and half hour, semi-structured interview guidelines were prepared and formatted according to their intent. All interviews were taped, with the prior consent of the interviewees. At the commencement of the

interviews, the participants were asked how long they had been in the AEC industry and what was their involvement with the Project. This helped gain an understanding of their experience. The majority of selected interviewees had between 20-40+ years experience in the AEC industry. Refer to the breakdown of the interviewees at the end of this chapter.

4.2.2 Part 2 of the Analysis

Part 2 gathered information around the specific projects and Client as shown in Figure 4.1 below. This information was obtained from four client representatives. The Literature Review highlights the importance of the client and the crucial role they play towards the success of the project.

	What?	Why?	How?	Questions/Information
2	The broad context of CWA Projects 1, 2 and 3 and the client perspective and role	To understand the big picture and where the three projects fit within that context. To frame the questions to help my understanding as to whether the projects were successful in achieving client expectations	Interview with an outline of key questions. Interview Client Liaison Manager, Project Director for client team, Client Manager for Finance and Administration, and the Client Project Planner. This was referenced with archival data from client source, project information and external reviews	Broad context, approach and philosophy, brief and values and vision of the projects and the evolution of the design Why the client chose to adopt CWA CWA workings and its benefits to the process from a client perspective Client satisfaction in both service delivered and outcome.

4.2.3 Part 3 of the Analysis

Part 3 analysed archival information, policies and procedures, and relevant statistical data to ascertain where the tangible measures identified under 'ordinary' and 'extraordinary' were realised under CWA. This was undertaken for Projects 2 and 3. The two CWA Managers for Projects 2 and 3 were interviewed as well as the Client Manager for Finance and Administration and the Client Project Planner, as outlined in Figure 4.2 below.

	What?	Why?	How?	Questions/Information
3	Project No.2 and No. 3 Focussing predominantly on the 'ordinary' but does include 'extraordinary' tangible measures, such as safety	To understand the chain of events to gain greater understanding of policies and procedures and specific characteristics of an operating CWA. To gain insight into the day-to-day workings of CWA.	Information from CMS: Obtain archival information, records/facts on the projects selected. Interview the CWA Managers, Client Manager for Finance and Administration and Client Project Planner Site visit Project 2 and 3	Relationships Process in selecting the team Long term relationships – difficulty for potential suppliers/consultants Review Quantitative Risk Analysis (QRA) and Risk Register, risk mitigation plans and risk reports Review monthly Work Status Project Executive Reports Review TOC and Final Cost Timeline of the project – projected and actual execution plan Project Quality Plan, quality review Health and Safety statistics

For the purpose of this study the actual dates, times and figures even though obtained were not disclosed. These measures were significant to understand the success of process rather than stating the exact figures and comparing those to industry standard.

4.2.4 Part 4 of the Analysis

For Part 4, it was important to interview people who had experienced working under a CWA agreement at various levels to give insight into its structure, particularly around the four dimensions, teamwork, learning, creativity and systems thinking. The data analysis from interviewees provided descriptions and interpretations of events. It sought to answer the guiding proposition, that the structure influenced the patterns of behaviour to provide a trusting environment to enable effective delivery of the shared purpose. The interviewees were from Projects 2 and 3. A total of 11 people were interviewed for this part. Refer to interviewees list at the end of this Chapter, Figure 4.4.

	What?	Why?	How?	Questions/Information				
4	Project 2 + 3 Principal's Group 2 out of the team architect engineer	To gain a systemic viewpoint of the 4 dimensions from the individual's position within different positions and levels of influence	Interview and observation <table border="1"> <tr> <td>TW*</td> <td>C</td> </tr> <tr> <td>L</td> <td>ST</td> </tr> </table>	TW*	C	L	ST	<p>For a more detailed breakdown refer to semi-structured framework in Chapter 5 the Analysis, Part 4</p>
TW*	C							
L	ST							
Project Executive Group 2 out of the team Design Manager Project Controls Construction Manager	As above	Interview and observation <table border="1"> <tr> <td>TW*</td> <td>C</td> </tr> <tr> <td>L</td> <td>ST</td> </tr> </table>	TW*	C	L	ST		
TW*	C							
L	ST							
Subcontractors 1 out of the team	As above	Interview and observation <table border="1"> <tr> <td>TW*</td> <td>C</td> </tr> <tr> <td>L</td> <td>ST</td> </tr> </table>	TW*	C	L	ST		
TW*	C							
L	ST							

*the table represents four key dimensions of Design Management philosophy: Teamwork, Creativity, Learning and Systems thinking

The semi-structure of the interviews provided a framework for the analysis and was based around the four key dimensions, specifically addressing intangible 'extraordinary' and 'human' measures. It formed the basis for framework of the interviews undertaken. The breakdown of these four dimensions is included in Part 4 of the Analysis (Chapter 5.7). The questions formulated were considered useful to uncover the formal and informal structure of CWA to see whether the day-to-day reality reflected the espoused collaborative approach. They were based upon the studies and Literature Review undertaken in all four areas of Design Management, prior to the commencement of the thesis. As well as that, general questions around CWA were asked at the beginning of the interview and more specific questions at the end.

4.3 Analysis of the research

Chapter 5 discusses the analysis of the four parts to this research, as outlined in 4.2. The findings of the interviews are presented in the specific parts of the structured framework. Relevant quotes are extracted from the interviews to support the discussion.

Burns (1997) believes that one of the features of ethnographic analysis is the emphasis on reflexivity: that is the description and analysis of the research process itself. For analysing the results, the predominant inquiry is to gain an understanding as to whether a CWA virtual organization acts as a healthy human system. It will therefore mainly provide an overview to encapsulate the whole of CWA rather than a detailed analysis of a particular part.

In saying that, whilst not the focus, there might be some cross comparison between the different projects operating under CWA, and distinctions will be raised if one was more effective than the other. Cross project analysis compares the responses across each project. Analysing each participant's responses enables drawing any similarity or distinction that exist among them, which identifies patterns or consistencies that emerge. Burns (1997) also suggests that inconsistencies are noteworthy and the fact that there, does not necessarily undermine the conclusions able to be drawn.

The analysis will also raise important areas that could be improved upon for the success of the CWA architectural project delivery system. It is hoped that the findings will create discussion within the industry as to what could be learnt from these observations and what could be expanded upon in further research. The desire is to inform the debate about the importance of architectural project delivery system and its implications to the end result.

INTERVIEWEES

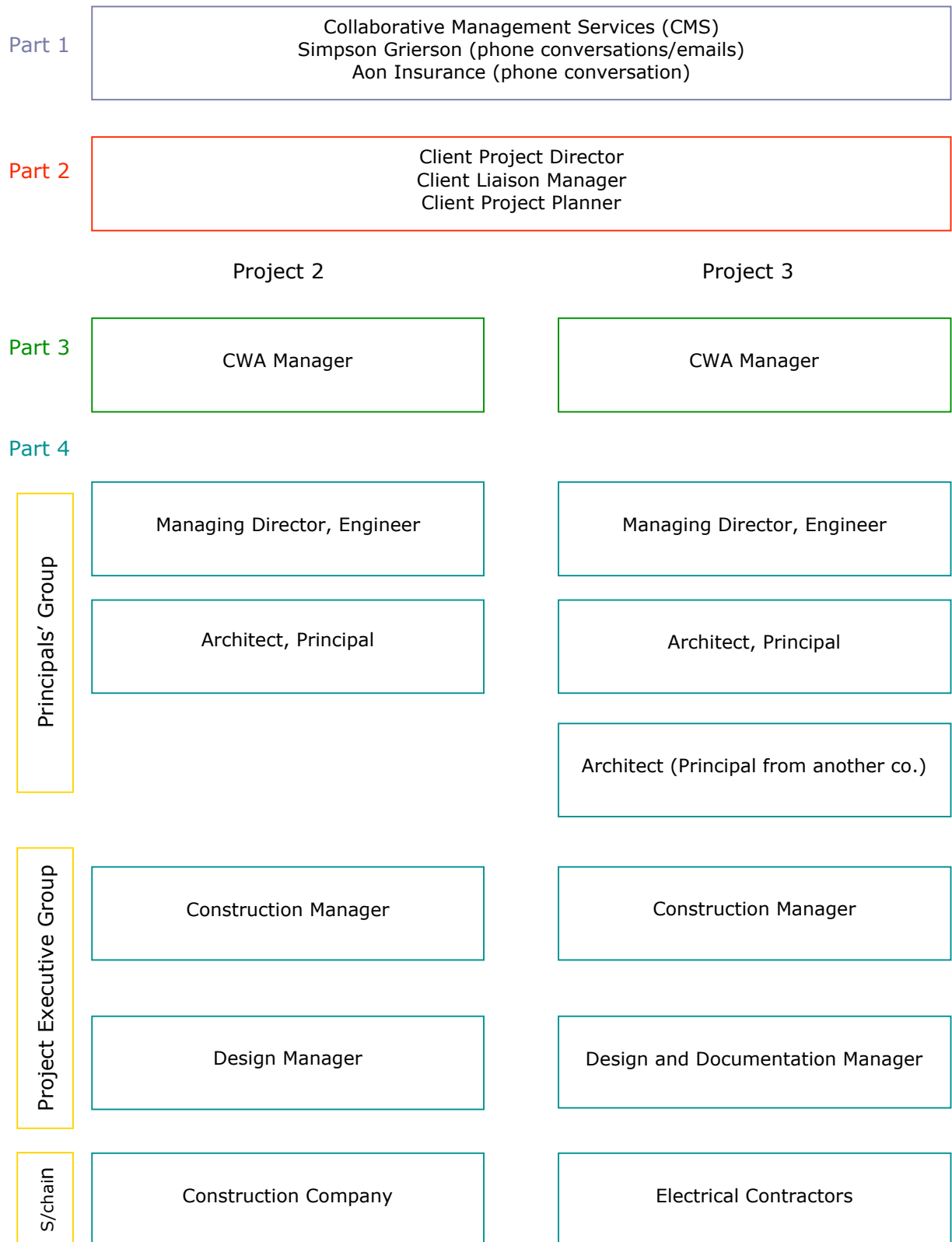


Figure 4.4 Table of Interviewees

ANALYSIS

5.0 Part 1 – CWA agreement

	What?	Why?	How?	Questions/Information
1	CWA general background information	To gain a general understanding of the formal structure of CWA agreement in its purity	Archival information from CMS Interviews with Aon Insurance & Simpson Grierson	Analyse the characteristics of the formal structure, such as the principles, practice, procedures, policies and performance measures that make a CWA agreement

The structure of CWA virtual organization is made up of tangible, technical and intangible, behavioural aspects. The formal structure incorporates both these within its agreement to ensure that the informal structure reflects the intent set by the team.

The CWA documentation process is typically split into two parts. The first stage is the Negotiated Framework Agreement, a simple, straightforward document that lays the foundation for the CWA formation process, prior to entering the second stage. The second stage, the CWA, is collaboratively facilitated and developed with each CWA 'virtual organization'.

For an architectural project the 'virtual organization' of CWA is made up of the CWA members and includes the client, architect, engineers, other primary consultants, the contractor and the supply chain. It has similar characteristics of an organization, as even though it is run as an unincorporated venture that comprises of a number of organizations, members have legally agreed to work together to achieve a particular project. A collective identity is created to help reinforce the 'virtual organization'.

5.1 Purpose

The overarching purpose of the CWA agreement is to continuously build trust within the team, by creating a collaborative environment to promote greater efficiency and be more effective in producing the desired outcome. It was specifically formed to enable and facilitate change from typical adversarial behaviour to collaborative behaviour. An important aspect in achieving this was the awareness that the agreement forms only part of the structure, and that the informal structure that is, the culture, the ongoing education, coaching and learning are an integral aspect of the whole. Understanding trust as an intangible emergent property recognises the value of delivering on promises and expectations.

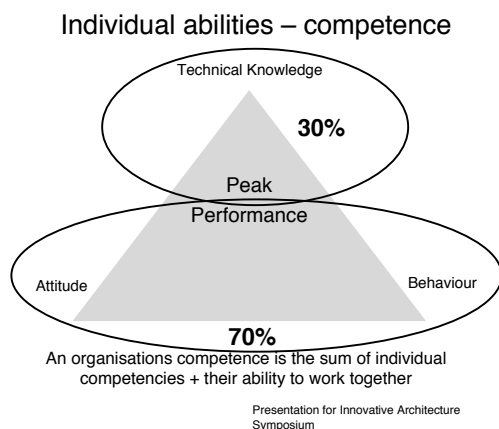


Figure 5.0 An organization's competence is the sum of individual competencies + their ability to

work together. (Diagram courtesy of Dr. Jon Broome), presented by CMS at the Innovative Architecture Symposium 2005

This diagram clearly shows the fundamental role the behavioural aspects of people play, the importance of effective relationships for teamwork and the need for this to be acknowledged within the formal structure of the delivery system.

Prior to signing the Negotiated Framework Document a workshop is held to identify the project goals, objectives and tasks. Working together, they then align the strategy of the virtual organization to achieve the required outcomes. An agreement is reached on appropriate economic drivers to achieve the common goals. A 'unity of purpose' for the particular project is created and provides a shared interest in the overall project outcomes. This process helps build the trust between the members of the team. All key stakeholders are represented at this workshop; and include the client, architect, engineer, main contractor and key supply chain and suppliers. Information is shared and inclusion amongst all team members is encouraged. The traditional method is in stark contrast to this, since there is limited disclosure of information, exclusion of key members at the design stage and no formal procedures to facilitate alignment and agreed unity of purpose.

5.2 Principles

The following principles are included in the agreement and are identified as key in the building of trust through adopting appropriate behaviour and attitudes of those involved in the project. They are at the forefront of the document as a means to endorse the significance and ongoing commitment of all those involved throughout the duration of the project. These principles are integral to the working of the agreement; thereby the practice, procedures and policies ensure that the principles remain active and alive.

5.2.1 General

"The project will be delivered ... in a spirit of co-operation adopting collaborative behaviour and utilizing the strengths of each CWA Member in a way which reflects the best practice principles of project alliancing..." (CMS & Simpson Grierson, 2004, p. 5).

5.2.2 Openness and honesty

Feedback is welcomed, as is the encouragement of early resolution of potential disputes, transparency of information, and where "confrontational attitudes are strongly discouraged" (CMS & Simpson Grierson, 2004, p.5).

5.2.3 Co-operation and teamwork

"CWA members will work together in a spirit of trust and co-operation toward the creation of an open, ethical and progressive relationship with common objectives, mutual benefits and support. Teamwork is encouraged. The CWA members will support collaborative behaviour, confront inappropriate behaviour and jointly solve problems... CWA Members will at all times behave in a fair and reasonable manner and ensure that all decisions are aimed at achieving a successful Project for the mutual benefit of the CWA members" (CMS & Simpson Grierson, 2004, p. 5).

5.2.4 Additional principles

The principles also include the importance of 'Generous Listening' to foster active listening behaviour, plus to promote a collaborative, 'no claims' culture and effective 'Communication' and a 'Good Faith Commitment'.

5.3 Practices and Procedures

The practices and procedures within the CWA agreement reinforce the adoption of the principles listed above and include the following:

5.3.1 Relationships

CWA members comprise of client, architect, engineers and the contractor. CWA is unique in that all members of the team have a direct relationship with each other, including the client. The client is legally part of the team, and is an equal member in decision-making. A 'virtual organization' for the project is created. On large projects the main contractor engages the supply chain. Their agreement mirrors the main agreement as it has the same principles, procedures and policies. Therefore in theory and in practice, they are part of one team in the organizational structure and process. This differs from the traditional master/servant hierarchical relationship and removes the positional power of the client. The allocation of risk supports this relationship structure.

Agreement Structure

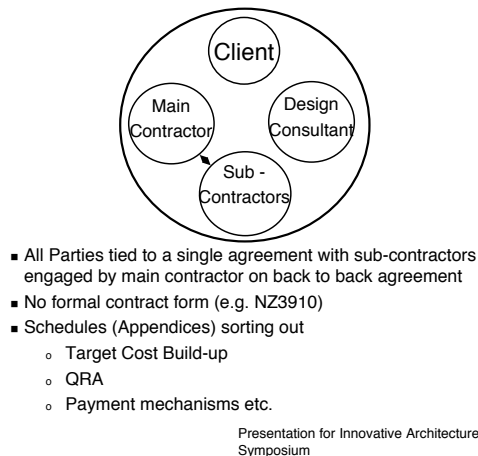


Figure 5.1 Agreement Structure, presented by CMS at the Innovative Architecture Symposium 2005

By including the whole team under the same set of procedures helps form a culture that builds on the trust achieved through each stage. The consistency between the formal and informal structure of this architectural project delivery system enables this to occur. The contractual, operational and behavioural relationships are seamlessly integrated and are 'peer to peer'. The agreement states that everyone will agree to work together in a fair way, which encourages a collaborative pattern of behaviour. Ultimately, the aim is towards symbiotic relationships, where each member recognises that they co-exist and thereby, are mutually supportive of one another, for the benefit of all.

As discussed, in a CWA agreement the client has a contractual relationship with the supply chain. This relationship is important as the supply chain undertake a substantial amount of the construction. In fact for this reason, the supply chain is identified as the most important and are therefore at the top of the inverted pyramid (refer to Figure 5.5). New types of relationships can also be established and encouraged within this model. This will be expanded on in Analysis Part 3 and 4.

It is important to note that this agreement is not a joint venture, but an unincorporated venture "set up as a group of people agreeing to work together. The agreement frames the way in which they operate with a common agreement on how to achieve it" (pers comm. Durbin, 2006).

5.3.2 Roles and accountability

The CWA agreement promotes self-responsibility and self-empowerment rather than positional power, which is authority based and hierarchical. "When the key stakeholders have a collaborative working arrangement in place, their team members are empowered and driven to complete a successful project, which leads to more efficiency, innovation, and less waste and duplication" (Project Quality Plan, p. 6, Project 2).

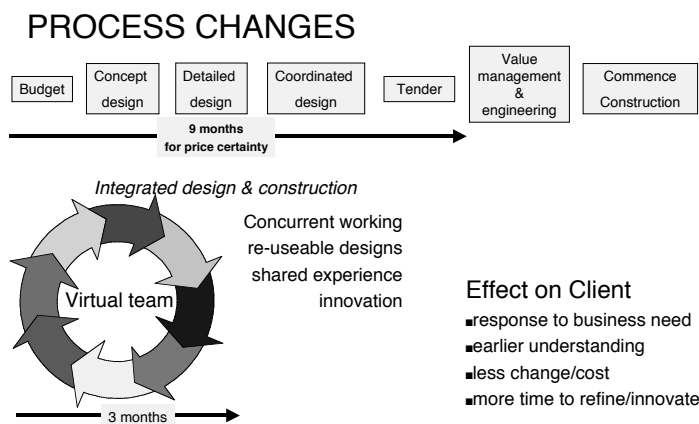
"Good CWA practice involves collective responsibility and accountability for project outcomes" (States Services Commission, 2006, p. 62). One example of this is the procedure to determine project completion. First, the PEG team has to agree that the project is complete in its entirety. Then the Principals' Group has to reach consensus and self-certify that it is complete.

Collaboration based on trust shares the responsibility amongst the team and thereby reduces the growing legal requirements and demand for sole responsibility. This, in turn, minimises unnecessary documentation and protective paper wars, reducing time spent on self-protection and increasing time spent on the actual project. Policies are created that guide everyone to work together to find solutions and identify risk areas for the benefit of all. This manifests directly in reduced insurance premiums (pers comm. Aon Insurance 2006).

The Client Liaison role is independent to CWA members, and acts as gatekeeper for end user requirements. Under this role, the person is able to request variations beyond the CWA team, which may be seen to be in conflict with other interests of CWA members.

5.3.3 Integration of design and construction

This significant practice supports a team approach to problem solving by involving the input of contractors, key supply chain and manufacturers in the design and construction stage. Clusters are formed during the design stage to ensure buildability and maintainability. The purpose behind this is to incorporate their knowledge to add value to the outcome. This integrative approach is fully supported by the formal structure's removal of personal liability to a collective responsibility. Combining the different disciplines within a shared work environment, supports greater level of communication and resolves the interfaces between the disciplines. It creates one team, one purpose, rather than design or construction being seen as separate to each other. It promotes working together rather than independent silos. Innovation is more likely to occur, as members are encouraged to step outside their traditional domain of influence.



Presentation for Innovative Architecture Symposium

Figure 5.2 The traditional linear and virtual integrated supply chain, presented by CMS at the Innovative Architecture Symposium 2005

By including all the main team members early on, ensures all those involved in the design and construction process know the client's objectives. This understanding helps inform all decision-making to actively support the realisation of a successful outcome for the client. This differs from traditional contracts where the Client objectives and brief are discussed at the design stage and are rarely referred to at the construction stage.

5.3.4 Team selection

In the traditional process the contractor and subcontractors are generally selected on lowest price rather than quality or alignment to vision of project. With CWA, the procedure is different, as the focus is on building the team first. The selection of the team is made on a 'best person for each role' basis. The selection criteria include suitability as well as eligibility and compatibility, so as to ensure the team is well balanced. The team selected is based on value rather than lowest cost, their ability to work together as a team and on anticipated alignment to the client's initial vision and objectives.

5.3.5 Team building and development

Education and ongoing coaching throughout the project delivery helps facilitate change process and alignment to purpose. An independent company facilitates this process. The purpose is to create a strong team culture, assist in breaking down the barriers between the different domains and work towards establishing trust. CMS have identified that trust must be earned by 'delivering on promises' and these behaviours require coaching. Sharing workshops and team building exercises fosters collaboration and supports the integration of the design and construction process. The coaching and workshops support continuous improvement as shown in Figure 5.3 below. CMS has training and coaching process, which ensures each segment of the supply chain, receives the necessary skills to participate fully in the CWA.

Additional to the initial teambuilding workshop (colloquially referred to by CMS as a 'sheep dip') are the following workshops, where all team members are invited to attend. They are as follows:

- Workshop One: An introductory foundation course in collaborative working, which introduces the commercial and legal structures, but concentrates in the main on introducing people to the new behaviours required for collaborative working to succeed
- Workshop Two: A team building module which examines the essential characteristics and structures of successful teams and how to create them
- Workshop Three: A second team building module which explores leadership, management styles (and when best to use each)
- Workshop Four: A module which explains how the Target Out-turn Cost (TOC) is put together, and how the payment mechanisms work
- Workshop Five: A module which explores Risks management and how the Quantitative Risk Assessment (QRA) is assembled
- Workshop Six: A module which sets out the legal frameworks
- Workshop Seven: A module which deals with project insurances.

In addition to these workshops are health and safety training which includes an introduction process to orient new members to the team.

5.3.6 Coaching and mentoring

Independent coaching and mentoring is available to all those involved in the CWA project. The formal structure anticipates queries from the team and provides on-going support from the PEG team and CWA facilitators/advisors.

5.3.7 Continuous Improvement

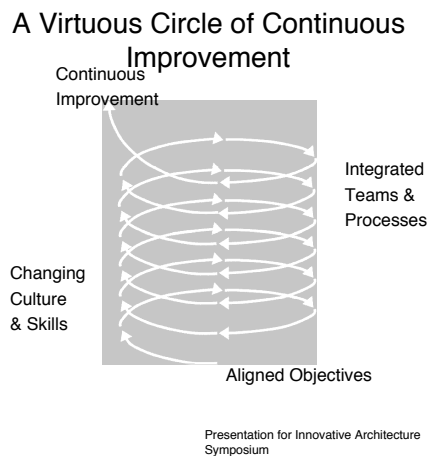


Figure 5.3 A virtuous circle of continuous improvement, presented by CMS at the Innovative Architecture Symposium 2005

As the diagram indicates, continuous improvement relies upon aligned objectives and learning and unlearning ways of working. Procedures and policies are included within CWA's formal structure to support this process. They operate within all tiers of the system, from the Principals' Group, PEGroup to the supply chain. All team members are encouraged to improve upon practices, with a special focus on the agreed performance measures. Procedures and practices such as workshops, coaching and training, plus policies that support the ability to admit mistakes, enables continuous improvement to occur.

5.3.8 Team identity

Each project operates under one name. This name helps establish a collective identity and integrates the different companies that comprise the team. The identity includes letterheads, business cards, t-shirts, construction safety vests and site notices.

5.3.9 Decision-making

Decisions are collaborative and are not made by individuals or separate disciplines serving their own agendas. When preparing costs, reports or other procedures, all work is not the responsibility of one person or discipline, but shared. Knowledge is therefore spread wide and diverse. The Principals' Group also operates under this premise to ensure collective responsibility, supported by the need for unanimous decision-making. This means that the Principals' Group has an obligation to CWA over and above their personal agendas. It is important than, that the collective purpose is aligned with the client and other members' objectives.

5.3.10 Cost

Traditionally, the price is comprised of the cost of the actual work, the risk, margins and profit. The downside to this is there is little incentive to reduce costs as profits are reduced as well. Further, each member gains profit at the expense of the other team members. This perpetuates no commercial incentive to look after one another. It operates under a closed book policy and is secretive, in that it does not disclose the breakdown of the price.

"The CWA seeks to achieve both a reduction in the overall cost and an increase in suppliers' profitability. This is achieved by avoiding premium pricing of unmanageable risk, stripping out waste and 'man-for-man marking' and integrating management teams" (Project Quality Plan, 2005, p.6. Project 2).

With a CWA agreement, at the beginning of the project all team members' margins are individually assessed and compared to observed normalised margins. They are then 'ring-fenced' and separated from the actual cost of labour and materials. Margins are separated into two parts, the overheads and the profit. An agreed percentage of the profit is separated, and invested in the painshare/gainshare policy.

This creates a twofold benefit; first, the actual costs and the overhead are guaranteed payment. This includes rework. Everyone knows that they will be paid at a minimum, their actual costs and overheads, and the incentive to gain profit propels them to perform to the best of their ability. And secondly, it assists each discipline within the industry, including professionals, to differentiate margins from actual costs. This knowledge leads to focus on how to reduce actual costs to increase profit and overall value. The emphasis shifts away from pricing and encourages continual improvement, as reducing costs does not influence their profit. The profit is tied to the final outcome.

The TOC is, in effect the agreed estimate for the project and comprises the actual costs of the labour, materials, on-site overheads, off-site overheads, profit and project risk contingency. Establishing TOC is a collective endeavour where the goal is to ensure costs are efficient and represent value for money. "It is calculated on what is genuinely believed to be the most accurate estimate of the likely cost of building it, including the risks which we quantify through a sophisticated methodology" (Pers comm. Project Director). Only on completion and acceptance of the TOC, does the CWA become formalised. This also affects the 'gainshare/painshare policy', as this cannot be finalised until this time.

Manage Costs Collaboratively

Traditional construction costing	Target costing
Prices determine contract value	Costs determine value
Performance, quality and profit (and more waste and inefficiency) are the focus of cost reduction	Design is the key to cost reduction, with costs managed out before they are incurred
Cost reduction is not customer driven, nor project/design team driven. It is driven by separate "commercial" people	Customer input guides identification of cost reduction areas
Quantity surveyors advise on cost reductions	Cross-functional teams manage costs
Suppliers involved late in design process	Early involvement of suppliers
No focus on through-life cost	Minimise cost of ownership for client and producer
Supply chain only required to cut costs – regardless of how it is done	Involves supply chain in cost planning

Presentation for Innovative Architecture Symposium

Figure 5.4 Manage costs collaboratively, presented by CMS at the Innovative Architecture Symposium 2005

5.3.11 Risk

In traditional contracts the client transfers the risk to another party, either the main contractor under the construction contract and the Architect and consultants under their separate agreements. CWA is different. The risk and profit are shared amongst all parties, including the client, in proportion to the agreed risk appetite, influence over outcomes and relevant sizing of contributions. This optimises risk management and shifts the process from being risk adverse, to proactive to the risk undertaken.

The whole team collectively works together to identify, avoid, mitigate, and/or minimise all foreseeable risk, under the facilitation of a Risk Manager to create a shared Quantitative Risk Assessment (QRA). This differs

from the traditional method, where everyone considers risk separately, and the Client and the Project Manager that cater for incidents create a Contingency Register. The QRA is a joint management of contingencies and lists opportunities as well as risks. There is one joint contingency sum for the whole team. Risk mitigation plans and risk reports are prepared on a four weekly basis to ensure that the QRA is properly managed and controlled.

5.4 Policies

The policies are integral to the agreement and aim towards building sustainable relationships based on respect and trust. This means that rather than policies that penalise, it adopts 'win-win' incentives that are fair to all, to encourage performance.

5.4.1 Joint and several risk assumption

CWA operates under a 'joint and several risk assumption' policy. When a party enters this agreement they waive their subrogation rights. This removes each party's ability to sue each other. This policy is often referred to as the 'no blame no claim' culture, as the team owns and manages the risks to the best of its ability.

5.4.2 No dispute clause

To help translate this into practice, procedures are set in place to resolve problems at the level they are created. A key towards collaborative behaviour is that parties are required to work together to find a solution rather than to blame. The practices and procedures provide support for people when things go wrong. The 'no dispute' clause, acts as an effective policy in resolving disputes, as all decisions that cannot be resolved are ultimately referred to the Principals' Group. All decisions made by the Principals' Group are required to be unanimous, that is all parties have to agree. According to Durbin (2006), "if there is a deadlock the project ends, rather than 'draconian' this is a powerful incentive to solve matters as they arise".

5.4.3 Insurance

The CWA insurance is under the joint names of CWA members, including the client, and becomes the Project Insurance. The client either agrees to retain the risk after the defects liability period is completed or an agreement is reached between the members. The client pays for this insurance.

Traditionally, the Architects and other consultants have separate professional indemnity insurance for their part of the work. The Contractor for new projects insures the Contract Works. Ultimately the client pays for both these types of insurance in the Preliminary and General and in the fees for the consultants.

There is a powerful incentive for consultants to be part of this. Professional risk is more manageable under CWA than traditional contracts. If design or documentation is incorrect or insufficient it is in the 'teams' best interest to work together to correct this. This results in the likelihood of a smaller chance of building something that is incorrect. Working under this method could minimise the need for consultants to call on professional indemnity insurance, which would ultimately result in a lowering of premiums.

5.4.4 Policy for decision making 'best-for-project'

One of the main mottos behind CWA is what is 'best-for-project' and ensures that decisions are based on what is best for the project rather than on individual gain.

5.4.5 Gainshare/painshare policy

This acts as an economic commercial driver to help align people together. It is a voluntary gainshare/painshare mechanism, derived to incentivise the parties to deliver an extraordinary project outcome, which might be measured in terms of costs, time, safety etc. The profitability is tied to the final outcome, where everyone must either ALL win or ALL lose. This creates an incentive to help each other and be constantly vigilant towards improving the whole process. It promotes each team member to produce the best outcome, both in the quality of the work and in achieving zero defects at time of completion. An added bonus is that it integrates each member into observing the whole process rather than focusing solely on their own role within the project and thereby encourages mutual accountability. The apportionment of 'gainshare/painshare' is pre-agreed between the parties. These arrangements are transparent.

Retentions may be applied, yet the CWA does not encourage the use of retentions as it rather use incentives to obtain zero defects. The rationale being that holding something back to ensure performance signals a lack of trust. If people cannot participate in the painshare/gainshare policy it is still important that they feel a part of the team. Performance based measures become critical.

Incentives such as the bonus for early completion are included under the traditional method, yet only the Contractor gains from this, rather than the whole team, especially the supply chain. Plus, usually this is undermined by the additional security the Client places through withholding retentions and often with the inclusion of bonds and/or liquidated damages.

5.4.6 Open book policy

All team members, including the client, in determining the costs of the project, adopt the open book policy. This ensures clear accountability and transparency and is accessible to everyone on request. Costs are managed collaboratively, rather than separately.

5.4.7 Pay for rework policy

The client agrees to pay all labour, materials and plant, for all rework to encourage the team to admit mistakes early, rather than to hide them. This does not include margins or profit.

5.4.8 Legal representation

CMS advocates the selection of one legal firm to represent the interests of all CWA members. This is designed to ensure fairness and probity, but more importantly a reinforcement of the unity of purpose and single team identity.

5.4.9 Performance measures for success

The current performance measures for success under a CWA agreement include the 'ordinary' measures: overall cost, timeframe and quality and the 'extraordinary' measures such as safety and performance.

5.5 Part 2 A Review of Projects 1,2 & 3, and the Client's role

	What?	Why?	How?	Questions/Information
2	The broad context of CWA Projects 1, 2 and 3 and the client perspective and role	To understand the big picture and where the three projects fit within that context. To frame the questions to help my understanding as to whether the projects were successful in achieving client expectations	Interview with an outline of key questions Interview Client Liaison Manager, Project Director for client team, CWA Manager, Project 3, and Client Project Planner This was referenced with archival data from client source, project information and external reviews	Broad context, approach and philosophy, brief and values and vision of the projects and the evolution of the design Why the client chose to adopt CWA CWA workings and its benefits to the process from a client perspective Client satisfaction in both service delivered and outcome.

5.5.1 General overview

The projects selected for this research are all major projects and are significantly beyond the majority of construction projects in New Zealand in terms of size and value. The projects were commissioned by the same Client, and were of similar type and complexity. The overall design, materials and construction technique for all projects were neither complex nor particularly innovative. To undertake the turnkey development of the four new projects the Client set up a separate dedicated client building project management team (CBPMT). The role of the project team was to ensure the successful opening of the new facilities by managing the RMA process, design, construction and commissioning of each new facility.

Due to the scale of the projects, only the top five contractors in New Zealand would have been able to participate. As discussed in the background, the context of the work influences the process and outcome of the work. "To varying extents, these factors have had a significant impact on the approach to, and the cost of, the projects" (States Services Commission, 2006, p. 9). One of these factors was skilled labour shortage. During the time these projects have been built the construction industry has experienced a boom period. These projects impacted the market as well due to their scale. Significant cost increases occurred in both materials and labour. Further, the sitings of three of the four projects were in remote locations.

In 2003, the Client began to review the traditional project delivery strategy after the problems associated with Project 1 (refer to Project 1, Section 5.5.2). In 2004 after doing an extensive review on alternative methods a decision was made to select CWA for the rest of the three projects. The decision not to proceed under the traditional methods was tested in the market, where it was found that the appropriate contractors were unwilling to enter a traditional competitive tender due to the rise in building activity, shortage of skilled labour and in three cases the remoteness of the building locations. Further, because of the size of the projects, the potential Contractors were not prepared to carry the risk, and therefore financial exposure relative to the likely gains (profit) to be made. The decision to proceed under CWA was reinforced by the successful turn-around and completion of Project 1. Adopting CWA had the added advantage of being able to continue design, team selection, preliminary pricing and planning whilst appeals in Environmental Court were in process. Working under CWA agreement further assured access to obtain local contractor resource as it created a non-risk environment and allowed traditionally competitive companies to work together. CWA provided a forum to embrace stakeholders in decision-making and gained local commitment, particularly with iwi, which helped obtain Resource Consents. It is to be noted that iwi consultation had largely concluded by early 2004 and CWA commencement work was not until later in 2004. Because of the early seeding work with iwi undertaken by the

CBPMT, CWAs were able to work with iwi on labour placement initiatives etc. Again, all work done with iwi to develop protocols on koiwi, Taonga, and Wahi Tapu (Waahi Tapu) occurred in advance of CWAs being formed.

The standard of quality expected by the Client was to the normal standards of the industry, with the addition of the specific standards prepared by the Client that related to the type of buildings. Completing the projects on time was of primary importance to the Client. One further requirement was that the all projects on completion, were to be defect free. This was for two reasons; one being the difficulty of access for remedial work after completion of the work and the second reason was the team agreeing to raise the bar in terms of quality in recognition of the Client's acceptance of taking full risk upon completion.

After reviewing Project 1 to gain insights into improving the process, it was decided that all subsequent projects would include Furniture, Fittings and Equipment (FF & E) within the CWA agreement of works. This decision recognised that asset management responsibilities and operational responsibilities were encompassed within an integrative scope of works and helped ensure the defect free stipulation. Each CWA 'virtual organization' became responsible for the activities of receipting supply, and the locating and fitting of supplied items. The FF&E specifying and purchasing remained with the Client and the client building project management team (CBPMT). FF & E budgets and risk were still held by the Client.

In theory, CWA operates from first principles, that is, it is best implemented at the start of the project delivery. With all these projects, the design had been in process for at least 1-2 years time prior to CWA being adopted. During that time, significant decisions had been made which impacted on the final outcome. Yet, this study is still relevant, as, in Project 3, with the significant scope change, required the full engagement of CWA and can be considered more/less as a pure CWA, as it required the full re-documentation of design. The design literally re-commenced inasmuch as the sizing of the facility necessitated the upsizing of support infrastructure services and the support facilities.

5.5.2 Project 1

Project 1 started life as a fully specified traditional project delivery system. Through a tender process, the Client engaged the architect adopting the NZIA Agreement for Architect Services AAS2 long form 1996 contract. The design commenced in 2000 and went out to the construction market for tender in 2002 under conditions based on the NZ 3910:1998 Contract. The earthworks project was also delivered using NZS 3910:1998 Contract.

At the time of tender, the construction market was experiencing a boom period, with resultant escalating rising costs and shortage of skilled resource. The lowest tender price came in significantly over the estimated budget. The Client proceeded with the lowest priced contractor on the basis that a value management procedure be undertaken to re-gig it to the original budget. This approach also required further investment (of an additional 8% of the construction budget) by the Client, which was equivalent to the savings achieved through the VM exercise. An agreed price was reached, and the contract was signed in March 2003, although work commenced earlier in January 2003. The design team was requested to reduce the costs and effectively carry out redesign work on almost every building on site. The delays caused by the RMA, and the wide-rise nature of the design meant that changes were required simultaneously rather than sequentially. This ultimately created a workload far in excess of the capacity of the design team, and raised serious concerns around completing the project on time.

The actual date for commencement of construction was February 2003. At that time, the selected contractor was indicating the possibility of litigation. It was agreed amongst all parties to attend a workshop to find a way

forward as everyone was determined to execute the project successfully. This was partly because the project was the first of four to be built and it was in the best interest of all, to be included in the possibility of future work. An arbitration expert who had extensive experience in construction projects, both internationally and nationally facilitated the workshop in July 2003.

The aim of the workshop was to bring about a new project structure that would address process, procedures and behaviour. It was to reorient the parties back to a position where they could work together as a team. The end decision upon the completion of the workshop was to establish a CWA styled agreement, where risks related to delivery (failure) could be shared equally amongst the team, as could rewards achieved through performance gains. To avoid the possibility of re-tendering, the CWA agreement became a variation of the underlying existing contract. All parties agreed that it was their intent that the CWA run the full term. Where there was conflict between the original and the CWA agreement, the CWA terms superseded the original. Yet, it was not a pure CWA, as the CWA methodology applied only to the governance and Project Management level. All sub-contractors remained on their traditional fixed-price original contracts with the Contractor, and were therefore not included in the collaborative structure or benefits.

A Memorandum of Understanding setting out activities leading to the signing of a CWA Variation Agreement was established in September 2003. The original completion date prior to the delays was set for 24 February 2005. Actual completion date under CWA was achieved on the same date of 24 February 2005, apart from one building, which was handed over on 8 March 2005.

As this was a hybrid project it was decided not to extensively review this in the research but to include it as part of Project Two. This is because in studying the structure the supply chain needed to be part of the overall agreement. The review of Project 1 will be focused on the quality of transfer of lessons learned and continual improvement undertaken as a result.

5.5.3 Project 2

The same team was involved in Project 1 and 2. Except in this case, the full supply chain was also included within the CWA agreement. The project is essentially based on the same design principles, but on a larger scale. Project 2 was the second CWA project starting from first principles apart from the integration of design and construction at the beginning of the project. This was because the preliminary design process commenced in 2002, under the traditional NZIA Agreement for Architect Services AAS2 1996. In 2004, the Client decided to adopt the CWA project delivery system to undertake the rest of the projects. In June 2004 the design work was brought to a hold point, awaiting the formation of CWA later in the year. This was to enable the integration of the design and construction process and incorporate value management changes undertaken during its formation. On conclusion of the formation process the team could then complete the documentation.

The Request for Proposal process to select the Contractor was initiated in September 2004. By mid October the parties had come together, and by early November 2004, the Negotiated Framework was established with the CWA formation principals. Towards the end of November, the design team was set up in the project office.

In January 2005, the initial construction team had started project planning and was involved in providing input to the design. The selection process of the supply chain was also carried out at this time. In March 2005 it was determined that the Negotiated Framework needed to be extended. In April 2005, a scope change to include FF & E to be carried out by the CWA was also incorporated into the scope of works. As discussed, the scope change related to the activities of receipting supply, and the locating and fitting of supplied items.

By 30 April 2005, the developed design was completed. And by October 2005 the detailed design was completed with commencement of building planned for July 2005. The actual commencement date was in August 2005. The programme for completion of buildings was set for 21 December 2006, followed by the site works, building commissioning and defect free process period until end of March 2007 to allow for FF & E and Client integration to commence by 1 April. Anticipated project handover date, 31 July 2007.

The initial date for completion of Target outturn Costs (TOC) process was 30 April 2005. This was extended a number of times when it appeared that completion would not be achieved. The TOC was submitted to the Client Steering Group by 20 December 2005 for approval, but was not ratified until June 2006. This meant that the Negotiated Framework was extended seven times prior to the CWA becoming formalised in June 2006. The makeup of the CWA agreement is that 96% of the work is undertaken under CWA methods and 4% under traditional lump sum.

5.5.4 Project 3

Apart from the Client, Project 3 comprised of a different set of team members from Project 1 and 2. The design commenced under the traditional building project delivery system. Through a tender process, the Client finally engaged the architect adopting the contract NZIA Agreement for Architect Services AAS2 2000 contract standard form in October 2002, although the design commenced in 2001, with the aim to tender to the construction market in 2004.

In February 2004, the completion of the design was on track. The Client, following the decision to adopt CWA project delivery system upon review of Project 1, sent a Request for Proposal to building contractors with the anticipation to commence work in July 2004. Toward the end of March 2004, a contractor was appointed as the preferred CWA contracting partner. The CWA formation programme commenced, and involved value management exercises, development of target costs, commercial terms and the QRA. The CWA Negotiation Framework was signed in May 2004. This was superseded by a CWA agreement supported by a guaranteed maximum cost plan (GMCP) in November 2004. In April 2006 the final acceptance of the TOC and the revision of the CWA agreement occurred amending the GMCP clauses and value, and other clauses such as gainshare/painshare.

Towards the end of May 2004, the Client issued a significant scope change where they requested that the project double in size, four weeks prior to commencement of construction. Essentially this meant that the design process had to start again. A design-scoping workshop was held in first week of June and involved the design consultants, contractor and major supply chain. This is a classic example in motivating a team to work together to re-design the project within an extremely condensed time frame.

The scope change impacted the ability to establish the TOC. As the need to start work was critical, a decision was made to commence work prior to completing the documentation and costs. It was therefore agreed to continue under the Negotiated Framework. This meant that the Client agreed to pay actual costs to all parties involved during the redesign phase, thus demonstrating their faith in the transparency of the process. It was agreed for key people to work from one location. In June 2004, the Negotiated Framework was extended to include other second tier consultants. The majority of the supply chain was provisionally signed up on CWA agreements that were aligned with the main CWA.

The increase in scope required the Client to seek additional funding to complete construction. Approval was granted for the final funding on 2 August 2004. This cleared the way for the commencement of the works and signing of the CWA agreement. The additional funding accounted for 3.8% of the total project value. The shortfall requiring new funding – and to conclude decision-making related to the acceptance of the TOC – was 1.4% of the total project value.

Simply put, the original commencement of the CWA agreement was to be in May 2004, which was then extended to August 2004. It was then forecasted that the CWA agreement would be signed early December 2004, which was then extended to April 2005. The actual date for TOC being established and CWA being formed was 23 December 2005. CWA members implemented approximately 60% of the workscope with the remaining 40% of the work being carried out by sub-contractors on more conventional 'priced' subcontracts.

More specifically, there were three key decision steps 'in the normal decision-chain' that determine growing levels of TOC acceptance:

1. the decision of the CWA Principals' to accept a TOC and recommend it to the Client
2. the Client making its acceptance of the TOC and recommendations to itself (the CEO)
3. the actual entering (signing) of the CWA agreement and formalizing of the relationship.

At each step the confidence of the supply chain grows but it is not until the last step is achieved that things such as painshare and gainshare distributions are concluded. In the case of Project 3: a "formal" CWA Agreement was executed on the basis of GMPC arrangements in November 2004. This agreement required the parties to deliver the works under the GMPC agreement up to either the time a Final Target Cost was agreed (forecast at the completion of the project), or Final Total Cost was known, again at the completion of the project. The GMPC was the Initial Target Cost agreement, which would be varied at the time the Principals arrived at the Final Target Cost. The Initial Target Cost was agreed as the "maximum available budget funding for the Project". Should costs by the CWA be incurred above the value of the GMCP, either prior to either agreement to the Final Target Cost, or the project being completed, the Client would only be required to pay to the value of the GMCP. The Final Target Cost (which was 1.4% above the Initial Target Cost) was presented to the Department in August 2005, whereas, agreement to it was not reached until 19 December 2005. The December agreement was on the basis that significant VM were made and that the Crown made available additional funding as mentioned earlier. The CWA variation agreement to the GMCP was executed in May 2006.

The allocated time for construction was 18 months under the traditional method. Prior to the scope change the allocated time under CWA was reduced to 15 months. With the impact of the scope change, the actual commencement of construction was shifted to September 2004, one week prior to the final RMA decision. Target completion date was set for 31 May 2006. One key difference of this project is that the site was purchased with existing consents in place, which enabled the Client to remediate (reinstate) the land area to provide a suitable building platform without delay. The site was previously used for quarrying activities. The existence of the consents was an attraction for the Client as was its location in industrial zoning. From this basis the RMA consideration were somewhat more straightforward although not without problems.

In April 2005, a further scope change was made that involved the CWA members to undertake the coordination of the receipt and placement of the furniture, fittings and equipment. Actual date of completion was 31 May 2006, and this included FF & E. FF&E receipting and placement was undertaken using Client resources supplied to the CWA. FF&E fixing was the CWA prime activity completed under a provisional sum. The Client carried the risk on both activities. The exercise to determine the distribution of costs was straightforward. This would not have been the case under traditional NZS3910 arrangements.

This project is again, slightly unconventional, as, like all the three projects it did not start out as a CWA agreement, and it also underwent the enormity of the scope change which added an additional dynamic to the project.

5.5.5 Role of the Client

As stated in the Literature Review, the Client's role is crucial to the outcome of the project. It is therefore important to review the Client and the subsequent implications they had to the overall success of the projects. The Client's vision for the four projects completely embodies a new direction from anything they had done before. This new vision had a significant influence over the design and operation of the facilities. The Client is a multiple stakeholders organization, structured around a Purchaser/Provider split. A Steering Group was formed to oversee the construction process. The Group originally comprised of the Chief Finance Officer and the two General Managers from the Provider side, and two General Managers from the Purchaser side. An additional dedicated Client building project management team (CBPMT) was formed to deliver these projects under the Steering Group. The Project Director of this management team, appointed in mid 2000, was not an employee of the Client, but had worked with them before. He was appointed for his combination of experience in senior level management of the facilities being built, as well as his extensive large-scale construction and development experience. He was reappointed in 2004 to continue his role and terminated his arrangement with the Client in December 2006, seven months ahead of completion of the final project: Project 2.

The four projects were an enormous undertaking in itself. Additional to this, was the urgency in realising these projects. The time constraint impacted the projects and Client decisions throughout. The continuous pressure on the CBMPT to confirm decisions for the four projects, where often the design, construction and fit out were occurring simultaneously, reflected this. By late 2004 the considerable strain was beginning to show, with the high workload, extended hours and reduced staff. This unsustainable situation continued into 2005. It impacted on their ability to review documentation in detail, and sometimes resulted in accepting information that did not comply with their new Facility Standards. These standards as mentioned below were created in parallel to the work. To complicate matters further, the Client relied upon forecasting provided by another independent department which was demonstrably and significantly below the actual forecast figures and fundamentally impacted all the projects, particularly on scope changes (such as doubling Project 3's size weeks before commencement of construction in order to meet forecast 2006 capacity requirements) with the resultant additional pressure to the time constraints, and the subsequent implication around finalising the TOC.

An additional complication to three of the four projects was the Client's request that they supply the precast concrete panels for the buildings. Project 4, because of its southern location, could not receive northern manufactured products economically. The Client undertook to take the risk for this work. Yet the CWA teams primarily felt the impact of the decision. Unfortunately whilst some benefits were experienced, such as availability and competitive costs, some of the panels for Project 1 were delivered late and were of substandard quality. Remedying this issue took considerable effort on the part of the CWA teams, even though problems continued to occur for Project 3.

A review undertaken late 2005, concluded that the Steering Group was often constrained or pressured in its decision-making due to insufficient time and/or information received from the Project Director of the CBPMT. Information was impacted by the fact that time was paramount above all other considerations and affected many of the decisions undertaken. It also indicated confusion regarding the Steering Group's role, as to whether they acted as an advisory or governance group. This had not been clearly defined and affected their decisions (States Services Commission, 2006).

In the States Service Commissions (2006), external review it was concluded that the Steering Group up until late 2005 did not have enough experience, particularly in construction projects of this scale, to be able to provide effective decision-making. Nor did they have any knowledge in partnering/alliancing building project delivery systems, and this reflected in their inability to comprehend certain aspects of this way of working. It would appear however that shortcomings in relevant experience in the Steering Group level were already addressed much earlier, as by 2003 the Steering Group had included in addition to the original group, an independent external expert with large-scale construction project management experience. As discussed, it was reported that the lack of transparency and availability of information provided by the Project Director of the CBPMT did not help effective decision-making. The Project Director acknowledged that at times due to the speed of the projects and resource constraints experienced by the CBPMT, there was an element of fait accompli on some decisions the Steering Group made. It needs to be remembered that the Client as a whole, due to the new philosophy adopted, also hindered the information delays. This philosophy extended to the Client's vision of the projects but also in adopting new operating procedures, training and recruitment implementation plans which reflected the new culture.

Resistance to change within the Client organization was indicated in internal reporting and shed an alternative view regarding who was responsible for not obtaining information on time. One department was especially resistant and in the opinion of the 2004 Steering Group and Client Liaison Manager, the reluctance was twofold. The first reason was towards accepting the collaborative philosophy of CWA, which required a new set of skills. And secondly, this was enhanced by resistance towards the significant departure within the organization as a whole. Often the Client would change their mind mid process or delay decisions in an effort to work through internal changes. This greatly hindered the process, especially when the Client was driving the time pressures.

The examples outlined above, clearly highlight the difficulty of realising agreed common objectives within a complex organization and reflect the concerns raised in the Literature Review, Section 3.6.9. The Project Director whilst not always providing timely information to the Steering Group (often due to the Client's own internal resistance), overall through his foresight and knowledge had the ability to ensure the effective functioning of these projects that would not have happened under a committee. It was his understanding of the benefits behind the collaborative practice and his full endorsement of the process as a whole that significantly helped towards the successful realisation of these projects. This again, supports the findings in the Literature Review, Section 3.6.7.

The Client Liaison Manager is also part of the Client building project management team (CBPMT). This role has been created to ensure that the Client's objectives are being consistently met. The role acts as an interface between the end user and the rest of the CWA team, and is therefore separate from the CWA team. All design issues theoretically need to be communicated through the Client Liaison Manager. The role also includes the ability to issue Client scope change variations which override CWA decisions. Under the CWA structure, this posed a point of tension, as the Client, represented by Client Liaison Manager, reported to the Project Director, who was also part of the CWA team. Furthermore, this role was particularly difficult to begin with, as many processes were new, not only in terms of CWA procedure but also in the overall design philosophy proposed by the Client. Conflict of interest with the CWA team occurred, especially when the Client altered or delayed making decisions. (These delays could have had severe repercussions under a traditional contract, as it would have led to time extensions and cost variations. In some cases these variations were extensive and potentially could have led to litigation). Some would argue that the issue was less about the Client making decisions, but rather about low quality design documentation supporting the decision making process. However, close review of the decisions shows a different picture.

Part of the Client Liaison Manager role was ensuring the compliance with Facility Standards. The Standards were an early vision of the Project Director who upon entering his contract found no standardization of design and no standardization of organizational site operations. This, coupled with the Client's lack of understanding on how the new philosophy would operate, spelt trouble when attempting to develop fit-for-purpose facilities. The Facility Standards were embarked upon by the CBPMT in late 2000, later transferring to Client control in 2003. These standards were developed to align with the Client's new philosophy and comprised of Manuals outlining the standardised componentry. Creating these standards required extensive involvement with different stakeholders in the organization. Again due to time constraints, placed by the Client themselves, the standards were not completed until after Project 1 and the initial design documentation for Project 3. This created additional tension between the CWA team and meeting Client expectations, as the Steering Group anticipated that the scope change in Project 3 should also include the new Standard compliance. In hindsight, these standards should have been created prior to the commencement of the designs for all the projects.

The Client Liaison Manager's role has evolved, due to the difficulties experienced. It was agreed that the role would be better managed with more than one interface with CWA. To ensure continuity of decision making, clear structures and processes were created. The former Client Liaison Manager recommended additional changes that she felt would further benefit the process, particularly with the relationship with the CWA team. These included, being part of the team building workshops and having greater accessibility to information such as the monthly reports or the QRA (this meant that the CWA team would have to trust that the Client Liaison Manager would not 'take advantage' of the information in the sole interest of the Client). This would help shift the focus from being seen as an outsider or adversary to the team. The Client having clear objectives and being better able to respond to decisions in a timely manner would also reduce tensions between the Client and the rest of the team (pers comm. Client Liaison Manager). This goes hand-in-hand with ensuring that the project objectives align with the Client objectives to allow for these changes to occur. However, tensions still exist although to a lesser degree, and the joint team building exercises did not occur, nor did monthly reporting of the QRA expenditure.

Significant to Project 3's success was the CWA Manager selected. He was part of the Client organization (seconded into the CBPMT then posted to the CWA) and was thus able to provide continuity of purpose from the Client perspective, within the day-to-day operations on site. Being a part of the Client he was able to understand their objectives and integrate them more in the decision-making. A number of people commented that optimal decisions were made rather than expeditious ones. This strengthened the vision and the overall team spirit of Project 3. His depth of knowledge of how the organization operated provided greater ability to obtain decisions. On completion of Project 3, the CWA Manager was involved in Project 2 as a CWA Handover Manager to ensure Client objectives consistently informed decision-making and to support the CWA Manager and the PEG in achieving a successful handover to the Client. Upon the departure of the Project Director in December 2006 the appointment of Project 3 CWA Manager to the Project Director (split) role occurred. The split role is one in which the Project 3 CWA Manager (now titled Construction Manager) takes responsibility for the CBPMT but without responsibility for acting as Client Principal Representative to the CWAs. A new independent contractor, employed by the Client, has undertaken the Client Principal Representative role.

Finally, in reviewing the CWA model, the Project Director states that the overall risk to the Client is reduced due to the transparent risk management process and through the visibility of the TOC adopted under this process. By predicting with accuracy the worst-case outcome of the project, it creates the potential to improve efficiency onsite, over and above norms and ultimately manage risks more effectively. The Client's acceptance of the risk is minimised due to the team being selected on their quality, experience and alignment to project rather than on cost. This risk is further reduced through efficient management of the project. Procedures such

as proper quality checks and payment for rework within a 'no blame, no claim' culture supports quality practice (pers comm. Project Director).

The Project Director fully embraced the philosophy of CWA, as he did not separate the Client's responsibility for the outcome of the project from the rest of the team. He understood that to achieve the projects objectives relies on the Client as well as everyone else. When attending Principals' Group meetings, the Project Director recognised the need to make a commitment to the CWA team and make decisions on what was 'best-for-project'. He saw the Client relationship as equal to the other members rather than one of positional power. The Project Director strongly affirms that as the Client is an integral part of the team, the Client's satisfaction to the performance to any one member is indistinguishable from the whole team.

One final point needs to be made. Ultimately the success of these projects, according the Project Director, was the CFO and CEO (at that time), being courageous to adopt a new architectural project delivery system, which had characteristics in variance with the traditional culture of the core Client. They both supported and understood the concept of trust and were thus able to commit to implementing aligned practices and procedures. In concluding this part of the section, from the Project Director's point of view, the CWA architectural project delivery system helped to deliver a better outcome, and meet the Client's expectations for all projects to date.

5.6 Part 3 'ordinary' and 'extraordinary' tangible measures

	What?	Why?	How?	Questions/Information
3	Project No.2 and No. 3 focussing predominantly on the 'ordinary' but does include 'extraordinary' tangible measures, such as safety.	To understand the chain of events to gain greater understanding of the policies and procedures and specific characteristics of actual CWA's. To gain insight into the day-to-day workings of CWA.	Information from CMS: Obtain archival information, records/facts on the projects selected. Interview the CWA Managers and Client Project Planner Site visit Project 2 and 3	Relationships Process in selecting the team Long term relationships – difficulty for potential suppliers/consultants Review Quantitative Risk Analysis (QRA) and Risk Register, risk mitigation plans and risk reports Review monthly Work Status Project Executive Reports Review TOC and Final Cost Timeline of the project – projected and actual execution plan Project Quality Plan, quality review Health and Safety statistics

5.6.1 Programme strategy

The nature of the design required a different strategy to typical large projects. Wide-rise construction differs from high-rise, as resolution of information is required at commencement of each building. To resolve this issue the CWA team created a 'takeaway bar' situation, where members of the design team provided on-site support to the construction activity, "80% of the time the supply chain was able to walk away with a sketch... this resulted in massive savings of time and reduced the amount of documentation that is prepared to offset claims rather than to aid the building" (pers comm. Project Director).

The CWA process is front-end and highly visible in terms of its management and planning. The required planning and reporting systems effectively managed and tracked the resources, time and progress beyond the typical standards currently adopted in New Zealand, and were more aligned to international standards. With the aid of proprietary software systems, the CWA teams were able to manage and track their productivity and efficiency. The Client definitely viewed the extensive planning undertaken by the CWA team as beneficial to the implementation of the project, productivity and to the risk management. The CWA Manager for Project 3 validated this claim. The general belief was that the advantages gained far outweighed the initial expenditure required by the extensive planning, education, training, coaching and strategy work.

The CWA Manager for Project 2 created a procedure manual, the Quality Project Plan to be aligned with the CWA agreement. It defines procedures that support a culture based on trust. Key performance indicators were set, for instance zero lost time accidents that aligned with the performance measures included in the agreement. The manual developed a management plan that worked towards continuous improvement. It also created templates around the different types of reporting, that were in keeping with collaborative practice.

5.6.2 Relationships

"CWA's practices and procedures directly influences people's behaviour"(pers comm. CWA Manager, Project 3), helped by the team being guaranteed actual costs for the work, which took away the financial uncertainty typical in a construction project. The 'inversion' of the pyramid structure challenges the conventional 'master/servant' structure. The inverted structure was identified as important as it reflected a support structure, reinforcing the notion that the leadership roles are created for the supply chain. The focus was about creating a service culture, as the management was seen to serve the supply chain. Refer to Figure 5.5 below.

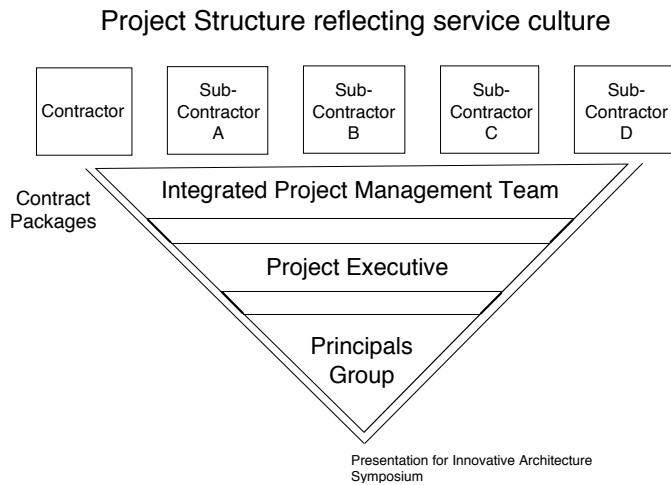


Figure 5.5 Organizational structure reflecting service culture, presented by CMS at the Innovative Architecture Symposium 2005

The CWA Manager for Project 2 adapted the inverted pyramid structure by adding additional groups, such as the CWA Contractors Cluster Group. This set up a greater communication flow between the PEG group and the supply chain and shows an example of the CWA model's ability to adapt and evolve.

CWA's practices and procedures further provide the ability to build new types of relationships that are not typical in a traditional delivery system. One such example was the Project 3 CWA Manager's ability to develop relationships with the iwi and local councils that would not have been possible under a traditional role. Another example is the close relationship between the CWA team and the shared insurance company.

5.6.3 Team selection

The criterion for selecting the contractor on Project 2 and Project 3 included 'best fit' in line with the CWA philosophy. The Project Director and others employed a rigorous process, externally audited by Audit NZ, to ensure that the Contractor had the right collaborative attitude, from the main building teams through to their personnel. The Contractor selected their supply chain through "conscious decisions around capability, capacity and ability to work well in this environment" (pers comm. CWA Manager, Project 3). Wherever the Contractor found gaps within their own organization, they would work with the established CWA team and select people outside of their normal sphere to find the right person for the job. This happened on several occasions, two examples being, the Health and Safety Manager was specifically selected for the project due to his successful experience in establishing a collaborative charter in another project. Another example was the selection of the CWA Manager for his right attitude and skills as an architect and project manager, even though he was an employee of the Client and did not have on-site construction experience. Project 2's Contractor also adopted this approach and employed many of the supply chain that worked on Project 1, such as the Electrician and Plumber companies to transfer the lessons learned.

The focus of CWA is on building long-term relationships. "It is really comes down to people and relationships (pers comm. CWA Manager, Project 2). Yet it is not difficult for potential new suppliers to become part of CWA if they are best for project (pers comm. CWA Manager, Project 2). One example of this is the Contractor asking one of their main competitors in the location of the project to be part of their team to help resolve the low level of labour available. The competitor agreed to become part of the supply chain and the relationship has proven

to be successful. Another example was engaging experts in their field, such as the door hardware specialist, to become part of the team to gain maximum benefit of their expertise.

5.6.4 Costs

For the purpose of this study, the actual costs were not deemed relevant. What was more significant was comparing the Turn-out-cost (TOC) and the Final costs of the projects, and establishing whether the TOC was set at a fair price. The TOC and Final costs are part of the CWA agreement, but when reviewing the cost, additional costs that the Client also assumes need to be considered, which add to the 'overall project costs'. Establishing whether the TOC's for each project is fair is difficult, and one that has been studied in greater depth by leading specialists in this area. Specialists, both internally and externally, have extensively reviewed the difference between the initial budget and final TOC and the increase has been found to be legitimate. These projects due to their scale and type are not typical and therefore difficult to cross compare with other projects. The internal review concludes, "the project delivery system selected did not result in the Client paying for a premium in the project" (pers comm. Project Director).

This was supported by an external review completed in July 2006. The report confirms that the heated construction market, skills shortages, remote sitings and design changes all contributed to the increase in the estimated costs of two (Projects 2 and 4) of the projects (States Services Commission, 2006). The substantial increases to three of the projects not only affected construction costs, but also impacted planning, consents and the design, all which contributed to the overall costs. What was not included in this report was the extra costs accrued due to the Client's time constraints and reliance on inappropriate forecasting resulting in significant changes and subsequent fast tracking in the design and construction process. One interviewee said that generally under a fast track process, design fees and construction costs more. Yet, there is a natural set off; the cost of the acceleration vs. the growing acceleration costs. This is likely a neutral factor. Particularly as the CWA process provides the ability to only draw what the supply chain needs, reducing the design fees. In addition, integrating the design and construction significantly reduced rework – "there's so little rework it's almost idyllic" (pers comm. Architect a, Project 3).

Project 2's 'overall project costs' increased by 31% from the 2005 Budget (States Services Commission, 2006). The 2005 Budget was indicative only and prepared prior to detailed design being completed. Market conditions and other external factors, such as material costs, additional travel costs to remote sites, increased labour costs, make it impossible to be able to build to the same costs as two or three years ago. States Services Commission (2006) conclude that "market influences accounted for about 57% of the increases"(p. 13). This was beyond the control and influence of the Client and the rest of the CWA team. Again, this report did not fully review the impacts related to the hypersensitive economy, nor to the full details, but relied on an assessment made by an earlier internal report. It needs to be noted, that the high levels of transparency achieved by the open book policy has helped review the cost increases which would not have been possible under a traditional method.

Reducing and often eliminating 'person marking' resulted in cost savings. "Normally everyone would be hiding their documents, but because it is all open and honest, half the cost reporting is done by our contractors' QS. It stops all this man-marking... everything is auditable, so there is nothing to hide" (Pers comm. CWA Manager, Project 2). Further, "co-locating the Client, design and construction offices to one location further created immediate savings to Client" (pers comm. Project Director).

Completion of the TOC for Project 2 and 3 was promised by the CBPMT to be delivered to the Steering Group for approval several times during 2005. Yet it was not until end of 2005 that Project 3's TOC was confirmed by

the Client, and by mid 2006 that Project 2's TOC was finally agreed. According to the States Services Commission (2006) external report by mid 2005 the Client considered to delay the construction of Project 2 as a consequence of the TOC not being finalised. They made the decision to continue on the understanding that the TOC would be available mid July 2005. The Steering Group did not receive the start of the TOC until September 2005, with the completion of the TOC in December 2005 (ratified mid 2006). The report further stated, that in lieu of the escalated cost the Client was denied the ability to make changes to reduce costs, (beyond the initiatives taken through the Client's participation as a Principal), as construction was in progress. The external report, supported by a several interviewees, suggest therefore, that not formalising the TOC created a disincentive for CWA members to ratify the TOC, as during that time they were being paid actual costs and the painshare/gainshare policy had not come into effect. The report suggests that not having the TOC ratified, minimized the incentive of the team as a whole to be efficient and deliver the project within, or in excess of, Client expectations. A main reason as to why the policy exists within this delivery system.

Yet, the Client expressed a contrary point of view. They stated that significant value management decisions were taken during the development period and post TOC. These are well documented in the final TOC papers. The Client's agreement to early gainshare, recognized the savings made prior to agreement of the TOC's. The external report's comment does not take into consideration that the early gainshare savings were brought into the equation and comprehension of outstanding painshare risk. An alternative argument raised, is that in spite of the late delivery of the TOC, the projects were able to capture and convert productivity gains and support Client scope decision-making to the benefit of all parties. Of particular note, are the savings made prior to TOC acceptance where the Client benefited 4 times more greatly than the CWA commercial parties, a distinction not made in the external review. One interviewee supported this view and stressed that even though the TOC was not ratified, it was not a free for all. All prices were scrutinized and best estimates were given through a willingness to participate and not abuse the system.

As a result of Project 2's high TOC, the Principals' Group heavily reduced the collective Quantitative Risk Analysis (QRA) register. The CWA Manager on Project 2 did not believe that the costs were padded. Yet some other interviewees expressed concern that the training seminars around the new costings sent out mixed messages. Especially to the smaller tier contractors who were particularly new to these procedures and could have interpreted the instructions given in different ways. This could be easily remedied by greater clarity in the instructions and a growing familiarity in this process. Substantially reducing the QRA resulting in a lower TOC affected the morale of the team, but not as much as initially anticipated. It was a learning curve for everyone. The outcome has been a TOC that more closely reflects the actual costs of completing the Project and risks (QRA) reflective of the nature and scale of the project. Those involved have realized the benefit, and savings are being made in the TOC, although risks are still being experienced.

The TOC is openly available to the CWA members except for the overheads recovery and profit margins, which remain confidential to each party, reinforcing the high level of transparency around costs. (Apart from the constraints on completing full auditing related to margins).

The current status of Project 2's cost compared to projected TOC, is that the TOC is tracking 1.2% below TOC forecast, and the 'overall project cost' is tracking 2.3% below forecast. Project 3's TOC was independently peer reviewed against a Cost Plan to meet probity standards and market norms. Project 3 was delivered within the agreed TOC and to the standard required. The actual expenditure under the TOC was 1.6% below the TOC budget. Of this savings, gainshare of 1.4% is due to commercial parties (payable on the conclusion of the Defects Liability Period in May 2007) and 0.2% is to remain with the Client.

To avoid the uncertainty around cost issues is it important that the TOC be completed prior to commencement of construction. This procedure is what happens under a pure CWA model. In saying that, this needs to be weighed against other factors that also impact the overall cost of the project. As discussed in the introduction, many other factors impact a project. Undertaking a macro analysis of the industry to determine resource availability, inflation costs, weather constraints and other factors, all need to be considered prior to making an informed choice. The Project Director suggested that a robust analysis process be done, to identify the risk and the benefits to determine the best methodology. In these projects, the time constraint, the weather constraint, resource availability and the rise in inflation swayed the decision to not allow additional time to formalise the TOC. To delay the work to obtain price certainty would have resulted in an overall significantly higher Final Cost. These projects clearly highlight the different consequences that may happen when not adhering to the integrity of a system's structure.

5.6.5 Time

Project 1 finished within budget and within time, a major achievement considering the difficulties it potentially faced at the start. In fact, it was entitled to at least a 10 month extension which it did not use. This occurred even with delays due to extended settlement of one of the building platforms, wet weather conditions, inability to commence construction for almost 8 months after the programmed dates, together with the force majeure delay caused by NZ Steel in providing the roofing material. These reasons would have resulted in significant time extensions if the underlying traditional contract conditions had been invoked. "Project 1 would not have been finished in the time that it was or the price that it was if it wasn't for CWA" (pers comm. CWA Manager, Project 3).

Project 2 is still under construction, but project completion is on track against the major milestones and is projected to finish on time. Project 3 finished on time, even with the substantial change to the project. This is an incredible achievement in today's litigious, delay riddled market and should not be taken lightly, especially when the project doubled in capacity, after the appointment of the Construction Contractor. The majority of people (including the Clients) that I interviewed do not believe this could have happened under a traditional contract. The CWA method directly contributed to completing projects on time due to the collaborative approach to solving issues and the ability to proceed with construction without a full set of documentation. These perceptions are reiterated in the external report where it states that, "there were sufficient indications to suggest that had the Client elected to follow a traditional procurement method, timeframes for completing the projects would probably not have been met"(States Services Commission, 2006, p.3).

Under a traditional method, "the whole confrontational nature of traditional contracts is often diametrically opposed to actually making progress on a project... this is because rather than moving forward you spend the majority of your time historically looking for extensions of time and claiming variations" (pers comm. CWA Manager, Project 3). CWA Manager for Project 2 also supported this view.

The CWA model particularly suits the delivery of innovative and flexible procedures to accommodate the tight timeframe. Yet even so, these projects again highlight the need to allocate the time to plan and design and follow procedures appropriately to avoid stress on the system.

5.6.6 Quality

Continual improvement is fully integrated as part of the culture of both Projects to help realise quality work and achieve zero defects. There is a shift away from the aim of Quality Assurance meeting a desired benchmark to one of continuous improvement. Project 2 provides access to all the quality records on the

Aconex document management system. If a mistake is made the lesson is captured and the information made available through this system. Further, healthy competition was encouraged between the different Project Managers of each building for Project 3 to minimise the defects prior to inspections. The emphasis placed on quality paid off, supported by the reduced number of remedial items on inspection of the completed buildings over time.

The notion of achieving zero defects, while a worthy target in principle, has not been achieved in practice for projects to date. Yet, defects are at a minimum on Project 3. They were not achieved in the following areas and for the reasons outlined below.

Earthworking and landscaping remained incomplete in the south/western portion of the site as April 2006 had one of the highest rainfall periods recorded in Auckland for that month. This affected the ability of the CWA to complete final ground shaping and spreading and levelling of topsoil and achieving grass strike. Even in hindsight it would have been difficult to mitigate this as the CWA on a 'best for project' result for the Client, had elected to install central plant based services. This resulted in the requirement for significant areas of ground to remain open and unable to be completed until the in ground work had been completed. Project 2 and 4 do not have central plant which means they have the ability to complete in all respects landscaping work progressively. Lessons learnt at Project 3 resulted in the other CWA's restructuring their programmes to ensure there was greater buffer time in the programme for this final work.

As there was no operational impact, the Client agreed to complete this work in spring. The work has now been completed. The downside to this decision was that it has cost more, as the CWA access into the facility (such as plant and topsoil and workers etc) was slowed.

The BMS Plant Monitoring/Control system was not delivered defect free. This was again part of the central services decision. Final testing and commissioning could only occur once all the central plant was operational. The supply chain representative responsible was significantly under-resourced in skilled commissioning technicians. This was compounded by the fact that they chose to use a new software platform for their BMS, for which Project 3 was the first project. The software programme created significant ongoing issues until November 2006, however it appears to have been resolved. This also has caused a down stream effect to Project 2. Again, as there was no operational impact, the Client also agreed that this could be resolved post handover, on the expectation that it would be fixed within a month. In reality it took much longer. Whilst this did not impact operations of the facility, it was an annoyance factor.

The SMS work was not delivered fault free. Again, the supply chain member used a new version of the software interface between the access system and their base SMS system. This too failed and resolution did not occur until November 06. This too caused a potential down stream affect on the completion of Project 2 and 4. The late emergence of this issue could have affected handover as it resulted in the late training of Client staff on the use of the SMS system. As a mitigation measure, the CWA funded the retention of some key supply chain personal to remain in the control room to assist the Client with electronic access.

Several 'fit for purpose' issues emerged just prior to handover, including some FF&E items. The Client agreed that these could be dealt with post-handover, due to the Client being part of the review process on the facility. They accepted that the identification of the issues had occurred too late to have the matters dealt with prior to handover.

Other ongoing issues were several minor deferred items and some minor defects. These were logged and tracked on an ongoing basis at weekly DLP meetings. They have now tracked to a minimal level. Overall the Client (particularly one Department) have indicated that they believe a very good quality project was delivered and that by and large they are pleased that no significant issues have yet emerged through the DLP period.

5.6.7 Health and Safety

Project 2's Health and Safety project target is <0.5/100,000 man-hours worked. In May 2006 it was sitting at 0.6/100,000 and trending downwards. This is compared to Statistics NZ industry target for LTI (lost time incidents), which is currently 1.1/100,000 man-hours, worked. The Project 2 CWA team has a dynamic programme to continue setting a new benchmark for H&S within the AEC industry.

As part of healthy and safety procedures, "the CWA has a policy of not allowing anyone to work on site unless they have been through the Site Induction process" (Project Quality Plan, 2005. p.34, Project 2). Part of the site-specific induction workshop includes a manual and a Project 2 identity hardhat and vest, which had the additional effect of strengthening the team approach through establishing a collective identity. Further to this, regular safety meetings are held fortnightly, which include the supply chain, to review incidents and continually seek ways to improve safety.

Project 3 created a Health and Safety Collaborative charter that aligned the whole CWA team and had everyone's logo surrounding the document. This type of collaborative charter was second of its kind in New Zealand, but aimed to "to set a new standard and benchmark for future construction projects by achieving excellence in Health and Safety practices. Cultivating an environment that encourages positive Health and Safety behaviours to create a project that we can be proud of and that will bring credit to all parties involved". It was agreed amongst the Charter parties, to review Health and Safety every 3 months, until the project was completed. The charter was displayed in lunchrooms and other common areas to reinforce the commitment amongst the team. In a CWA PEG report, it was noted that a collaborative culture in relation to H & S was developing on site. Project 3's final Health and Safety statistics was 0.416 LTI's per 100,000 man-hours, which is considerably better than accepted national statistics.

5.6.8 Insurance

These projects have experienced significant reductions in premiums in comparison to other projects of this type. The Insurers identify the 'no blame no claims' policy for all parties, acts as an incentive to reduce defects. The call out on policy is much lower than on traditional methods. "The evidence indicates that the insurance market sees it as a step forward" (pers comm. Aon Insurance). In saying that, they express some cautiousness, as this is very new to NZ. Prior to full acceptance of the CWA method they would like it to operate in the NZ AEC industry for a longer period of time.

Aon Insurance researched in Europe similar project delivery systems to CWA that revealed some negativity. This was due to the team placing less emphasis on risk management because they were covered by the insurance. If operating under true principles, with correct procedures in place this fear would be eliminated, as in the case under these four projects. When I interviewed the Insurer, there had been no major claim to date on all four projects.

All the insurance is supplied by one entity for these projects, where for these sized projects there might typically be 10. This provides many benefits, such as reduced premiums, clarity of information and continual involvement of the Insurer's with the team. (The Insurer's do not think this would happen to the same degree

with projects under \$50M). By being the sole provider enabled them to create a website for the insurance covers for the projects rather than provide a manual. This is a perfect example of the transparency of information, as this is accessible to all those involved on the project.

As this concept is new, and to encourage its adoption, the Insurer expressed the need for future Clients to be educated and therefore informed about the advantages of sharing risk and retaining risk after the project's completion.

Initially, one of the major consultants chose not to enter the CWA agreement for the first project, as they were reluctant to share the risk and were concerned with residual design liabilities. On completion of Project 1, they expressed a willingness to be included in the CWA team for Project 3 as they realised the benefits the agreement provides.

5.6.9 Incentives

The 'painshare/gainshare' policy acts as an incentive to get the projects completed with zero defects on time. The policy is paid out on the end result creating an incentive for those involved to support each other. The Client was willing to set a cap on the pain share liability to enable companies to agree to this incentive and not create unacceptably high losses. In agreeing to cap the pain, the Client also looked for agreement to the capping of gains. Both are agreed in all projects.

5.7 Part 4 – Teamwork, Creativity, Learning and Systems Thinking

5.7.1 Introduction



Figure 5.6

5.7.1.1 Influence the outcome

"There is no doubt that CWA helped deliver a better outcome" (pers comm. CWA Manager, Project 3). Many others reinforced the view that the CWA structure influenced the outcome, "as we are all focused on one outcome, not necessarily on making money. One of the major advantages of CWA is that there's no incentive for anyone to take shortcuts. We are all in this together. You are all going to make your pre-agreed operating margins and you are guaranteed costs. In fact by taking shortcuts you run the risk of doing things twice and losing profit. There is also no motivation to substitute for a lesser grade material, as the savings don't go to one individual they are shared. So the incentive is to do it once and do it properly. And that culture is ingrained from the labour workforce to the Client" (pers comm. Architect a, Project 3).

5.7.1.2 Key benefits

Identified below are quotes which sum up key benefits frequently expressed by the interviewees. Firstly, under this system, the team had the ability to select the right people rather than being forced to select the cheapest tender. This filtered through to all levels of the team. "You are able to develop a champion team from day one and this reduces many of the headaches that can otherwise occur" (pers comm. Construction Manager Project 2). This was supported by a supply chain representative who stated, that "by not having to tender at the lowest price you get more out of your supply chain" (pers comm. Supply chain rep, Project 2).

Secondly, you "have the buy-in from the Client. Having the Client there, making the decisions with you helps ensure that functionality and operational requirements are retained" (pers comm. Engineer, Project 2). A further key benefit "is the human interest. What CWA does is take away the fear, the issues that happen post-contract, the potential of litigation and the messy paper debate. Opportunities are there, it's about building the team"(pers comm. Architect, Project 3). This was reinforced by another interviewee, who states that "at the end of the day it is about working with people, not getting personal, being open and honest" (pers comm. Construction Manager, Project 3).

"All projects are a triangle of cost, quality and time. Achieving all three is very rare in my opinion. But CWA goes closest to achieving all those" (pers comm. Design and Documentation Manager, Project 3). CWA works because if the cost is too high you get a chance to work together and re-cost it. "CWA means you have the time to work it out, and get a true cost. Under the traditional method the lowest priced tender wins even though they may have priced too low. This can lead to them unable to perform and the Client ends up running the risk that a company is going to build a building they can't afford to do. I am a strong believer in CWA" (pers comm. Supply chain rep, Project 2).

Unlike traditional contracts, where there are retentions and often disputes, "with CWA they pay actual costs, profit margin and overheads per month. We couldn't have asked for anything better. Honestly, if I could do every single job as a CWA I wouldn't do another job again on conventional pricing". He continues by

suggesting that under other contract structures, where there is a dispute, there is no method to resolve the problem except through the courts, an inefficient process which often leaves the company bankrupt (pers comm. Supply chain representative, Project 3).

Many interviewees stated that the scope change on Project 3 could not have happened under a traditional contract, and if it had, it would have resulted in enormous cost and time blowouts. According to one interviewee, the project could not have started construction for at least another 6-9 months.

5.7.1.3 Collaboration

Interviewees stated that collaboration was the key driver behind CWA and therefore became the foundation of the project delivery system. "Under CWA you build a team early, which helps build trust. There was also greater interaction with the supply chain (pers comm. Engineer, Project 3). The integration between design and construction, meant from the construction point of view, it was going to be right the first time and that it was buildable (pers comm. Construction Manager, Project 2). Collaboration was also seen to "benefit the harmony of the site, and benefit the guys at the coalface" (pers comm. Construction Manager, Project 3).

Many interviewees expressed that a collaborative culture was created by the CWA ethos, through its practice and procedures. Some of the practices, procedures and policies being: 'best-for-project', the collective nature of every decision, and the non-existent possibility of litigation. Even though not yet perfect, as people sometimes reverted to old patterns of behaviour, the structure encouraged people to learn to work together rather than take a proprietorial position.

"CWA is not a band aid. It wipes the slate clean and starts with a fresh document and a fresh approach. You couldn't engender a CWA culture by taking an existing building contract and by adding a few clauses that suggest to everyone that they were going to act in a collaborative way" (pers comm. Architect a, Project 3). Reinforced by "this is collaboration. Every other procurement methodology I've undertaken you're straight into an adversarial role to start with. I have done this particular type of building under 4 different procurement models and no matter how rigid the Client specifications to ensure performance criteria, it is always undermined" (pers comm. Architect a, Project 3).

5.7.2 Teamwork

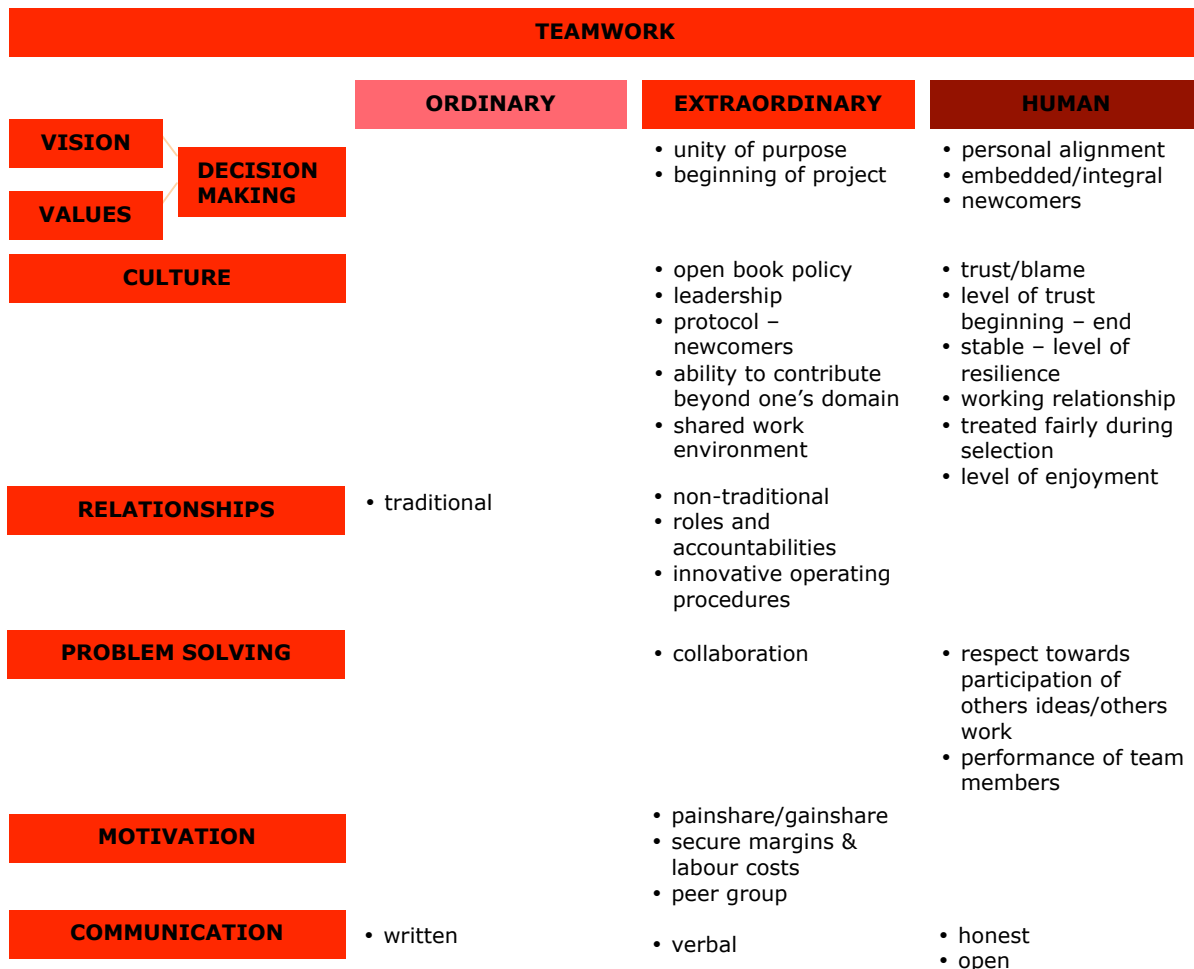


Figure 5.7

5.7.2.1 Vision and values

“Establishing a unity of purpose helps teamwork and informs people’s decisions” (pers comm. Design and Documentation Manager, Project 3). The Design and Documentation Manager for Project 3 felt a personal alignment was essential to the success of a project. He felt a connection to most of the values established under the CWA structure. He further expressed the advantage there was to having “other people have the same goals that you have with regard to the project”. The vision and values for each project was done as part of the team building process. Others observed that the team identity helped strengthen the unity of purpose.

Yet there was some disparity amongst the different team members interviewed for both projects about what the ‘unity of purpose’ and therefore ‘best-for-project’ actually was. In reviewing the transcripts a summary as to why this occurred could be made as follows. One reason was that key members were excluded from the initial design process as CWA was formed after this stage. This resulted in some of the higher aspects of the vision not filtering into the decision-making in the latter stages. Secondly, this was not helped as within the Client organization, there were different values coming through at different levels. The Client’s vision and values were not being clearly articulated within their own practice. As stated, this was due to the extensive change occurring within their organization, resulting in the Client often changing their own objectives during the process. And further, the Client Project Director key drivers were, delivering the buildings on time, within budget and with zero defects.

As a result, the overwhelming 'unity of purpose' mainly reflected a partial Client vision and objectives. The majority of interviewees when asked stated "it's to deliver or exceed Client expectations. Therefore it is to deliver a project within time, to the cost, without compromising the quality of standards" (pers comm. Engineer, Project 2). This understanding was ultimately what informed the majority of decisions.

In saying that, the CWA Manager for Project 3, through his personal knowledge of the Client's vision, was often able to make decisions that benefited the Client. The PEG team on Project 3 also incorporated the CWA principles onto their business cards. These acted as prompters for everyone, to continuously remember to practice 'open and honest communication', 'teamwork', 'transparent processes' and a 'no blame' culture, which also affected their decision-making. Overall, it was felt amongst those working on Project 3 that there was genuine team consensus.

Whilst not all team members knew the full Client vision, there was an expression of interest to know what the Client wanted, to enable them "to get more involved so we can suggest better ideas" (pers comm. Supply chain rep, Project 3). Several interviewees stated that the more this knowledge was spread to all the people on the team, the greater the alignment, thus creating the ability to change the thinking from an 'ordinary' focus to a bigger vision. One architect discussed an opportunity provided at a workshop where he was able to articulate the Client's vision and the impact that had on the people that attended. It helped integrate the Client's vision with decision-making as it engaged them into WHY they are doing what they are doing. Unfortunately, as the time pressure was so great, there was less opportunity to do this on a regular basis.

There was consensus amongst many, of the importance of "ensuring that the decisions are the right ones for the project over the long term" (pers comm. Engineer, Project 3). One example of this was where the team agreed to do extensive re-work which involved a 6-digit figure, because it was the right decision long term even though everyone's bottom line was affected by that decision.

Project 2 currently runs induction sessions for all new workers. The key focus is on health and safety but the Client's vision, values and objectives and the CWA approach are also briefly addressed. Project 3 did not do this, but in hindsight would adopt this approach. Overall, it was felt that implementing additional protocols to newcomers could greatly benefit the process. "It would be useful to have a verbal introduction, with a brief history of how the project has progressed to date. It would be worth 3/4 day for someone on the Principals' Group vs. an hour for someone in tools" (pers comm. Engineer, Project 3).

Prior to selecting new members it would be useful to continue the initial practice of informing them of the Client objectives and the shared vision to confirm alignment. Also, it would be constructive to create a procedure that would readily integrate a new member into the established team, to enable greater acceptance of that person within the team. This ties in with the recommendations expressed in the Literature Review, Section 3.6.11.

5.7.2.2 Culture

It was unanimously agreed that the 'open book' policy positively influenced the culture. According to one interviewee, it brought credibility to the team and a willingness to peer review each other. It was generally felt that the policy created a greater openness amongst the different disciplines. An example of this was where the supply chain was able to "sit down with the main contractor and price a job together. We haven't done it before, but we sat down and did it and we all worked as a big group" (pers comm. Supply chain rep, Project 2).

It also brought with it transparency and honesty; “our books are open books till the last nut and bolt – we’ve counted everything on the job – we’ve got 6 prices on some items; you can’t fiddle those numbers... I am sure you could go to some supplier to load the price, but somewhere you’ll be found out and jeopardise a lifetime of trust” (pers comm. Supply chain rep, Project 3).

There were those that resisted opening their books and therefore elected not to be part of the process. For those that agreed to be part of the ‘open book’ policy and pricing structure, found an additional advantage of understanding their cost structure more (pers comm. Construction Manager, Project 3).

The majority of interviewees stated that there was strong leadership at each of the different tiers within the CWA organization. “Under CWA, leadership is a multi-headed entity. You are working as a team so it doesn’t encourage one individual at the front, instead it becomes a group moving forward” (pers comm. Architect, Project 3). This type of leadership reflected the collaborative leadership as reviewed in Section 3.5.12 of the Literature Review. Only a couple of interviewees expressed concern that without a designated leader no one would take the initiative. They believed this did not happen with these projects due to the personalities of the people involved.

Addressing the issue raised in the Background, that discusses the architect and their traditional role as leader, one architect reflected on the CWA process. “Has it hindered the process the fact that we as architects are not the leaders? No, in fact the process has been enhanced by the fact that the architect is not the primary leader. In saying that, the leadership role is shared and our opinion is respected” (pers comm. Architect a, Project 3). A view supported by Japanese architects in Section 3.2.5.

Client leadership was also highlighted as an issue, particularly due to the Client’s culture undergoing such a dramatic process. Their lack of clarity often impacted the direction of the project. One interviewee noted, “it’s the Client culture that is the potential undermining force”. Yet it was often noted that the Project Director for the Client, showed strong leadership and visible commitment to collaborative practice.

It was unanimous that everyone had the ability to contribute beyond one’s domain. The structure of CWA, encouraged this practice to the point where it was expected from all those involved. “You only have to say “what’s best-for-project” and people will listen...it is slowly coming to the culture where people aren’t looking out for themselves but for others as well” (pers comm. Supply chain rep, Project 3).

It also created unexpected opportunities to expand one’s skills. The Construction Manager on Project 2, enjoyed the ability to step beyond his domain of knowledge and help other businesses create better systems so that everyone could benefit.

Shared work environments were established amongst the design teams, the management team on site and the supply chain for both projects. Everyone affirmed that this practice positively benefited the collaborative culture of the team. “Putting the design team together in the same office, that was great. The guys that worked on it enjoyed the process and I’m sure the benefits are measurable. Such as the immediacy of response and the awareness of each other’s needs. It was extremely collaborative” (pers comm. Engineer, Project 2).

Influenced by the scope change, Project 3 resulted in a fast track situation, which exerted substantial pressure on the design documentation. This meant that time was of the essence and communication needed to be constant. To achieve this the design team shared a workspace. Whilst many saw the benefits of this, there

were reservations amongst all the architects that I spoke to, who experienced inefficiencies with this practice. These were mainly due to the design team unable to progress with the documentation, as they were delayed waiting for Client decisions. This was exacerbated, as they increasingly were called upon to become 'de facto' construction team members and in the process lost their ability to do their role properly. Overall, the architects recognised the advantages a shared workspace offered, but expressed its limitations for all design work. One architect thought it worked well for service and other performance-type work, and another saw the benefits of the feedback line, where "the architect will have access to most of the other design disciplines on site, and the builder, so you can get the team together to consult directly". Yet he also highlighted the potential risk if critical decisions got answered too quickly without carefully considering the ramifications. As a way forward it was suggested, that with technology, only one architect was necessary on site during construction as a link. Rather than trying to arrive at a definitive answer regarding shared working environments, this raises the need to improve this practice in future work.

For both projects, everyone appreciated the benefits of locating the management sheds together. One interviewee likened it to a small town. Yet another interviewee felt that the placement of the Project 2 sheds on site was too removed from the actual main workforce and created an unnecessary separateness, between the management and the supply chain. A point to consider for future projects.

Initially there was some reluctance in Project 2, amongst the supply chain to share work sheds, exhibited by the protective attitudes towards their information. Within a short span of time this attitude dramatically changed to where there was a definite willingness to share. The shared working environment carried through to the staff lunch areas. The lunchroom provided opportunities for the supply chain and management to interact. The Project 2 PEG team also organised team building functions every couple of months as another way of strengthening the team dynamics. They also felt that team morale was enhanced by having clearly expressed milestones.

The majority of interviewees asserted that the 'joint and several risk assumption' policy that enabled CWA to operate under a 'no blame no claim' culture, facilitated people to put his or her hand up and admit a mistake. "In a normal project, we cannot admit liability, we've got a pretty strict protocol around that. In CWA if you've stuffed up the first thing you do is get the problem out on the table" (pers comm. Engineer, Project 3). Interviewees acknowledged that whilst sometimes an uncomfortable experience, the general emphasis was for everyone to learn from it so that the mistake did not happen again.

Clear procedures were in place to help resolve problems early and at the level in which they occurred. This built on creating a trusting environment to support cooperative rather than adversarial behaviour. Both CWA Managers and a Construction Manager indicated that there was still a way to go to help break down the entrenched behavioural patterns, such as the unwillingness to admit mistakes. Yet by continuously delivering on the promises and expectations expressed under this process, it helped build trust amongst the team. When things went wrong, rather than disbanding into silos, they got together and worked towards seeking a solution. What was experienced, was that when a problem was shared it got resolved very quickly.

People were more forthcoming in admitting mistakes, as they were being paid to rectify the work. "In the beginning there was a blame culture. It took about 6 months to get into this way of thinking... it took a long while for people to accept that they would get paid for it, and to inform the team so they could reassess the problem"(pers comm. Supply chain rep, Project 3). "Yes we admit mistakes, we don't hide them, because you get paid to fix them here" (pers comm. Supply chain rep, Project 2). Also, interviewees acknowledged that there was no incentive to substitute cheaper materials, because payment was made on actual materials. Only

one interviewee thought that the ability to admit mistakes was not due to the policy, but to the honesty of the individual companies.

Overall there was a general consensus that the procedures and policies supported this practice. When a mistake was made, it was in the interest of the team to fix it rather than to lay blame to avoid paying for it (pers comm. Supply chain rep, Project 2). A major advantage of the 'no blame, no claim' policy was that less time (up to 50% according to one interviewee) was wasted in confrontational issues.

Many interviewees readily concurred that the level of stability of the culture was different under CWA than a traditional method. The culture had a stability or level of resilience, and "when things go wrong people are there... it took more than a year to build that trust" (pers comm. Supply chain rep, Project 3). The Construction Manager for Project 3 stated that CWA is now business as usual. He discussed an example that was defused with meetings and "stopped everyone throwing their toys out of the cot. In a normal situation you would have been firing off letters and there would have been lots of heated discussions... but everyone sees there is no future in that... so with our structure we're able to deal with it better, we have built up a resilience to those sorts of things" (pers comm. Construction Manager, Project 3). This was supported by the architect on the project who declared "once everyone's adopted the culture, if we stay united we're impenetrable" (pers comm. Architect a, Project 3). This clearly shows the benefits the CWA practice and procedures instill, to ensure the team remains stable even when things go wrong. Yet one architect expressed reservations, and stated that "it should. But when things get tense, it often reverts into traditional adversarial roles". (pers comm. Architect, Project 3).

Views on the level of enjoyment experienced by members of teams on both projects were unanimously positive. Below are some of the quotes taken from the interviews that clearly express this and the impact that had as a whole, to how the team worked together.

"Everyone is pulling on one end of the same rope... and the majority of the supply chain say they are enjoying the project" (pers comm. CWA Manager, Project 3).

"Some days you think jeez it's all going good here. You get a good feel for that. Probably closer to the end I'll be thinking I hope there's another of these to roll on to" (pers comm. Construction Manager Project 2).

"At our last BBQ everyone turned up – they really enjoy the job, mostly because of the no-blame culture (pers comm. Supply chain rep, Project 3).

"My guys that are here are very happy" (pers comm. Supply chain rep, Project 2).

"If you build the right team you will have a level of enjoyment. CWA encourages a good time. Might be a little guarded under normal process" (pers comm. Architect, Project 3).

"Best team and best project I've worked on" (pers comm. Design and Documentation Manager, Project 3). This was from an interviewee who has had 34 years experience in the AEC industry

"This is going sweet as a nut, no question... it's in the top 10% of the projects we're involved in, in terms of how people interact, how happy they are... guys really like going out there, and they're learning a lot, they're like sponges" (pers comm. Engineer, Project 3).

"I've enjoyed it, I'm still enjoying it" (pers comm. Architect a, Project 3).

A clear example of the culture and the respect they had towards their environment was that "no one's gone into the toilets and written graffiti on the walls – that's usually the first thing that happens. None of that's happened" (pers comm. Construction Manager Project 2).

Sharing the insurance was seen by some to remove the distrust element typical with most projects. Also, the workshops were thought to benefit this process. A strong level of trust was developed and maintained during Project 3. This was helped by the long-term relationships between the Contractor and supply chain involved in this project, as the trust was already established between them. The Construction Manager indicated that initially there were issues between the supply chain and the designers due to entrenched behaviours coming to the fore, but were quickly mitigated by the PEG team's strong team ethics. Architects on both the projects thought that the trust within the team was quickly established and grew stronger over time.

Through my own observations, reinforced by the interviewees, the culture of Project 3 appeared to be more open, and it is interesting to note that CWA Manager for Project 3 was in an open plan space rather than in a separate room as in Project 2. The CWA Manager on Project 3 reflected the high level of openness and honesty amongst the whole team, including the supply chain. The workspace was set up in such a way that there was an ease of accessibility to information and people. It is the only project that included the word 'team' within its name, and in terms of being a real team "it was considered to be the best of the lot... there is a definite culture on that project, and a tribute to all those involved" (pers comm. Design and Documentation Manager, Project 3). This was supported by the existing culture of the selected Contracting company, who already operated under collaborative practice and principles, and therefore easily adjusted to the new way of working.

5.7.2.3 Relationships

Many saw the organizational structure of CWA as non-traditional and a definite change from other project delivery systems. One opinion for this was that "it is not based on the master-servant relationship" (pers comm. Engineer, Project 2). "CWA compared with a more traditional alliance is a lot more fluid and more flexible. It offers a team a foundation to build their own dynamic and their own agreement. A traditional alliance can be a lot more structured. CWA is more fluid as it allows the dynamic of the team to influence the final form... Having the Client in the team is an absolute must" (pers comm. Engineer, Project 3).

According to several interviewees, everyone has their part to play, but the barriers did not exist between the disciplines. The roles and accountabilities were purposely flexible to allow for innovative solutions and a blurring of boundaries between the different team members. This ties in with the views expressed in the Literature Review, Section 3.6.5. "You've got a mandate to do this but you can challenge each other. There's got to be cross-fertilisation and people can't be too precious about crossing boundaries" (pers comm. Engineer, Project 2). Rather than each role taking formal responsibility for his or her part, everyone was responsible for the whole. The CWA team act as one entity and was therefore responsible for the documentation. Variations to the TOC only occur if there was a scope change agreed by the Client. This provided an incentive for the team to work closely together to get the documentation as accurate and coordinated as possible, as otherwise it would impact everyone's profit. There was a collective responsibility for delivering the project and therefore a collective ownership of all risks and opportunities.

Yet the responsibility generally stayed with the people employed for that role. It relied on the respect and expertise of each individual to maintain his or her influence. "It might blur the edges a little bit more but the

contractors do the contracting and the designers do the design – but there is an integration that is probably greater than you'd normally get" (pers comm. Architect, Project 3).

Even though the structure was non-traditional, it still had a hierarchy. Problems were only presented to the Principals' Group if the PEG team could not resolve them. "If they can sort it out at the coalface it doesn't get to us... we hardly heard any issues, I've had about 2 phone calls from the CWA Manager in 12 months. It is great, it means I can focus on other things" (pers comm. Architect a, Project 3). Mechanisms were in place to be able to address adversarial situations, thus minimising the impact on a project. For instance, upon a disagreement unable to be resolved amongst the parties themselves, the parties involved were required to report to their immediate senior rather than place a written complaint, with its subsequent delays. This again reinforces the views expressed on effective collaborative practice, in the Literature Review, Section 3.6.17.

In hindsight, a general opinion was expressed that the Client Liaison Manager role in future needs to be more carefully considered. Whilst the role requires being separate from the team to be able to represent the Client, it also needs to be seen as being part of the process. People suggested that this could be achieved if the person was more frequently on site and involved in the workshops. Her inability to be able to do this was impacted by her extensive workload, the Client's delayed decision-making, or their frequent requests to change things as they adapted to their new direction. This affected her ability to answer queries in a timely manner, and she often became the bearer of bad tidings, which caused unnecessary resentment. This clearly highlights the important role of the Client in helping the process. People confer, that her role is extremely important and there is a growing acceptance of the need to have such a role in the process.

The CWA ethos requires an overarching project loyalty to ensure decisions are 'best-for-project'. Yet whilst many of those interviewed saw themselves as part of the CWA team, their main loyalty still lay with their own practice. One interviewee commented that "there is a Project ethos which encourages teamwork and I am part of that. Yet I think you have to have a healthy balance, we are working collaboratively but we are still individual organizations with our own responsibilities". This is reflected in the fact that individuals or organizations on behalf of the CWA team are still signing Producer Statements. It raises an interesting issue which will be resolved as more projects are undertaken.

5.7.2.4 Problem solving

CWA's structure nurtures an environment that encourages people to share problems and work towards collective decisions. Many people commented that the PEG team on Project 3, was a prime example of this way of working. The Construction Manager on Project 2 also felt the benefits of everyone working together on site. This was a new experience for him in his 40+ years of being involved in the construction industry. He noted that the procedures helped this experience. In typical projects every instruction had to be written, but CWA eliminated this requirement and instead "you talk and it's done – it's so easy you pinch yourself and wonder when it's all going to go to custard".

The scope change that occurred on Project 3 was a clear example of collaborative problem solving under CWA. After the scope change, Project 3 adopted an integrated approach to the design and construction. Cluster groups were formed between the different disciplines to resolve design and buildability issues. (Both the CWA Managers express the benefits of this practice). The Design and Documentation Manager on Project 3 states that under other methods it would have been more difficult to realise, as "CWA allows you to bring a team together quite easily, because everyone understands what their role is and there is no hierarchy, the fact that the whole team was onsite was quite crucial and should not be underestimated. We were all pulling on the

same ropes together and we had access to all the people we needed quickly and the barriers came down... Being part of a team made this change easier to achieve... If this was done under a traditional contract there would have been big claims and delays and the project would not have been completed on time”.

Another example of collaborative behaviour was in the willingness exhibited by those with more experience or knowledge in key areas. This was especially evident around business, and in helping other team members to work out their profit and Preliminary & General. In the process, the smaller members of the supply chain learned valuable knowledge and were able to set up new systems for future use (pers comm. Supply chain rep, Project 2).

Further, the supply chain held regular group meetings as part of the CWA practice. This provided an opportunity for people to know what other trades were doing and coordinate with each other, from pouring concrete to deliveries to site. As everyone operated as ‘one team’, they gained from this exchange. In Project 2, interviewees observed direct evidence of less wastage occurring, less traffic at the gate, thereby, creating a safer and more efficient site.

Yet, one interviewee expressed a different opinion, and stated that the collaborative practice only extends to the first, second and management tiers of the CWA team and did not impact the labourers on site. He believed that this is due to them having a different set of priorities. He perceived no difference in how they worked. And stated that working smarter and cost savings mainly occurred by working collectively during the design stage.

Several interviewees pointed out that collaboration could occur under other building project delivery systems, even traditional contracts, where everyone respects other people’s opinion and are committed to achieving the best outcome. “The team is the core thing where everyone is working to the same goal and respecting each other” (pers comm. Design and Documentation Manager, Project 3). The difference being that CWA provides a framework that supports people to quickly establish strong relationships. It also provides the financial buy-in into the risk and the buy-in of the supply chain. “You can run a traditional lump sum contract and still have collaboration. But underlying that collaboration is a profit motive. Inevitably it becomes adversarial if something goes wrong and there’s the blame game” (pers comm. Architect a, Project 3).

A number of interviewees spoke about the respect they experienced towards each other’s ideas and work. The Construction Manager through his leadership style and his willingness to help empower others to lead, often in return, gained unexpected assistance from the supply chain (pers comm. Supply chain rep, Project 3). The “painshare/gainshare accentuated to certain supply chain members that we should be looking out for other things, not just our own work – our mate’s work, not damaging it and trying to get away with it... it takes awhile – not everyone immediately gets their head around it” (pers comm. Construction Manager, Project 3).

Non-performing team members were not as frequent under this process. One interviewee suggested this could have been due to the initial ability to select the best people for the project. Yet if it did occur, the typical ‘carrot’ of non-payment that normally provided an impetus for sub-standard work was vetoed under CWA, and therefore other practices were required to come to the fore. “You still have to use CWA behaviour on these people because that’s what we’re trying to do site-wide with the supply chain to get them used to working this way” (pers comm. Construction Manager, Project 3). Steps were taken through discussion, addressing the issues and finding ways forward together. The majority of interviewees agreed that matters often got resolved this way. Ultimately, if non-performance continued, CWA has a procedure in place that allows the team to replace anyone, though it was agreed that it was important to have another substitute organised to avoid delays.

When others saw non-performance there was an incentive to report it, "we look at what's best for project" (pers comm. Supply chain rep, Project 2). "It's a CWA problem because we've stuffed up as a group – that's our culture" (pers comm. Architect a, Project 3).

5.7.2.5 Motivation

The 'painshare/gainshare' policy and the secure margins were identified by many interviewees, especially amongst the contractors and supply chain, as primary motivators for the team to work together. The "painshare/gainshare is part of collaboration – if you don't have it you don't have a collaborative contract" (pers comm. Supply chain rep, Project 2). One interviewee raised the point that the policy incentivised people to select the best teams possible to ensure quality work. There was the opinion as reviewed in 5.6.4, that if the TOC and QRA had been finalised a lot earlier on, the 'painshare/gainshare' policy would have worked better.

Because of these incentives, where previously, the normal attitude on site would be to turn a blind eye to damaged work, or other trades experiencing difficulty, people looked out for each other. Different disciplines within the supply chain communicated amongst themselves rather than speaking through another person. The CWA Manager on Project 2 believes that collaborative practice was most beneficial at the supply chain level. People were willing to become spontaneously involved in helping each other if need be, as they knew that they are being paid for it, and without the claim culture there is no need to "protect your own patch rather everyone understands that the better we all do, the better we all do" (pers comm. CWA Manager, Project 2). "We've started developing a culture where everyone will start talking... we even share our labour force, as we still get paid those hours regardless of which company your employee works for.... If I can spare him for an afternoon just to see my fellow contractor out of a fix...by all means" (pers comm. Supply chain rep, Project 3). One example being, containers were delivered on site at a time when those generally responsible were not there. Rather than return the containers to the yard and have them redelivered at \$1500 cost the next day, other trades helped unload them.

As discussed, the potential 'painshare/gainshare' policy motivated many of the team members, but many were also motivated because they believed it was a new way of doing things. "It was the people we've got on the job; their attitude is 'we collectively want it finished, we know as a team it's going to make a difference to our reputations – we're finding it's a better way to work – if we can convince other people to follow the same principles it will make our work life less confrontational" (pers comm. Construction Manager, Project 3).

Generally, the professionals did not see the painshare/gainshare as a motivator. The primary motivation for them was the challenge, to do the best they could do, participate, be team players, and to further their reputation so as to be considered for future work.

5.7.2.6 Communication

Overall, the communication was felt to be "a lot more verbal, there is a lot more trust". Information was written down to help the process rather than for protective measures (pers comm. Construction Manager, Project 2). This was endorsed by another interviewee who stated that the "communication was more open and honest and inclusive; CWA provided the ability to listen to someone who wouldn't have had a voice on an ordinary project" (pers comm. Design and Documentation Manager, Project 3).

Open communication, access to up-to-date information and transparency of information for Project 2 and 3 were supported by the adoption of Aconex, a computer software programme that acts as a communication tool. It broadcasts information, provides up-to-date documentation, and takes away the traditional shields. It

illuminates or erases risk by sharing common data and project information. Copies of Resource Consents, Building Consents and all other important information were also stored on Aconex. Safety procedures and lessons learned were accessible to those working on the project through Aconex. People were encouraged to send all correspondence under this system. Otherwise, information that was manually sent was scanned. Training was made available on site to ensure everyone was able to access this information.

"It's great, there can be no miscommunication or no one can say that my fax machine didn't work! It creates a 99% track record vs. fax messages and phone messages" (pers comm. Supply chain rep, Project 3).

The CWA Manager for Project 3 states that the management style was verbal. Further the PEG team deliberately created a culture that encouraged people to ask questions. "The stakeholders are encouraged to communicate with each other and share information about the project and any problems that may arise" (Project Quality Plan, 2005. p. 6, Project 2). The communication was a lot less formal, and therefore more honest and open "as you might as well sort it out, where in a normal contract it may be better to shut up and write it down" (pers comm. Supply chain rep, Project 2).

Reports, such as the PEG monthly reports, were written by a collective representation of the different disciplines, rather than from one person's perspective. The report addressed progress, matters arising and future planning in all areas of the construction process, including Health and Safety and Risk management procedures throughout the life-cycle of the project. The Principals' Group, comprised of another multidisciplinary group, reviewed this report.

The Project 3 team, volunteered in their own time to share information and help Project 4's team, even though they are competitors. "If it weren't for CWA we wouldn't talk to them" (pers comm. Construction Manager, Project 3). This also occurred amongst the supply chain; "there is always a constant flow of information between the companies where normally it wouldn't happen ... normally you've not nothing to say to them" (pers comm. Supply chain representative, Project 3).

The Project Director acknowledged the high level of trust between the CWA team, reflected in the limited correspondence created under this method, affirmed as an example of everyone working together as a single team. He stated that the old fashioned contractual adversarial position taking correspondence was virtually zero. However, the level of documentation required for hand-over as part of the specification requirements was probably far more detailed than typically expected on a traditional project.

5.7.3 Creativity

CREATIVITY			
	ORDINARY	EXTRAORDINARY	HUMAN
TRUST/SAFE		<ul style="list-style-type: none"> shared professional indemnity insurance risk analysis 	<ul style="list-style-type: none"> step outside comfort zone supported encouraged
PRIMARY MOTIVATION	<ul style="list-style-type: none"> external factors 	<ul style="list-style-type: none"> incentives 	<ul style="list-style-type: none"> intrinsic motivation interest, challenge
DECISION MAKING		<ul style="list-style-type: none"> team consensus constrain/foster integration of design & construction 	<ul style="list-style-type: none"> ability to listen to each other aligned to vision & values

Figure 5.8

5.7.3.1 Trust/Safe

Most of the interviewees agreed that CWA provided a safe environment for people to challenge ideas and design decisions. A general opinion held, was that the shared indemnity insurance fostered the ability to communicate and provide input beyond one's typical sphere of influence. The CWA's formal structure allowed greater exploration of options and detailing with the supply chain than typical. This ensured greater constructability early on. "You don't have to worry about contractual issues in relation to when you come up with a good idea" (pers comm. Construction Manager, Project 3). The shared indemnity insurance was supported by the collective risk analysis, which highlights key areas that people were willing to take risks on. "It helped innovation because you knew that if it went wrong we were covered. But it also highlights an area that might fail so more attention is placed on it. Every time you list the risk you list the mitigation measures as well" (pers comm. Architect a, Project 3). Having the Client involved in this process was beneficial, as they could understand the implications behind the decisions made. Further, gaining the input of the supply chain helped make sensible decisions around timing of work to minimise risk.

It provided the ability to build prototypes and test out ideas. "Firstly, you're in an environment where you know if you make a mistake you're not going to be immediately in court. It allows you to throw things into the pot in an environment where you're going to get good honest feedback from the people who are going to go out and build it. The CWA structure provided more fluidity" (pers comm. Architect a, Project 3).

The structure of CWA encouraged and supported people to step outside of their comfort zone. "Value management workshops are able to be successful, as everyone is free to give their opinion without recourse or negativity" (pers comm. Design and Documentation Manager, Project 3).

Not everyone agreed. From both Engineers' perspective, innovation was not impacted by the shared insurance, as they always strive towards innovation. Nor did identifying the risks make a difference in terms of their creativity. They maintained, "innovation is brought forward when the Client is prepared to support it" (pers comm. Engineer, Project 2). One architect felt that it had no input into design creativity and once a concept was developed it should be robust enough to deal with numerous issues. Overall, it is difficult to fully answer this question, because the designs for all the projects had been completed prior to the formation of CWA. Though, Project 3 had substantial changes to the design due to the scope change and so basically started from first principles.

5.7.3.2 Primary motivation

Money was definitely a motivator for the majority of the interviewees, yet not so significant for the professionals interviewed. In saying that, some of the supply chain became so committed to the principles of CWA and the desire to continue to work under this process, that this motivated them to be as creative and innovative as possible. One supply chain representative felt it was important to be proactive in achieving creative solutions, to be recognized as helping the project, and therefore considered for future work. He stated, "this is what I love doing. Second, you want to promote your company and you want to make a profit. The painshare/gainshare was a huge plus factor".

The key objective of the 'painshare/gainshare' mechanism was to ensure that the actual price comes in less than the target price (TOC). It constructs an impetus for all parties to work less hours than they estimated, explore better ways of doing the job and find similar quality materials at lower prices. One architect stated that the team became more considerate, or did that extra thing to make it easier for the next person, which ultimately minimised the defects (pers comm. Architect, Project 3). Yet a few disagreed, and stated there was no pressure in the CWA pricing mechanism for the supply chain to think creatively when they priced (pers comm. Architect, Project 2).

It was generally agreed though, that the 'painshare/gainshare' incentive combined with the willingness of those in management roles to listen to the supply chains opinions, helped empower people to seek solutions to continuously improve and innovate. Positive peer pressure was another motivator that was promoted within the formal structure of CWA (pers comm. Design and Documentation Manager, Project 3). It incentivised everyone to work together as a team, rather than as individuals.

5.7.3.3 Decision making

"Team consensus is the only thing there is" (pers comm. Architect a, Project 3). "If there is a decision to be made, you take it to the PEG team and they'll have an opinion, everyone's collective experience has a say... we agree and move on, so you don't feel like you're carrying it all yourself. It is not a formal process where xyz happens but you still have some robustness. We have a register of any decisions made so if anyone challenges it, we as PEG team made it collectively. You get strength by numbers" (pers comm. Construction Manager, Project 3).

The design concept for Project 2 was already completed prior to CWA being formed and was therefore not part of the process, though the documentation was. "It was a good arrangement, the contractors understood more around the development of drawings... we were there to take on board their contributions" (pers comm. Architect, Project 2).

Under CWA it was felt that the integration of design and construction "fosters creativity because you're bringing contractors and the supply chain into the process" (pers comm. Design and Documentation Manager, Project 3). Tool Box meetings, involving the supply chain were a great place for ideas to be developed, not only for health and safety issues, but also for all aspects of construction. Again, through being able to meet on neutral grounds, many people contributed that would never have done so in a traditional project delivery system. Processes that have been around for 20 years or so were challenged. The Engineer in Project 3 supported this view, except he felt that because of time constraints this was limited.

One engineer observed that the CWA structure created a level playing field. He noted that they were "not subservient to the architect. In the 5 -6 years we've worked with the architect we've learned a lot about each

other. We have gained a lot of respect in the process. CWA allows us to have a stronger voice. You can influence a decision more and your profile and role is elevated. If people manage themselves and respect each other in the environment with a common goal, it should foster creativity" (pers comm. Engineer, Project 2).

"The integration of design and construction fosters innovation. We can learn from each other, if we all go together it's a lot stronger" (pers comm. Supply chain rep, Project 2). The design team, were seen to be willing to sit down and review the drawings and make them easier to build and work. It was felt that it brought people together, and helped build up friendships. The supply chain knowing they were being paid for their advice, felt it created a more relaxed atmosphere, which encouraged a willingness to listen to each other. A plus side from an architect's point of view was that the greater involvement with the supply chain established buy-in and a familiarity with the building, assuring that there would be no surprises. Also, fewer drawings were produced, as the team worked together to provide a list of appropriate drawings. CWA engendered a culture of ongoing value management. "Through value management we created a service corridor underground where all the main services are running in one tunnel. For future flexibility that's great. (pers comm. Architect a, Project 3). According to the architect this level of collaborative value management is never realised on other projects.

Working together brought information to the fore. For instance, information such as the crane size that the Contractor would use on site, allowed the engineer to accurately design the right loading. From just one question, it improved the buildability, led to faster implementation, which ultimately resulted in cost savings (pers comm. Engineer, Project 2).

Therefore the general consensus was that the integration of design and construction fosters creativity in the input of the detailing and implementation, enabling the project delivery, and the effectiveness of teams. Yet in terms of architectural design, the architects expressed some concern. This was particularly the case, as these projects experienced higher than expected TOC's. This placed pressure on the design, as design aspects are often seen as optional. "The architect can get worn down with the continual stripping down of the architecture – it is very easy to attack and it can get frustrating defending it" (pers comm. Architect, Project 3). Another architect stated that whilst no one challenged the architectural design concept, "where you defend the realm is that in architecture there is a lot of subjective... and because it is subjective you cannot hide behind a code like an engineer can. That is where the Client objectives and vision come to the fore. Being part of the decision making, they understand that not all cheaper decisions are the best decisions in producing the final outcome... The CWA Manager, being part of the Client was very supportive of what we were doing. He was part of the original briefing process, which has to make a difference and ensures that the facility embraces the brief" (pers comm. Architect a, Project 3).

A comment made from one interviewee, was by not finalizing the TOC prior to construction, impacted the daily management procedures and minimized the ability to find innovative solutions. In saying that, the end result of having the TOC reduced, incentivised everyone to think smarter in finding ways to be more efficient.

With the scope change for Project 3 a decision was made to accept that there would be gaps in the documentation to enable construction to start on time. Innovative processes were created to manage those gaps. The CWA structure supported this decision. People worked together to creatively find solutions (pers comm. Design and Documentation Manager, Project 3). One example was after the scope change on Project 3, the electrical supply chain helped with the redesign and drawing of the documentation to be able to deliver the buildings on time. The supply chain representative expressed that this would never happen on a traditional project.

A key initiative was to collocate all members of the supply chain in purpose-designed accommodations on site which resulted in significantly better communications, problem solving and breakthrough thinking. A greater amount of the work was prefabricated in these workshops under a controlled environment, producing higher quality work. Extensive planning, particularly by the plumbers prior to implementation also resulted in new practice and greater efficiency (pers comm. Construction Manager Project 2).

Another area of creativity was around reducing the final cost. One example was undertaken through the initiative of one of the supply chain members. When a supply chain member presented an alternative scheme to the team, the architects considered the proposal and agreed to the majority of the changes, except on particular items they considered important, thus saving the CWA team an enormous amount of money. Another example was on electrical cabling, where the supply chain member was able to substitute it with another cheaper cable without compromising on the integrity of the specifications.

The supply chain representative on Project 2 also created a new role in their team to add value to the process. He introduced a draftsman who could communicate both at the design end and at the construction level. This worked so successfully that it was implemented in other parts of the project. Both supply chain representatives stated that they made the additional efforts because of the incentives and security provided under the CWA structure. They also stated that they would not generally do so under other project delivery systems as there was no impetus to do so.

The typical baiting and blaming often experienced in architectural projects was replaced to where different team members listened to each other. To the point where it felt "like we all work for the same organization" (pers comm. Construction Manager Project 2).

5.7.4 Learning

LEARNING			
	ORDINARY	EXTRAORDINARY	HUMAN
PERSONAL MASTERY		<ul style="list-style-type: none"> • personal goal • culture-encourage 	<ul style="list-style-type: none"> • did you change • identify patterns of behaviour
TEAM LEARNING		<ul style="list-style-type: none"> • communities of purpose • reaction to mistakes (learn vs blame) • risk analysis (development & innovation vs status quo) • continuous improvement 	<ul style="list-style-type: none"> • group aims/intent • ability to change as a group • visible commitment from management • support • ability to listen
WORKSHOPS		<ul style="list-style-type: none"> • economic incentives • identify benefits of new approach 	<ul style="list-style-type: none"> • level of support • help with resistance

Figure 5.9

5.7.4.1 Personal mastery

The CWA's formal structure did not specifically endorse personal mastery, but was found to support those with personal goals. According to one interviewee, there was some facilitation to help people acknowledge and work through defensive behaviours, but this could still be improved. Another interviewee felt that the structure of CWA provided support to change, "if you feel like you've got an issue you can talk with your peers, you don't always get that. Rather than draw into myself when a problem occurs I'll talk about it straight away. It encourages development both personally and in helping others" (pers comm. Construction Manager, Project 3). It was generally noted though, that when the pressure was on, people sometimes reverted to type.

Not everyone set themselves a personal goal, but some did. If so, they were typically work related, such as, ensuring that by their input the project would be 100% defect free, or to learn from and build on their experience of being part of CWA, or being involved in such large projects. "With anything new you learn things – you compare it to where you've been and where you want to go. In that respect it was a new experience" (pers comm. Architect, Project 3). One interviewee expressed a desire to be a better manager through his ability to look at things differently. He felt the process gave him an opportunity to "open my horizons and expand. I feel like I'm a conductor bringing this whole team together" (pers comm. Construction Manger, Project 2).

5.7.4.2 Team learning

On completion of Project 1, the Client Building Project Management Team developed formal processes for post-completion review of the design and construction. A workshop was held to discuss lessons learned, and to transfer those learnings to the other three projects, particularly for Project 2 due to its similar design. The Client, consultants, contractor and other major supply chain members attended. Procedures were assessed and amended where appropriate, one example being the co-ordination of drawings. The lessons learned from the value management and value engineering undertaken in Project 1 were assimilated into Project 2. The design details were also reviewed, adjusted where necessary and incorporated into the documentation for Project 2.

One such example was the decision to thoroughly geologically test site conditions on Project 2, due to the problems experienced with subsidence in Project 1. "This was a wise investment and achieved greater certainty of outcome. That's refreshing and fantastic" (pers comm. Engineer, Project 2).

Each tier of CWA organization worked as a team towards continuous improvement (CI). It was commented that part of the Principals' Group's role was to monitor and oversee the learning on site to ensure that mistakes did not continue. The PEG team also worked towards CI. The PEG meetings were ideal forums to review suggested improvements prior to implementation. Processes were created as standard practice, such as reviews, to transfer lessons learned and provide opportunities to achieve efficiency gains and continuously improve the work. The attitude towards this way of working was well received (pers comm. Design and Documentation Manager, Project 3). The PEG team measured CI against the key performance measures, in this case, cost, time quality, performance and physical safety.

Two examples of this occurring in Project 3 were, at the completion of the first building, a review was undertaken to minimise the level of initial defects. Procedures and role responsibilities were changed in response to that review and as noted earlier initial defects were greatly reduced. Secondly, a standard was set in place to avoid the initial confusion as a result of disparate documentation references to finishes.

On Project 3, "every Friday we have a meeting with the project managers, service managers, service co-ordinators and programmers ... we talk about problems, it's a bit of a release... it is a safe environment... if there's a problem – as long as they're up front with us we'll work with them and deal with it" (pers comm. Construction Manager, Project 3).

The challenge to change status quo in terms of pricing and adopting new methods was stimulating and rewarding for some members. Especially when it helped the overall efficiency and profit of the team. This was supported by others leading by example. "We want to be seen as proactive, helpful and willing to participate, we want to be seen as someone who does the best for the project... other subs started to look at us – if they can do it why can't we" (pers comm. Supply chain rep, Project 3).

In Project 3, the Principals' Group consciously decided to feed off each other's expertise, and in the opinion of the architect, this was achieved. "We also decided that as this was going to be hard work and it was new that we were going to have fun. We have been working for nearly 18 months and we still have the same objectives – which is pretty cool...everyone listened to everyone else; that was good" (pers comm. Architect a, Project 3). The Principals' Group members stated that overall, they were a lot less defensive than in traditional projects, there was a willingness to interact and when issues arose, they worked together to mitigate them as opposed to defending their position.

"By taking away the blame helps resolve mistakes. Take away the blame – that's the fundamental thing. I cannot stress how important that is. Under the traditional process everyone is protecting their position and not contributing any useful progress. The old culture reinforces this pattern, and CWA takes it away. This part I'm an absolute convert – it makes the day-to-day job a joy" (pers comm. Architect, Project 2).

"Even though blaming did occur, you have to respond to the problem as a team, not look for contracting claims...it's a constructive response to a problem rather than the total blame culture"(pers comm. Design Manager, Project 2). "We all reacted really well to mistakes – we got on and fixed them. We were able to acknowledge that 'we've stuffed up here, CWA owns the problem, how are we going to fix it effectively?' that's our process" (pers comm. Architect a, Project 3). "Mistakes are in the open, the cost gets absorbed into the

price, which provides an incentive to work harder to recover it somewhere else, so that sets a good environment for continual improvement, whether it is in time or better details" (pers comm. Engineer, Project 2). The Supply chain representative in Project 3 supported this, where he noted that people were not complacent about others making mistakes, but because of the personal relationships developed between the team through Workshops and Toolbox meetings for instance, there was a greater willingness to help.

Most interviewees confirmed that the team was able to learn to not react typically to mistakes and blame others but collectively find solutions. (Though a few disagreed, and said people responded as they have always done). The Project 3's PEG team's position towards the supply chain was to "be open and honest, tell us what the issue is, so we can resolve it and work people around" (pers comm. Construction Manager, Project 3). The Construction Manager expressed that at times it's difficult not to revert to norm, but the CWA principles, the openness and the no blame, reinforced that commitment, "the difference here is you have the thought, but you get over it quickly... normally you'd write someone a letter, but you can't write a letter to yourself, so you get over it quicker, you learn to work with people, help them out... a lot of man management" (pers comm. Construction Manager, Project 3). This was supported by the values stated on the back of the business card, which were constantly being referred to by the PEG team (pers comm. Design and Documentation Manager, Project 3). Typically, when the PEG team reformed to accommodate new members they informally discussed the best approach of working together to achieve the desired outcomes.

The majority of the interviewees stated that people were willing to change behaviours and help each other in the process. Behavioural changes came from experiencing the benefits of collaborative working. It was a facilitated process, helped by the coaching and workshops. It was noted that being new to the CWA philosophy required training and on-going learning to fully embrace and thereby contribute to their best potential. "Still, it is a difficult balance between changing behaviours and keeping up with the day to day running of the site, especially one that is on fast-track" (pers comm. CWA Manager, Project 2).

A general opinion was that there was still a lot to learn and unlearn. "It will take many years of the industry to convert to CWA in the true sense" (pers comm. Supply chain representative, Project 3). Old behaviours did come through and create unnecessary tension. "The challenge is to carry on the practices that we have put in place here to the next one" (pers comm. Construction Manager, Project 3). One difficulty that was expressed, was that it was easier to change habits when fully immersed in the project, but some people were only involved under CWA about 20% of their time and the other 80% of their workload they operated under different processes. This creates some difficulty in affecting changed behaviours.

It was felt that the risk analysis process was different to traditional practice as the collective team formulated it. Whilst risk analyses are done on large projects, "it's just more of a team effort and therefore more of a learning process" (pers comm. Design manager Project 2). To improve upon the procedure of creating the shared Risk Register, it was suggested that a standard Risk Register could be formed and then adapted for each project to avoid overly complicating it (pers comm. Engineer, Project 3).

When asked about the visible commitment from management, differing opinions were expressed. On the whole, it was felt that there was visible assistance from management to help team members adjust to the changes or to any resistance they might have felt. "If you've got a problem come tell us..." was a constant phrase heard by the supply chain (pers comm. Supply chain representative, Project 3). An example being a supply chain member was very anti-CWA to begin with, and initially refused to sign up with the 'painshare/gainshare' incentive. Because so many people continued to talk to him and answer his queries over 15 months, he finally understood the process and was willing to sign. He recognised the values in the principles

behind CWA, and even though he had completed his work and had no further input into the process he placed his faith in the overall team. This example reveals the complete turn around undertaken by this supply chain member and highlights the importance of coaching and mentoring people to help them change their entrenched beliefs and assumptions.

Many commented on the PEG team selected for Project 3, as they saw them committed to collaborative practice. Particularly the CWA Manager who was seen to be crucial to the project's success. Members of the Principals' Group stated that those within the PG also showed a visible commitment to make decisions that were 'best for project'.

One interviewee expressed that on Project 2 there was not a lot of initial support from the Principals' Group until towards the end of the TOC pricing, where the PG, PEG and contractors went out for a meal and people were openly able to express their concerns and feel heard by it. A few interviewees also acknowledged the visible commitment from the Client Building Project Management Team to learn to collaborate, but not from the Client overall.

There were many positive statements made in regards to team members' willingness to listen to each other. For example, "the PEG team is a strong group who voice their opinion and are listened to" (Pers comm. Design Manager, Project 2). Plus, from another interviewee, "no doubt about it, we all learned to sit back and listen, even when we didn't always agree" (pers comm. Architect, Project 2).

At the beginning, the supply chain was a bit defensive towards each other, but that changed over time. The workshops were identified as being useful in helping letting go of defensive behaviour. Many initially struggled with the new methods of claims and of helping each other. Listening skills were often identified as fundamental. It was recommended that "they could do with a workshop on collaborative working – you don't have to agree but you have to offer an alternative" (pers comm. Engineer, Project 2).

5.7.4.3 Workshops

The majority of interviewees valued the workshops as they were seen as a way of bringing the team together. They also felt that they provided the perfect forum to outline the benefits of working under CWA. "Stewart gave us confidence that the whole process was going to work" (pers comm. Architect a, Project 3). There was a 100% attendance to Project 2's first workshop. "It was amazing, everyone was listening and were quite intense – that was a good start" (pers comm. CWA Manager, Project 2).

Most interviewees agreed that the workshops were essential. Yet, many saw that they could have been improved. The workshops set the scene but it was felt that there needed to be more. Refresher workshops were suggested, to help reinforce the principles, practices and procedures adopted under the CWA approach. It would also provide an opportunity to air issues, improve practice and re-engage people with the vision. It was recommended that everyone be included.

Beyond the training provided in workshops, there was available ongoing coaching and support as it was identified as important to build the culture and include everyone. Workshops were only a part of the practices and procedures reinforcing the collaborative methods, as it can "sometimes take awhile for the message to sink in. You have to be persistent and consistent... 'it's like safety, their attitude was 'he's going to spring us' some contractors took 3-4 months before their attitude changed" (pers comm. Construction Manager, Project 3).

5.7.5 Systems thinking

SYSTEMS THINKING			
	ORDINARY	EXTRAORDINARY	HUMAN
MULTIDISCIPLINARY		<ul style="list-style-type: none"> integration of design & construction 	<ul style="list-style-type: none"> High/low understanding of importance of other disciplines in achieving success Willingness to listen to other disciplines ` inputs within your domain Given equal weighting
UNDERSTANDING THE WHOLE		<ul style="list-style-type: none"> identify intended and unintended consequences forward planning seeing the big picture/context benefits 	
DECISION MAKING			<ul style="list-style-type: none"> mental models linked to vision & values
CONTINUAL IMPROVEMENT		<ul style="list-style-type: none"> project management participation.insular risk analysis – welcome input, inclusive project planning problems – anticipated/avoided `less haste, more speed` improvement teams to improve design & construction process 	

Figure 5.10

5.7.5.1 Multidisciplinary

Those interviewed stated that the integration between design and construction under this method was different to what normally occurs, as the traditional barriers were removed. Working under CWA, helped people begin to recognise the importance of other disciplines in achieving success. “There is a very high informal understanding of the importance of other people’s work” (pers comm. Design and Documentation Manager, Project 3). One Supply Chain representative thought this happened due to the level and type of contact that occurred under this process.

“If you have been around for awhile you know there’s a lot of cogs that go together to make a successful project.... But to the uninitiated, a CWA process immediately highlights how important it is to get everyone working together... right down to the chippy... the culture has been very good and you realise how important it is that everyone cares.... Walking around on site it is like a well-disciplined home” (pers comm. Architect a, Project 3). Another interviewee felt that the CWA structure provided team members a higher understanding of each other’s role in delivering overall success. “Every time you look at a building you realise the importance of each and every sub trade... the process makes you communicate with others and makes you responsible for coordinating with them, when previously it would have been someone else’s problem”. Management endorsed this level of inclusiveness, not only through procedures, but also in how they operated. “At a management level everyone respects everyone’s position, no different” (pers comm. Architect, Project 3).

It was noted that a positive aspect of integrating design and construction was the reduction in friction amongst the different team members (pers comm. Engineer, Project 3). Several interviewees on both projects believed that the while integration worked well, there was some resistance experienced amongst the professionals,

particularly the architects to this practice. There was some concern that professionals reverted to old patterns of behaviour and in the opinion of others were unwilling to adopt a collaborative approach. One architect suggested that the input of the contractor was overvalued, reinforces this notion. In saying that, this was not always the case, and the rest of the team were quick to note when professionals positively integrated the collaborative principles and readily applied them in practice. One of the supply chain interviewees experienced the designers willing to listen to their comments, especially around buildability issues. It was further noted that if professionals showed a willingness to change things generally, when they became adamant on a particular issue, more people were supportive of their opinions. Many confirmed the positive benefits the CWA method had to removing the perceived hierarchy between the professionals and the rest of the team.

It was generally felt that under the CWA structure there was a genuine willingness to listen to other members' inputs. "I've become a better listener, you have to hear each other out and then put your case forward. And it should be 'best for project'. It may not be the architect that gets his way – it may be that the contractor has the best solution and that brings the best value to the Client" (pers comm. Engineer, Project 2). "We get involved in the turnover of the whole job and our advice gets taken... Some people learn from us and we learn a lot more about working with people" (pers comm. Supply chain rep, Project 2).

Many of the interviewees, affirmed that the CWA approach supported the relationships to have no positional hierarchy over each other "It's a level playing field and the contractor has an equal opportunity to input proactive ideas into the design process" (pers comm. Design and Documentation Manager, Project 3). What made this work, was that the ideas were assessed by their merit and from the position of what is 'best for project' rather than by the person's role. "Bringing everyone to the same level is crucial and I think it worked pretty well on this project" (pers comm. Design and Documentation Manager, Project 3).

The Construction Manager on Project 2 states that CWA practices support this integrated approach by creating forums for people to speak where everyone was recognised as equal and of value. He felt, that over time this would only be strengthened. Yet some had reservations and adhered to the view that personalities drive decision-making. Another interviewee stated that equal weighting "can never happen – you're all coming from different strengths and positions. You are not always going to think that respective opinions are of equal importance, again it is helped by CWA where notionally at least there is equality... in practice it does not iron out completely (pers comm. Architect, Project 2).

5.7.5.2 Understanding the whole

The general consensus was that CWA enabled the team to understand the whole project. "I think everyone knows a bit more about the bigger picture rather than their isolated little thing. This increases the level of understanding of the project" (pers comm. Construction Manager, Project 2). This was further supported by another interviewee who states, "there is absolutely no question that people have a greater understanding of the whole context under CWA" (pers comm. Engineer, Project 3). Yet there were some differing views expressed. "It's good that the whole team is driven to the end of the project, CWA encourages understanding the big picture, but this can also be achieved in other contracts" (pers comm. Architect, Project 3). Supported by the Design Manager on Project 2 "To me it's always been an essential part of project management".

The focus on forward planning was helped by the Principals' Group's role, which was to monitor and think ahead, "that's the aim... to be not someone looking at the rear vision mirror but someone at the top of the mast looking forward" (pers comm. Engineer, Project 3). What is 'best-for-project', was embedded in the

culture of CWA. It reduced people from limiting their thinking to their own role and prompted them to make decisions that were 'best-for-project'.

Those not normally involved in consent processes, realised the benefits of the integration first-hand, and stated that "because we helped put the consents together it gives you more of an insight; here I've learned the extreme amount of work that has to happen first" (pers comm. Construction Manager, Project 3). The supply chain also noted the benefits in being involved in the design in helping them understand the whole. By having that understanding they were able to contribute and make valuable recommendations. One example was to "promote an open trench system instead of ducting under the ground"(pers comm. Supply chain rep, Project 3).

The openness experienced within the CWA culture extended beyond the 'open book' policy. One example was that there was only one programme, rather than separates one to show the Client, for instance. "You can not have this on this arrangement because it is all open and everyone wants to know where we are" (pers comm. Engineer, Project 3).

5.7.5.3 Decision making

Several interviewees on Project 3 provided examples that reinforced that decisions made were aligned to the values of what was best for Client, even when it cost the project more. This can happen on other projects, but the CWA environment made it a lot easier.

As raised in the teamwork section of this analysis, "'best-for-project' can depend on your assumptions... in my view it is important that when setting up CWA everyone needs to agree on the vision and values that informs decision making. Best for project can mean getting the project completed on budget and on time, yet the team ultimately needs to deliver a facility that is fit for purpose, specified correctly and meets the Client's expectations" (pers comm. Client Liaison Manager).

Several interviewees understood the importance of including in the decision-making the Client objectives, but in reality, the commercial drivers often carried greater impetus. In saying that, they recognised that ensuring that the Client was satisfied should be a priority.

5.7.5.4 Continual Improvement

It was unanimous that under CWA, participation was not only welcomed, but also requested from everyone. "The culture of CWA encourages continuous value management and everyone's ideas are asked for and welcomed" (pers comm. Architect a, Project 3). This included being involved in compiling the QRA register. Many facilitated workshops were held with everyone participating and itemising perceived risks. Rather than management trying to second-guess they obtained a list from experts in their own fields.

Extensive planning was done for both Projects 2 and 3. Project planning helped avoid problems, but Project 3's Design and Documentation Manager argued that implementing the appropriate software could have been done earlier. "Planning definitely helps, yet more could have been done as it is fundamental in making the job better. It provides a chance of starting and going on right" (pers. comm. Architect, Project 2). In regards to continuous improvements, "problems are anticipated and avoided as a team we are constantly throwing in points of view" (pers comm. Architect a, Project 3). To help achieve planning in future projects, one interviewee raised the need to educate Clients so that they can understand the benefits of extensive planning at the beginning.

One example of the ability of the structure to adapt and evolve was undertaken by the PEG team on Project 2. They identified the need to improve the flow of communication between the supply chain and the PEG team, to enable the supply chain to have a direct communication link with the Principals' Group. Others endorsed this view and expressed the benefits of relevant team members attending key Principals' Group meetings, especially around TOC and QRA. The person I interviewed from the supply chain in Project 3 also realised the benefits in creating another level of conversation and felt this was missing in Project 3. This was supported by a Principals' Group member who also recommended the benefit of occasionally receiving different perspectives from other members within the PEG team at monthly meetings.

5.7.6 Wrap-up

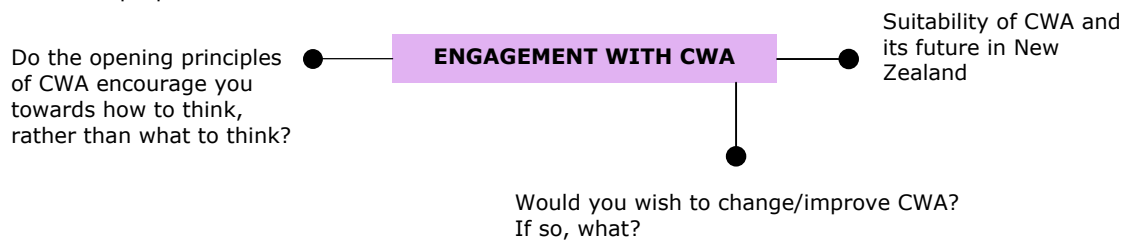


Figure 5.11

The majority of the interviewees agreed that the principles included within the formal structure, influenced the outcome as they were embedded in the process. According to one interviewee, they encouraged people towards how to think and be proactive (pers comm. Design and Documentation Manager, Project 3). Another interviewee states, “yes, by virtue of the fact that everyone is constantly trying to resolve issues and do what is ‘best for project’”(pers comm. Engineer, Project 3). And another, “yes, but you have got to keep the culture going – you have got to walk what you talk. If we say we want open and honest communication from the subcontractors then we have to give it back to them” (pers comm. Construction Manager, Project 3). And finally, “the principles are embedded within our environment, it is not just a thing where we preach it and practice something else. It influences people on how to think rather than what to think, and you’re happy to make suggestions because they are encouraged right across the board” (pers comm. Architect a, Project 3). This clearly reveals how the formal structure’s intent was integral within the informal structure.

In relating their first experience working under CWA, many thought it was a real learning curve. On the whole the interviewees felt, “it is a good process. It is fairly robust provided people are driving it”. And that it was a “proactive step in the right direction to the way projects should be procured and worked” (pers comm. Design and Documentation Manager, Project 3). This was endorsed by the supply chain representative who commented “I like the system, we’d use it where we could, I’d be happy to do another job” (pers comm. Supply chain rep, Project 3). And by an architect, who states “I was not as apprehensive as a lot of people because I’ve been through all these other procurement methodologies... It seemed to me to have leapfrogged the PPP methodology... I went into it happily and I’m still enthusiastic” (pers comm. Architect a, Project 3). And, “if you got the right outcome in terms of TOC it would be the dream job... I’d love to work in a CWA where everybody wanted the best to come out from a design point of view... theoretically it could happen, but it hasn’t happened here because we’re under huge cost pressure... I’d like to see one work properly” (pers comm. Architect, Project 2).

When asked about what they would change to improve the CWA system, a considerable number of them expressed as a key issue, the need for greater resolution to the costing. It was recommended that cost reviews should start as early as possible. It was recommended that an additional interim TOC between the developed design and the construction would reduce the margins of uncertainty and create a clearer picture of the likely costs. A few interviewees thought that the main issue to address was around achieving competitive pricing to obtain a keener TOC price. Some felt it worked well for Project 1 as a target tender price was already established. They expressed concern that too much time had been taken up determining the TOC for Project 2, and that the TOC needed to be established earlier and with more stringent controls. To achieve this, they recommended better facilitation and training on the pricing model. To help gain greater clarity, one interviewee suggested that the Construction Managers review the presentation documentation and workshop materials describing CWA cost process, to minimise any mixed messages. Many of the concerns raised, mirror the issues highlighted in Part 2 and 3 of the Analysis, as the TOC was a key focus at the time of the interviewees.

Reinforcing the point made in the Section 5.7.5, a few interviewees raised the idea that it would benefit the process if other members of the CWA team could address key issues to the Principals' Group, rather than only through the CWA Manager, who currently reports on their behalf.

Several interviewees reflected on improving the Client direction so that resources could be managed more efficiently. It was felt that the Client overall, required to embrace collaborative practice and have clear objectives. Too many new procedures within the Client organization were addressed during the process that should have been done earlier.

I was interested to gain a perspective on the suitability of the CWA model for different sized projects. Many thought there was a cut-off point, where it would no longer be effective, anywhere from \$20 - \$100M. This was mainly due to the concern that the Client would be paying in both time and cost to educate people into the CWA philosophy. Also, with the considerable infrastructure required to support the procedures, many felt that this method could not be transferred to smaller projects. "It is suitable for larger contracts where there is a risk of delivery, time, cost, Client indecision – it is probably the way to build projects" (pers comm. Architect, Project 3). Yet a few interviewees felt that it could be applied to any sized project, especially when the Client was deeply involved in the process, and believed that the key principles, practices and procedures could be employed. Further, they saw the benefits this process had to enable innovative projects, where the team has the capacity to change, create prototypes and explore ideas.

When asked about the future of CWA in the NZ AEC industry there was mixed views. Some felt there was a future but to a limited degree, as they did not think developers would adopt it. They saw it more suited for an institutional project where a close marriage between all project stakeholders is required. One architect stated, "we'll consider it as a contracting method for other projects. I don't think it is the answer to every project but it was never intended to be. There are projects where there's huge benefits to be gained... how you drive it forward will be interesting. I'm not sure the professions will push for it". Another interviewee felt that "when you have absolute certainty, other methods of procurement can achieve similar benefits. CWA is a good vehicle when you've got uncertainty, provided that the commercial tension, pricing tension, behavioural training run hand-in-hand, otherwise it will end up just being cost plus" (pers comm. Engineer, Project 2). And, "in the right context. All different procurement methodologies have their place in the different cycles".

"CWA is a great way to go. But I suspect there won't be as much uptake in building as there would be in infrastructure – bridges, roads etc". This was reinforced by a concern raised by an architect, who was "not willing to lower the architectural standard to achieve CWA continuance". There were a few others who were apprehensive about the implications the new Building Act will have on the CWA process, the introduction to the Licensed Building Practitioner, the Producer Statements being signed by individual companies rather than the CWA team as a collective and the shared insurance if the Client wasn't willing to retain the risks after completion. All these issues will need to be carefully considered and openly articulated within the AEC industry to mitigate concerns.

"It's got to have good contractors for collaboration to work. You'll get a lot of people who won't want to do it – the bad builders, the fly-by-nighters, the unorganized, the hungry, all of that ... it won't work" (pers comm. Supply chain rep, Project 2).

I also interviewed the two CEO's of the contracting firms. They initially were willing to adopt this method because of the unique way of procuring projects, and for its ability for them to add value. "It allowed every chance of avoidance of claims, contractual and operational arguments between all parties involved in the

project. It gave us hope that this was a new great way of procuring projects” (pers comm. CEO Contractor, Project 3). Both expressed a continuing willingness to adopt this approach for future work. Under the CWA model a better alliance is formed between the key players, helped by the sharing of risk. Creating a shared purpose with common objectives also facilitated this approach. One CEO believed that you could obtain equally good relationships between the parties involved under a more traditional contract, as even though the contract has impact, the behaviour is what matters. Though he went on to say, that the major benefit was the agreement’s ability to remove the master/servant relationship and create an equal platform.

Another advantage for the contractors was the removal of the expensive tendering process. If this type of agreement continued, it would potentially have ongoing benefits for the AEC industry. Projects of this size can cost up to \$150,000 to tender. Under CWA, submitting a proposal reduced this to quarter of that cost. This had an additional bonus, that if successful, the contractor was guaranteed an early assured outcome and therefore able to plan more efficiently. Under CWA, with the size of projects and with the shortage in labour, there was considerable merit in managing risk by knowing earlier on in of your involvement in the project. This enabled the securing of resources.

One of the CEO’s believed that CWA could be valuable for all sized projects, as it purports economy of scale, and cuts out duplication and multiplication by creating one team. When asked about the future of CWA in NZ, some uncertainty was expressed. It was felt that public airing around the TOC was detrimental, as it dented the delivery systems ability to build on top of these projects, even if those opinions were not grounded in facts. Rumours will be taken as reality. Mainly due to the general skepticism within the AEC industry, as many saw it as threatening to their businesses.

To strengthen its certainty within the NZ AEC context, they suggested that it requires key respected industry leaders to continue to prove how it works and provide tangible evidence. The TOC procedure in theory is the right way of obtaining price certainty, yet it requires more demonstration projects to show its effectiveness.

And on a final note, it is “important that the AEC industry adopt a building project delivery system that is fun and fair” (pers comm. CEO Contractor, Project 2).

CONCLUSION

6.0 Introduction

The following conclusion is divided into three sections. The first draws together the specific findings of the analysis and then taking each part of the analysis sequentially, it examines these findings in the context of the structure of the CWA virtual organization. The second section identifies the key implications emerging from the research, while the final section summarises the thesis as a whole.

6.1 Review of the Analysis

This first section may in turn be seen as being composed of five parts; a structure that reflects the four-part arrangement of the analysis together with a summation of the analysis's findings. The first part compares CWA's formal structure to that of a healthy collaborative system as established in the Background and Literature Review. Parts two to four examine the overall success of implementing the CWA model with specific reference to the projects researched: the second part reviews the role of the Client, the third the agreed performance measures, and the fourth assesses the extent to which teamwork, creativity, learning and systems thinking maintain a healthy collaborative system. The final part provides a general review of the analysis and concludes this section.

6.1.1 Part One of the Analysis

A distinguishing feature of the CWA approach is the empowerment of people to make 'best-for-project' decisions instead of managing through control. The responsibility for a project's success is shared, with everyone in the team determining the eventual quality of the outcome. Such team performance is formally incentivized in CWA's policies and procedures. The formal structure motivates people by rewarding quality work, purposefully creating a vested interest for all team members from the client through to the supply chain.

The CWA structure is designed to work as a system, with each aspect strengthening the whole. Within this system the notion of 'other' is minimised meaning adversarial behaviour finds little leverage within a team. Both primary and secondary research validate the principles of openness, honesty and fairness in establishing and maintaining a system of healthy relationships. CWA's adoption of these principles promotes the emergence of trust. A healthy system also requires regular monitoring to ensure that the formal and informal structures remain aligned and congruent with the agreed shared purpose. In this way, the current reality continues to move towards the desired future outcome.

While trust and synergistic teamwork may be experienced under other building project delivery systems, this is often despite the formal structure rather than because of it. In such a case, an informal collaborative structure overrides the formal agreement, but usually reverts to the terms of the contract once something goes wrong. In contrast, the formal structure of CWA creates a 'living agreement', one that requires active engagement from all those involved by including behavioural and technical aspects. Under this 'living agreement', the nature of the architectural project delivery system is altered and a new way of working is required; an approach that can remain flexible and adapt to changing circumstances through continuous learning and unlearning. Education and facilitation play a vital role in CWA accomplishing this way of working.

Part One of the Analysis showed that the formal structure of the CWA model included all the recommendations made by the AEC industry for achieving a healthy collaborative system (particularly those outlined in Sections 3.2, 3.5 and 3.6 of the Literature Review). The formal structure of CWA evidently does possess the capacity to create sustainable and innovative practice, not only as assessed against a project's outcome, but also

according to the means adopted in attaining that outcome. Sustainable and innovative practice under CWA is reliant on the extent to which the virtual organization agrees to operate under broader measures of performance. In order to deliver on these 'extraordinary' and 'human' performance measurements a project delivery system needs to celebrate the 'extraordinary' and 'human' as well as the 'ordinary' measures. The structure must include all those aspects perceived as contributing to the overall success of the project.

6.1.2 Part Two of the Analysis

Decisive in the success of CWA project outcomes is the integration of the Client into the project team. The analysis confirmed that representation of the Client by a single individual (i.e., the Project Director) in place of a committee was key to the realisation of each project; a point identified in Section 3.6.7 of the Literature Review. Yet the analysis also suggested that this representation might be improved. The relationship between the Project Director and the Client organization was sometimes strained and divisive which led to a distancing of the Client organization from the process. This distance created a disjunction between the vision of the Client organization and the agreed unity of purpose amongst the CWA teams. Moreover, the analysis showed how Client time pressures placed stress on the system as a whole.

Overall, the CWA model, achieved most, if not all, the agreed performance measures. As the Project Director confirmed, the CWA model was still able to deliver on the Client's expectations even under conditions that were far from ideal. It seems reasonable to conclude then, that had the CWA architectural project delivery system been implemented from the outset, it would have maximized potential benefits by providing broader performance measures and more active engagement throughout the project.

6.1.3 Part 3 of the Analysis

This third part examines the ability of the CWA structure to attain the team's unity of purpose as reflected in the agreed performance measures. These projects showed that while some team members' appreciated that fair costing could also mean costing keenly and creatively; this understanding was not universal. Costing under CWA differs significantly from the traditional approach and as a result the costing process represents a steep learning curve for many people. Ostensibly counterintuitive, many would require on-going coaching in order to realise the win-win potential of this approach and relinquish entrenched behaviours.

Additional procedures were recommended to mitigate concerns over costing procedures on future projects. As an example, implementing greater resolution of costing earlier in the process, at the developed design stage, would reduce the margins of uncertainty, such as those experienced in Project 2, and help the Industry gain more confidence in this method of costing. The CWA model did however provide cost certainty once the TOC was established, even under complex, fast track methods, as illustrated by Project 3 where the Final cost was under the TOC. Project 2 is also operating under the agreed TOC at this point.

The analysis indicated that shifting the focus from price to cost provided an opportunity to reduce costs by improving efficiency of materials and process with a consequent increase in the profit share. By delineating actual price, risk and margins, CWA has made a significant contribution to the costing of projects within the AEC industry. It is important that knowledge of this costing framework be built upon and shared with others.

That Projects 1 and 3 were completed on time, and Project 2 remains on track, clearly demonstrates the benefits of CWA. The internal and external variables impacting these projects would have undoubtedly caused delays, extensive cost blow-outs, and an increased likelihood of litigation under a traditional process. A

majority of interviewees expressed the view that CWA's fluid structure provided the means to deliver innovative and flexible procedures to accommodate these tight timeframes.

For Projects 2 and 3, a zero defect target was set with regard to quality performance. Although Project 2 did not attain this target by CWA completion, the defects and works deferred were minor and did not impact the operation of the facility. Six months after the May completion date most have now been resolved. This represented a significant achievement and gives an eloquent demonstration of the flexibility of collaborative process, particularly given that the project doubled in size just four weeks prior to commencement.

Health and safety was a high priority on these projects and the corresponding performance figures show the effectiveness of continuous monitoring and performance improvement across all tiers.

6.1.4 Part 4 of the Analysis

The final part of 6.1 will assess the extent to which teamwork, creativity, learning and systems thinking help develop trust and sustain a healthy co-creative system through collaboration.

6.1.4.1 Teamwork

A unity of purpose instilled greater levels of trust within the teams and made them more effective. Trust further increased as results were achieved and people delivered on promises. Team culture received greater attention at management level during the CWA process, which helped ensure that the espoused culture was aligned to the reality experienced by the team. Team culture was also supported by the structure, for instance the 'joint and several risk assumption' policy that promoted 'no claim no blame' behaviour. Even with the difficulties experienced, those working on both Projects 2 and 3 reported a high level of enjoyment.

Formal and informal facets of the CWA structure encouraged a continuous flow of information and ideas and open communication between members of the team. Transparent reporting of information was also emphasized and communication was not confined to any particular routes. As the Literature Review highlighted, these practices are central to maintaining a healthy system.

The analysis determined that the CWA structure had a direct influence on people's behaviour. The majority view supported the central premise that a system's structure directly influences people's behaviour. As discussed in the Literature Review, the inverted pyramid of the organization begins to resemble the system's tree and supports its ability to change. This ability to adapt, learn and evolve is fundamental to the ongoing success of the CWA model.

6.1.4.2 Creativity

The analysis reiterated that creativity and innovation was supported by the formal and informal structure. In terms of design and materials, innovation was not a key priority given the nature of these projects, but the CWA model appears to have the structure to enable high levels of innovative practice. The CWA model views creativity as a process that can be positively managed within teams. It provides the structural environment to explore uncertainty and therefore creativity; from the moment-by-moment creativity of continuous improvement to dramatic break-throughs in ideas, materials and project procedures.

The research also showed that effective teamwork provides a larger and more diverse pool of experience to draw from. This diversity challenges team members to reframe beliefs and assumptions, and find new ways of working within teams. Integrating teamwork practices created an opportunity to both minimise risk and maximise innovation. Innovation requires the courage to venture into the unknown, a willingness to learn and

challenge conventional thinking, so the safer the team environment, the greater the likelihood of innovative practice emerging. The complementary practices of creative exploration, good teamwork and learning therefore need to be built into the structure of the process.

6.1.4.3 Learning

Continuous improvement was backed by the practices and procedures of the CWA architectural project delivery system. Monitoring, feedback and integrating lessons learned helped strengthen the CWA process. Increased productivity did not necessarily denote a rise in labour forces, as the analysis showed, it was more often generated by continual improvements based on new knowledge. Continuous improvement demands that people challenge assumptions and the *status quo*. This inevitably involves a degree of risk, however the 'no claims, no blame culture', by removing the threat of litigation, made it possible to use 'failure' as an indication of continuous improvement. Paradoxically, this yardstick was used to minimise mistakes reoccurring in the project.

While 'failure' provided a useful indicator, it was actually a team member's ability to admit mistakes that was prized. Team members were carefully selected according to the criteria of eligibility, capability and suitability with an individual's ability to work within team perhaps of most importance. Once assembled, the on-going learning of a team would be facilitated by regular training and mentoring.

The initial team-building workshop was used to surface any difference of opinion or principle between members of the team. It provided the space to positively explore the group's shared purpose and objectives, or to opt out whenever differences proved too great. Often, the process of working together in identifying a shared vision, purpose and values quickly united a team. Interviewees considered workshops central to learning and letting go of entrenched beliefs. New patterns of behaviour emerged within these projects, but the research also revealed that people occasionally reverted to adversarial behaviours under pressure. It was generally felt that the industry would take time to fully embrace collaborative practice as there was much to learn and unlearn.

The CWA model highlights the importance of implementing the disciplines of a learning organization. Although CWA currently emphasises integrated teams and continuous improvement, it falls short of fully endorsing the disciplines of a learning organization. CWA stands to gain a great deal from this step within a given project as it would make greater change possible and ultimately transform the AEC industry.

6.1.4.4 Systems thinking

A systemic model is capable of dealing with the growing complexity of architecture. Adopting a systemic perspective shifts the focus from blame to an acceptance of responsibility, thereby helping develop an awareness of the patterns of behaviours that shape events. The analysis exposed the interconnections between numerous parts of a project and the bearing each part had to the fulfilment of the project as a whole. This ability to see the project in context shifted the focus from the detail to reveal a continuous interplay between the whole and the parts.

Overall, an assessment of the formal structure demonstrates that it does actively facilitate teamwork, creativity, learning and systemic thinking within its practice. The degree to which these may be attained, depends upon the team's unity of purpose and agreed measures of performance.

6.1.5 Overview of the Analysis

CWA has shown an integrative, co-operative and inclusive approach to design and construction. It has achieved extraordinary targets, value management and team performance. These projects have revealed that CWA presents a collaborative and holistic model. The inherent formal and informal structure of CWA model facilitates collaboration as it addresses the wellbeing and learning of people in addition to the success of the outcome.

While powerful, collaboration does not guarantee quality or inspiring work and it would be discouraging if a lower standard of architecture were the consequence of implementing the CWA model. While architects particularly fear the dilution of creativity through a process of 'designing by committee', the CWA model values the architect as design leader. Admittedly, the standard of work is determined by the shared vision agreed by the team and its definition of success, but the more inspiring the vision, the less likely it is that the intensity of that vision will be diminished by bargaining or personal influence.

The issue of CWA's insistence on project loyalty over company loyalty remains contentious. The strength of a CWA team is determined by the individual integrity of those involved and their agreement on the vision and values that guide their actions on a project. Provided they uphold these principles, people can remain loyal to their company whilst still honouring the commitment made to the virtual organization.

The projects studied were complex and exceeded the scope of projects typically built in New Zealand. While perhaps unrepresentative of the NZ AEC industry, these major projects are nonetheless significant as their scale provided opportunities to more clearly evaluate the practices and procedures adopted under this approach. In each case, the teams were able to manage the implementation of the project and track productivity, with the aid of proprietary software systems, which provided invaluable data for assessing CWA's effectiveness beyond current NZ practice.

A prevailing view was that CWA model might not be suitable for all projects. The majority of interviewees maintained that the CWA model was only appropriate for larger, more complex projects. This assertion is not borne out by the analysis. Whilst some procedures might need modification to reflect project size, the principles forming the basis of the model still hold true. This was confirmed by a number of interviewees, including the CEO of a major construction company, who asserted that the CWA model could be made suitable for general construction. Training and coaching would still be required to facilitate the necessary change in culture. On smaller projects, team members could be trained in external workshops to minimise the cost impact to clients. These could be made available through the industry. In the UK, the Construction Industry Training Board (CITB) levies contractors as a key source of funding for this purpose.

6.2 Recommendations and the way forward

6.2.1 The influence of the general culture on the AEC industry

As the Background describes, collaborative practice is becoming increasingly prevalent across a variety of domains. The trend is moving away from adversarial win-lose situations in favour of win-win arrangements. Collaborative working is based on such a win-win relationship and yet within the AEC industry the idea that one might profit without it being at the expense of another remains antithetical.

Any living system needs to be able to learn and adapt to its environment. If the AEC industry is considered as a living system then the importance of it remaining responsive to changing conditions becomes critical. Unless the NZ AEC industry questions its assumptions and evolves through constructive dialogue, it may find itself left behind, with quality building the first casualty.

The Literature Review compiles convincing evidence for the AEC industry moving to a collaborative working model, particularly if it wants to deliver consistently value-driven, innovative and sustainable architecture. However, knowledge of organizational learning, creativity within teams and systems thinking must be fully adopted by mainstream practice if this is to occur. It is then imperative that the NZ AEC industry embraces best practice by following the examples of other AEC industries worldwide.

A major benefit of adopting collaborative, holistic architectural project delivery systems such as the CWA model will be its stabilising influence on what has traditionally been an unstable, boom and bust environment. This could have several significant run-on effects. Regulating the profits and margins received within the AEC industry in this way will provide an opportunity to invest in educating the industry. Furthermore, industry Research and Development will facilitate innovative and sustainable practice. An issue raised in the Appendix.

To fully realize collaborative practice will require that clients take a leading role. They will also need to be educated in the process in order to be able to select the most appropriate architectural project delivery system to meet their objectives. It is essential that major clients, such as government, champion collaborative practice by being prepared to pay a fair and reasonable price, even when the market is willing to do it for less. Informed clients overseas are, in addition, appreciating the benefits of retaining the risk after completion of the project. They realize that it is more important to create an environment that encourages getting it right first time.

The education of clients and industry will call for an open discourse supported by learning resources, such as a library of AEC industry experiences. Each project operating under a collaborative model provides its own opportunities to learn. Ideally, the projects examined here would form part of such a library. As a significant contribution to informing future clients, these learnings would be recorded and made available through the NZ Construction Clients Group.

6.2.2 The on-going role of the architect

The architectural profession will also need to revise their currently myopic view of AEC practice if they are to remain effective and retain a leadership role in the delivery of the built environment. The drive for value-driven, innovative and sustainable architecture provides an ideal opportunity for architects to recover their influence. Delivering on these expectations will require a more participatory role, one that includes a willingness to share leadership and collaborate with others towards a final outcome. The traditional project delivery system currently approved by the NZIA leaves architects increasingly isolated. Alternatively, the NZIA moves to endorse a collaborative holistic model that recognizes an architect's unique skills and creative input.

Research into innovative and sustainable practice among successful architects is recommended to determine which architectural project delivery systems are currently in use around the world. The Literature Review specifically sought out publications to determine what systems were being adopted. This search only revealed the paucity of information available. An indication perhaps of how much Western architects currently value their process.

6.3 Concluding Summary

The overall conclusion that emerges from this research is that a collaborative human system such as an organization must design its structure to establish trust in order to be healthy. To do this requires effective teamwork, on going personal and team learning and recognition of the continual interplay between the whole

and its parts. Incorporating the disciplines of a learning organization within such a structure helps make this a reality.

Creativity within teams cannot be assumed; it must be actively fostered by a systemic organizational structure. For a system to be innovative, such as the system of an architectural project, creative practice has to be integrated within the whole of the team and in all stages of the project. Respect for other people's contribution and positive relationships dwell at the heart of a creative system. While the disciplines of a learning organization are necessary, other aspects are also required to enable its success such as intrinsic motivation, shared risk and diversity.

Finally, the analysis supports the proposition that a collaborative, holistic approach positively impacts the final outcome. In short, a healthy process delivers a healthy outcome. The ability to generate a 'desired future reality', in this case one that creates value-driven, innovative and sustainable architecture, is dependant on ensuring the conditions for such a healthy process.

A growing number of researchers and AEC industry leaders now insist that a new collaborative, holistic architectural project delivery system is essential to realising value-driven, innovative and sustainable architecture. They assert that the AEC industry need a workable systemic model that supports a broader vision, beyond ordinary measures of cost, time and quality, to actively empower people to create extraordinary buildings through extraordinary organizations. This thesis finds that CWA offers such a model, as it provides a structure that helps sustain a healthy co-creative system through collaboration.

APPENDIX 1

Trends around value-driven, innovative and sustainable architecture

As discussed at the beginning of this thesis, these three drivers are interdependent with each other. The New Zealand Construction Industry Council (NZCIC), a recently formed interdisciplinary body, is currently preparing 'Best Practice Guidelines for Construction Procurement' based on international and national research covered in this Literature Review. Their discussion document identifies these three key drivers, (as well as safety), and the subsequent need to address the process of procurement (NZCIC, 2005). Research has indicated that these three drivers require a holistic approach and therefore process to architecture. By adopting a collaborative systemic model that engages a broader set of measures, beyond time, cost and quality and includes 'extraordinary' and 'human' measures enables trust to emerge. Trust is a necessary prerequisite for a collaborative human system to deliver a shared purpose. This understanding is briefly reviewed below.

1.1 Value-driven architecture

One driver is the growing awareness of the importance of architecture, which is quality and value led rather than initial cost driven (OGC, 2005; RIBA, 2001). The AEC industry acknowledge that value for money, and cost effectiveness are not the same (S. D. Green & Lenard, 1999). Value engages a more holistic approach, addressing the whole-life-cycle of the building, and encompasses both tangible and intangible measures (RIBA, 2001). Cost effective outcomes are generally focussed on initial costs and limit the delivery to tangible measures. Adopting whole-life-cycle costing reflects sustainable practice and informs long-term decision making (Cole, 2006a). This understanding also applies to selecting the team; under a value driven project the most suitable people are selected for the project, rather than the lowest tender. This has been identified as important for on-going success of the industry, and was included in the Latham (1994) Report.

1.2 Innovative architecture

Innovation is being highlighted as crucial to the on-going survival of the industry (OGC, 2005). "External and internal forces are exerting greater pressures on the industry to provide more innovative solutions and improved performance" (Kumaraswamy & Dulaimi, 2001, p. 333). One force being the increasing number of clients expecting innovative solutions (Smith et al., 1999). Another trend is that the AEC industry has realised that only through innovation can the industry adapt to the complexity of the context it operates in (Steele & Murray, 2004). And thirdly, the emphasis on innovation is partly due to the worldwide trend apprehending the financial benefits that innovation can bring (Steele & Murray, 2004).

Research and Development is an essential part of implementing innovative practice (Steele & Murray, 2004). Yet, currently the industry experiences unreliable profit margins and therefore research and development has fallen by 80% since 1981 (Construction Task Force, 1998). This issue must be addressed to enable innovative practice in process and technology (Strategic Forum for Construction, 2002). The drive towards innovative practice is being supported by "the emergence of groupings such as the Centre for Innovation in Construction Engineering (CICE) in the UK and the Australian Centre for Construction Innovation (ACCA) in Australia are evident responses to challenges for innovation in the construction industry" (Kumaraswamy & Dulaimi, 2001, p. 333). Further examples are the HK \$5 Billion innovation and technology fund set up by the Hong Kong Government, and the Movement for innovation (M4) in the UK, (formed due to "Rethinking Construction") (Kumaraswamy et al., 2004; Saxon, 2001).

But what does innovation mean? One definition is "the successful implementation of new ideas" (Blockley & Godfrey, 2000, p. 279). New ideas are "not limited to design ideas or new products. We also consider

innovation in project processes and communication" (Rogers, 2001, p. 32). This type of innovation amongst a project delivery team requires the organization having a structure that is able and willing to respond to change (Steele & Murray, 2004). Sharing a unity of purpose that supports innovation, within a collaborative multi-disciplinary team from design through to construction helps realise this goal (Kumaraswamy & Dulaimi, 2001; Steele & Murray, 2004). It is important to acknowledge that innovation and risk are mutually inclusive (Kumaraswamy et al., 2004). That is, it is usual to have higher risks when stepping into the unknown. How that risk is shared amongst the team is directly linked to the success of the project and whether the team is adversarial or collaborative. This requires active management, through collective understanding, information and appropriate processes (Blockley & Godfrey, 2000).

Nam and Tatum (1997) in a study of 10 innovative projects in the USA, emphasize the pivotal leadership role the client plays in guiding the team towards innovative practice, partly through their involvement and through integrating organizational learning skills within the architectural project delivery system (cited in Walker & Lloyd-Walker, 1999). "The link between organizational learning and a climate of innovation is close and complimentary" (Walker & Lloyd-Walker, 1999, p. 127). This requires the formal structure to integrate the technical and behavioural aspects in recognition of the importance people play in the process of achieving innovative architecture. Organizational learning adopts systems thinking and thereby a more holistic approach.

Lenard (1999) concludes that four key factors are required to successfully deliver innovative architecture. These being: "the client's recognition of the need for innovation; contractual incentives to encourage innovation; creation of symbiotic learning environment and open communication at all levels (cited in Kumaraswamy et al., 2004, p. 324).

1.3 Sustainable architecture

Since the late 1980's there has been an escalating awareness of the need for sustainable practice in terms of its procurement and final outcome in the AEC industry (Elliot, 1997; Pasquire, 1997). Cassidy (2003) states that "the green building movement has continued to progress and is the most vibrant and powerful force to impact the building design and construction field in more than a decade" (cited in Sharrard, Bilec, & Ries, 2005, p. 11). Extensive research has been undertaken by the AEC industry as a result of this (Pasquire, 1997).

This is validated by the emergence of the Building Research Establishment's Environmental Assessment Method (BREEAM) in the UK in 1990, and the US Green Building Council in 2000. The World Green Building Council (WGBC) was formed in 1999, which currently has nine member countries, with 31 countries including NZ, establishing national green building councils to enable approval into WGBC (Lockwood, 2006). Sustainable construction was also a 'core-cutting issue' and part of the vision under Accelerating Change (Strategic Forum for Construction, 2002). Further, the 2005 UK Government Sustainable Development highlighted the UK government's continuing commitment to be amongst the leaders in sustainable practice in its procurement of buildings, goods and services (OGC, 2006). In doing so, they recognise the need to broaden the performance measure to include social, environmental and cultural issues. Innovation is also identified as important (OGC, 2005). They undertake this commitment, whilst also supporting an efficiency agenda, as they view efficiency not in terms of lowest initial price, but in terms of quality and value, resulting in assessing whole-life costing. To enable this to occur, they recommend that these measures are considered and implemented early on in the procurement process (OGC, 2005).

Both Reed & Gordon, (2000) and Lockwood (2006) reiterate the importance of multi-disciplinary teamwork at this early stage, to achieve sustainable outcomes. This is supported by extensive research undertaken by the

US Department of Energy (DOE) and Finnish Government technology agency Tekes (Reed & Gordon, 2000). Integrating design and construction further leads to a greater ability to deliver client objectives, such as sustainable practice (Elliot, 1997). Both Lockwood (2006) and Pasquire (1997) conclude that if a breakdown occurred in one or all disciplines, or at any stage in the process, the result would be partial or loss of sustainable practice. Lockwood (2006) and Cole (2006b) therefore stipulate the importance of team selection and alignment towards these objectives. "Every link of the supply chain has a critical contribution to make toward sustainable construction and development" (Strategic Forum for Construction, 2002, p. 35).

Adopting systems thinking practice is essential in achieving sustainability (Blockley & Godfrey, 2000; Cole, 2006a; Spence, 2001), such as implementing whole systems and processes that are integrative and create synergy. Collaborative practice, facilitative leadership, partnership and cooperation and a common language amongst the team were therefore identified as key, to maximise the contribution of each member's expertise towards the success of the outcome. Organizational learning was identified as a way of meeting these practices (Walker & Lloyd-Walker, 1999).

In Elliot's (1997) conclusion, he suggests as a way forward "new construction management techniques which take a more holistic approach to management than has traditionally been the case" (Elliot, 1997, p. 182). Reed & Gordon (2000) support this by stating that "when the building industry has a workable model that demonstrates how to practically embrace these environmental issues, as well as the related costs and benefits; it will more readily accept an integrated systems design process as standard practice" (p. 326).

The purpose of this research is to identify a collaborative, holistic model whose structure facilitates the delivery of an agreed unity of purpose, such as value-driven, innovative and sustainable architecture.

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