Remote Site Design Management

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ABSTRACT

The aim of this research was to develop and validate a conceptual design management model for international, collaborative remote site projects. In the last decade or so there has been an increasing number of remotely located and often environmentally sensitive sites becoming the focus for development work involving potential investors/entrepreneurs/stakeholders or government and non-government agencies. There were no previously documented empirical examples, nor theoretical models, for remote site design management. Projects on remote sites are frequently government funded, making the approval processes, and timelines for example, subject to political influence, which means that the projects are potentially more difficult to manage, at all levels of involvement. The conceptual model was developed in association with the development of a typology for remote sites, and an investigation of three previously completed eco-resort and Antarctic science projects located on environmentally sensitive world heritage sites. The model responded to and reflected the perceived need for a well-integrated management approach to remote site projects. The research aimed to also demonstrate the potential portability of the model, in terms of offering a basis for a relevant management framework for built environment projects, international scientific drilling projects and international humanitarian aid projects. Grounded theory and case-study methodology were adopted when developing the typology, the conceptual model and when validating the design management model, as it involved empirical enquiry that afforded investigation of the remote site design management phenomenon within a real-life contexts. Two main case studies were undertaken to test the model, one being an historical Antarctic Science Drilling Project and the other, a current UN Humanitarian Project in Sudan. The findings to date support the conceptual design management model as being relevant for not only non-profit and/or Humanitarian Aid projects in the Post-disaster Reconstruction context, but also for commercially based Antarctic Science projects. Subsequently, the model has also been applied to a Post-disaster Reconstruction project in Aceh managed by the Jesuit Refugee Services (JRS).

Keywords: case studies, design, management, framework, reconstruction, environment, remote sites, Humanitarian Aid, Antarctic.

Publications that have resulted from this Doctoral Research

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Refer Appendix A for full papers.

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FOREWORD

The journey associated with the research and writing of this doctoral thesis, has been challenging, rewarding, and at times all–consuming. There have also been several chances to reflect on the research and why one embarked on a PhD in the first place. Interesting to also note how far my thinking and knowledge has progressed from those first days of enthusiastic, and at times naïve, endeavour to the realisations, shifts and expansions or refinements of those initial objectives and their subsequent and at times surprising outcomes. This is particularly evident when the end is finally drawing near, and one has that real sense of ownership of the research objectives and findings and yet be able to clearly identify what future associated research possibilities there are once the doctoral research is completed.

The idea for researching into remote site projects from a management perspective, where there were collaborative international stakeholders involved, was essentially seeded initially from Antarctic, New Zealand and Australian world heritage project experiences and research, and a background in design and construction project management. The doctoral research process began with a reflective stage, reviewing published secondary data by others, and selected primary data from my masters degree a few years earlier (Kestle, 1995), that later informed the attributes and dimensional aspects of the development of a 'remote site typology'. The journey then continued in earnest with a thorough and focussed literature review being conducted, (as written up in Chapters 2, 6 and 7 in particular) followed by the design of the research, including the proposed methodology, the development of a typology, a conceptual theoretical model, then the data collection, analysis and conclusions. Over time as the work progressed, the possibilities and realities of managing remote site (often world heritage) projects, with multiple stakeholders with various political agendas, differing management approaches and differing expectations regarding project outcomes emerged. Irrespective of how objective the researcher's perspective aimed to be, acknowledgement is hereby made that personal experiences and the interpretations of the collected interview data have influenced the discussion of the results in part. However the intent, the content and the contributions to the research, of the interview transcripts have not been manipulated nor have they been diminished in their intent or value.

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ACRONYMS AND ABBREVIATIONS

AEC	Architecture, Engineering and Construction
AHC	Australian Heritage Council
ALNAP	Active Learning Network or Account Ability and Performance
ATCM	Antarctic Treaty Consultative Meeting
ATS	Antarctic Treaty System
CARE	Cooperative for Assistance and Relief Everywhere
CEE	Comprehensive Environmental Evaluation
CEP	Committee for Environmental Protection
CERF	Central Emergency Revolving Fund
CIROS	Cenzoic Investigations in the Western Ross Sea Region
COMNAP	Council of Managers of National Antarctic Programs
CRP	Cape Roberts Project
DASET	Department of Arts, Sport, the Environment, Tourism and Territories
DOC	Department of Conservation (NZ)
DFID	Department for International Development
EARP	Environmental Assessment and Review Panel
EIA	Environmental Impact Assessment
EPSRC	Engineering and Physical Sciences Research Council
GB	Great Britain
GNS	Geological Nuclear Sciences
HA	Humanitarian Aid
HEC	Human Ethics Committee (University of Canterbury)
HRR	Humanitarian Response Review
IASC	Inter-Agency Standing Committee
ICOMOS	International Council of Monuments and Sites
ICRC	International Committee of the Red Cross
IDPs	Internally Displaced Persons
IEE	Initial Environmental Evaluation
IRW	Islamic Relief Worldwide
ISC	International Steering Committee
JEM	Justice and Equality Movement
JRS	Jesuit Refugee Services

LINZ	Land Information New Zealand
MFE	Ministry for the Environment
MSF-H	Medicins Sans Frontieres - Holland
NDS	National Strategies for Sustainable Development
NGOs	Non-Governmental Organisations
NSF	National Science Foundation (United States)
NZAP	New Zealand Antarctic Programme
OCHA	Office for the Coordination of Humanitarian Affairs
OHCHR	Office of the High Commission for Human Rights
OMG	Operational Management Group
PMI	Project Management Institute
QNPWS	Queensland Parks and Wildlife Service
Red-R	Registered Engineers Disaster Relief
RMA	Resource Management Act
SLA	Sudan Liberation Army
SMART	Simple Multi-Attribute Rating Technique
SSSI	Sites of Special Scientific Interest
TNP	Tongariro National Park (NZ)
TRP	Tsunami Relief Program (in Aceh, Indonesia)
UK	United Kingdom
UN	United Nations
UNCSD	United Nations Commission on Sustainable Development
UNDSD	United Nations Division of Sustainable Development
UNESCO	United Nations Educational Scientific and Cultural Organisation
UNHCR	United Nations High Commission for Refugees
UNHQ	United Nations Headquarters (Khartoum and Geneva)
UNICEF	United Nations Childrens Fund
UNJLC	United Nations Joint Logistics Centre
UNSHA	United Nations Sudanese Humanitarian Aid
USAP	United States Antarctic Programs

CHAPTER 1. INTRODUCTION

1.1 Rationale for the Research and Contribution to Knowledge

Projects in remote locations such as the construction of dams, canals, oil rigs, and the rebuilding work associated with disaster relief have been undertaken for a number of years now, with disaster relief and reconstruction projects markedly increasing in the last five years or so, in Africa, Malaysia, Pakistan and China. These projects would appear to have several aspects in common such as multi-stakeholders, who sometimes form a management, operational and collaborative consortium(a) for the duration of the project; the work is often conducted under extreme weather/climatic conditions, and the processes associated with the environmental context and potential impacts, appear to involve significant and protracted protocols. Political agendas also appear to be evident on many if not all of these projects. Management of these remote site projects has been conducted by the scientific, oil exploration, engineering and humanitarian aid personnel and their related organisations, yet the management approaches have not been documented or published in the international research community from a theoretical perspective.

An increasing number of remotely located and often environmentally sensitive sites are becoming the focus for new or post-disaster development work involving potential investors/entrepreneurs/stakeholders or government and non-government agencies. Projects on remote sites are frequently government funded, making the approval processes, and timelines for example, subject to political influence(s).This means that the projects are potentially more difficult to manage, at all levels of involvement. Projects located on remote sites often have extremely limited operational windows, due to extremes in local climatic conditions. As a result, remote site management has started to become more widespread, in recent years, as project participants are able to utilise advanced information technology and systems (Kestle & London, 2003).The clients, stakeholders, designers and construction industry representatives involved on these frequently sensitive remote sites have an increasing duty of care in a global sense, to these pristine environments and their associated ecosystems. The environmental movement in recent years has focused worldwide attention on the need for sustainable development of these remote sites, as against the pragmatics of the ‘*getting the job done, on time and to budget’* historical approach taken by construction

companies building in these areas distant from their home bases (Kestle & London, 2003). The specifics associated with researching into design management and remote sites rendered no previously documented empirical examples, nor any theoretical models from published literature, and the research community had not considered nor created theories related to this specific topic, from an integrated design and management perspective. Theory-building and model-testing was therefore seen to be required in this field/discipline area of managing projects on remote, environmentally sensitive, and often hostile sites. The main objective of the doctoral research then became the development and validation of a conceptual theoretical model in the field of design management as specifically applied to internationally collaborative remote site projects.

1.2 Focus and Position of the Research Project

The thesis intends to inform the design management debate by contributing a conceptual design management framework/model for remote site projects, and an associated typology for remote sites. In addition, an analysis of multi-stakeholders viewpoints is presented on the usefulness of the management framework/model as a tool when managing and coordinating the pre-planning and operational stages of international scientific, humanitarian aid, and disaster reconstruction projects.
The thesis draws on grounded theory, which is a systematic qualitative research methodology in the social sciences that emphasises the generation of theory from data in the process of conducting the research (Glaser & Strauss, 1967), and also draws on case-study methodology.
In order that the research topic, methodology, literature review and analysed data maybe more readily understood, early clarification of definitions and terminology was considered to be of paramount importance. The key terms associated with this research topic are therefore identified and clarified in the following subsections 1.2.1, 1.2.2, and 1.2.3.

1.2.1 Remote Sites

These are typically located within environmentally sensitive regions primarily due to the region being previously undeveloped or under-developed. Sites can be categorised and considered to be ‘remote’ in relation to their,

- environmental sensitivity

- the distance to the site from continuously available logistical support
- the hostility of the environment in terms of the climate
- the difficulty of physical access to the sites
- the lack of available local materials and labour resources
- be located in areas of hostile physical conditions.

Further, remoteness when based on a continuum related to the physical distance of participants from the site, falls potentially into three different categories:

1. Where the project participants such as the design, construction and facility management personnel are not at, or adjacent to, the project site, instead being located in another city or town.
2. Where selected groups of the project participants are not initially located at or adjacent to the project site. For example, the design team and project/construction management teams have their offices in other countries or regions, and may move to the project site's region, or install their agents within the region where the project site is located.
3. Where the majority of the project participants are located adjacent to or actually at the project site, with the remainder (such as componentry suppliers or the conceptual design teams) being located remote from the project site.

The majority of construction projects would typically fall within the third category.The most extreme situation in terms of a remoteness category, is category 1 which would likely involve a range of differing project types within three predominant property markets, being:

1. Commercial projects, and tourism including ecotourism.
2. Government/NGO projects, scientific investigations, and space exploration.
3. Civil infrastructure, such as oil /gas rigs, pipelines or dams.

Remote sites pose unique challenges for the participants involved throughout the design, production and operational stages of a project. Most construction projects have a degree of remoteness and this having been acknowledged, means that projects can be viewed through a proxemics lens and the difficulties associated with remoteness, can be specifically explored. Increased global awareness of environmental issues and the emergent sustainability movement has created a focus for research and critical thinking in this area. However, there is still a lack of fundamental research in the area of the development and management of remote, environmentally sensitive and frequently hostile sites (Kestle & London, 2002).

1.2.2 Lean Design Management

Lean design management in the construction industry has developed from the lean thinking and management approaches associated with the manufacturing industries, where there is a focus on efficient and effective production processes, minimising waste, and essentially producing exactly what the client wants. There are five key lean design management principles being Value, Value Stream, Pull, Flow and Perfection (Womack and Jones, 1996). '*Value*' in this context refers to specifying value in terms of the product rather than by design. '*Value Stream'* refers to when and how the 'value decisions' are made. '*Flow*' refers to ensuring that the resources are immediately available for when the product is to be produced. *'Pull'* refers to customer demand, and *'Perfection'* refers to the customised product being the focus of every aspect of lean design management.

1.2.3 Design Management

Design Management is regarded as an emerging field (Ballard & Koskela, 2002). The specifics associated with researching into remote sites rendered no previously documented theoretical models of remote site management. The discipline of design management is not focussed on design per se. Instead, design management within the disciplines of the built environment, is a complex process that is fundamentally concerned with the integration of specialist knowledge, value generation, and the critical timing of key design and management decisions. The design and construction processes have become more complicated and more fragmented over the last few years, and this has a series of differing, yet related, impacts on a number of factors. One of the significant factors is the difficulty surrounding the development of a shared understanding of the objectives of a project amongst the various stakeholders (Tombesi, 1997). Having a shared understanding that facilitates working toward the identification of what is valued in the project, impacts on how and when critical decisions are made on design and coordination issues. Poor integration of specialist user and producer stakeholder knowledge can result in an inappropriate synthesis of the needs analysis, leading to a lack of or a low level of value generation for the clients and stakeholders.

Design management is considered, in some sectors, to be a complex social situation, and value to be a socially constructed phenomenon, which means that decision-making can be inherently unpredictable (London, 2002).

Design managers have emerged as new and valued specialists on projects, who integrate and coordinate the design process, and in particular have the responsibility for the interface with other organisations involved on the project(s). Design managers are not normally the designers, though many are from design or management related backgrounds. Instead they are process coordinators, who ensure that the process deadlines, reviews and consequentials are met. They ensure that there are sufficient integrative and coordinating mechanisms for the work to progress in a timely manner, keeping the focus on the tasks and objectives to achieve the value criteria set down and agreed at the initial stages of the project.

The design and development process frequently involves a range of informed to ill-informed decision-makers. This process and the resultant outcomes are driven by the initial and therefore critical decisions made at that time (London & Ostwald, 1996). Add the dimension of remote site projects and the complexity, and the critical nature of the initial decision-making stages increases and diversifies even further. Traditional project design and development issues expand to include those directly related to the location of the site, for example the lack of familiarity on the part of the personnel, with the social, physical, cultural and economic criteria.

1.3 Thesis Objectives

The objective has been set in terms of the overall research question, which is:

"What are the key factors and drivers that constitute a plausible theoretical conceptual design management model for remote site projects?"

The objective of this research is to develop and validate a conceptual design management model for remote site international collaborative projects, as there are no previously documented empirical examples, nor theoretical models that completely address remote site design management. The objective will be achieved by developing a typology specifically for remote sites using dimensions and attributes applied from previously published research, and the development of a conceptual design management model. The model will initially be developed by reviewing selected data from previously conducted research, and will then be tested in terms of two major case studies, which comprise a retrospective review (2003/4/5) of an historical case study of an Antarctic Drilling Project at Cape Roberts, and the other is a current UN Humanitarian Aid Project in West Darfur, Sudan (2004 onwards).

This research aims to not only develop and validate the theoretical design management model for remote sites, but may also demonstrate the potential portability of the model in terms of offering a basis for a relevant management framework for built environment projects, international scientific drilling projects and international humanitarian aid projects.

1.4 Structure of the Thesis

Chapters 1 to 3 comprise the Introduction, Literature Review and Analysis, Methodology and Research Rationale. The aim of these chapters is to set the context and rationale for the research, and describe the methodology being adopted. Each of the chapters includes links as relevant, to other chapters or sections of chapters.
Chapter 4 documents the development of the Typology for Remote Sites
Chapter 5 documents the development of the Conceptual Design Management Model for Remote Site Projects.
Chapter 6 documents the Retrospective Historical Case Study research conducted on the Cape Roberts Drilling Project Antarctica in 2003-5.
Chapter 7 documents the Case Study research work conducted on the UN Sudanese Humanitarian Aid Project -West Darfur in 2004/5.
Chapter 8 is an overall discussion and comparative analysis of the findings, and how they may have impacted on the original conceptual design management model. The chapter also discusses the usefulness of the model on a range of very different remote site collaborative international projects.
Chapter 9 documents the conclusions of the thesis.
Chapter 10 discusses ideas for further research.

CHAPTER 2. LITERATURE

2.1 Introduction

The research was focussed on the design management discipline, and explored how it could potentially be interpreted, linked and implemented on remote site projects in environmentally sensitive areas internationally. To address the main objective of the research as outlined in Chapter 1, a review of published literature associated with the discipline of design management was undertaken to provide a framework for these remote sites. The review and analysis also explored perceived remote site design management links with the published literature on lean design management, humanitarian aid management, sustainable development, value management and environmental sustainability, in order to develop knowledge in these fields and establish gaps in the knowledge.

2.2 Review of Lean Design Management

The concepts and implementation of lean design principles and lean production were first introduced in association with the car manufacturing industry, and have been subsequently interpreted and applied within the construction industry worldwide for the last two decades (Howell, 1999). There are five key lean design management principles being Value, Value Stream, Pull, Flow and Perfection (Womack and Jones, 1996). These five principles were considered further by Garnett *et al*. (1998), who postulated that several different *value* strategies need to occur within single projects as the client may have one definition of value, whereas the end user or the stakeholders may have others. This is not dissimilar to previous design and value management literature.

Howell and Ballard (1998) discussed the goals of lean thinking, and the early misconceptions and resistance amongst construction industry personnel regarding lean thinking being a useful management tool, regarding lean thinking as being simply a manufacturing technique. However, Howell and Ballard (1998), "*believed that the goals of lean thinking* does in fact *describe the management of dynamic projects,"* and went on to state that, "*Lean is a value seeking process that maximises value and continually redefines perfection"*, and that "*the goals of lean thinking redefine performance against three dimensions of perfection,*

- *a uniquely custom product,*
- *delivered instantly, and*
- *nothing in stores".*

This in their view essentially maximises value and minimises waste. This third dimension of perfection certainly has relevance for the Antarctic sites in particular, as discussed later. They further suggested that "*Lean thinking forces attention on how value is generated rather than how any one activity is manage*d" (Howell & Ballard, 1998), and that *"lean production presents a very different model –where production is managed so that actions are aligned to produce unique value for the customer."* This they said was basically achieved by ensuring that value to the customers, throughput, management, information and materials required to completion, were the primary objectives. Conversely, Howell and Ballard, (1998) postulated that project management was essentially a combination of activities, stating that *"lean thinking views the entire project in production system terms, that is one large operation…..and implementing lean means adopting a 'project-as-production-system' approach …defining the objective in customer terms and decentralizing management."*

The lean thinking and lean production tenets were identified by Womack and Jones (1996), as including 'specifying value by product' thereby essentially placing the specification of value ahead of design; 'identifying the value stream', which influences when and how decisions are made; 'making product flow' at the 'pull (demand) of the customer', 'whilst pursuing perfection' and 'customised product'. Mapping of the value stream is probably better understood as a collection of 'process flow charts' that identify which actions determine when the next operation can start, according to Howell and Ballard (1998). This could be regarded as having similarities to critical path analysis for task management planning. The current practice is one of encouraging rapid completions in order to try and keep costs and completion times to a minimum, but in reality this basically results in cautious 'fail safe' approaches being taken by project participants, to protect themselves, against uncertainties on the project". *Under lean thinking, improvements are made by reducing uncertainty in work flow, hence eliminating the need for intermediate backlogs,* and then *redesigning the planning system at the* operations *level"* (Howell & Ballard, 1998). As a result of lean thinking being about a 'product-as-production system' approach, rather than those that are currently contract or activity focused, it basically takes on

board the uncertainty and complexity of the project. By doing this, lean (thinking) aims to translate local level improvements into better results for the whole project, by reviewing every stage as a part of the whole, and identifying their impacts on the outcomes. According to Howell and Ballard (1998), there is a need to be more focussed and aware of production management, rather than productivity improvement. As reporting on productivity, particularly at the activity level, they suggest is "*missing the point of system performance"*.

2.2.1 Reviewing Current Practice

Much of the research on lean thinking and lean design falls into the tactical category rather than being strategic and theoretical, a view supported by Garnett *et al.* (1998). There were a few papers (Brochner, 1995; Melles, 1997 and Fisher, 1997) that were concerned with lean concepts that made reference to culture, people and translation perspectives. Koskela (1997) and Seymour (1999), suggested proposals for implementing lean construction at the organisational level rather than just at the operational level. In essence, "*to achieve a lean enterprise"*, Seymour suggested, the principles of value, value stream, flow, pull and perfection need to be considered at a strategic rather than just at the tactical level(s). This work was followed up two years later by Seymour and Rooke (2001) using an ethnomethodological approach in terms of their sitework activities, this time in a visibly orderly manner, by changing their mindset essentially.

Howell and Ballard (1998) agreed with London's research (1997), where it was suggested that changes of the mental model needed to be made. They further suggested that lean thinking, applied at the beginning or alternatively applied midway in well run projects, revealed the weaknesses of the current systems by mapping the project value stream. The manner in which the design process stage is handled has a significant, and often deleterious effect on all of the subsequent stages of construction project production, according to Huovila (1999), Ballard (1998), and Formoso (1998). These researchers put forward a range of propositions to minimise the problems for the production personnel, including integrating the design and construction processes, and changing mental attitudes. The separation of design and construction had long been identified as one of the key problems of construction, and that whilst design and build goes some way toward organisational integration, Huovila (1999), Ballard and

Koskela (1998), and Formoso (1998), still believe that there is significant room for improvement in terms of the design process.

2.2.2 Management

In lean design management literature *value* has been the sole focus of research investigations and found to be an important part of design management. However, other models have been explored by Formoso *et al*. (1998) that include *conversion* and *flow* in their investigations. Further to this work by Formoso *et al*.(1998), Ballard and Koskela (1998), Freire and Alarcon (2000), concluded that three distinct models - conversion, flow and value generation - comprise the process of lean design, but added that the principles of lean design are generally unknown to the general public. An analysis of the application of some of the lean construction principles to design management from the point of view of design as conversion, flow and value generation was made in a paper by Tzortzopoulos and Formoso (1999). The findings from the two Brazilian case studies in their paper identified some gaps in the knowledge of the application of theory in design and in particular the value generation view of design concepts and principles.

The lean design management literature primarily focuses on the production approach and processes, but a few of the researchers, for example (Garnett, 1999, Huovila & Koskela, 1998) adopted a more sociological approach to lean design. The lean design principle of 'flow' is relevant from a sociological and environmental viewpoint, as it tends to be focussed on a more holistic approach for theoretical and project development work. In addition, remote sites, which are frequently environmentally sensitive, may need a more holistic approach.

An ethnographic case study was made of the partial implementation of the value stream approach on a construction project by Garnett (1999), and the model created was tested to develop a target baseline for improvement throughout the entire process. The results to date suggest that the UK construction industry is challenged by the cultural change, whilst several US companies have witnessed significant gains by employing lean thinking. Garnett (1999) believed that her research will contribute to new theory on lean thinking by taking a social constructivist methodological approach to the process work, *"through ethnographic case-based research"*.

The question of how to use lean production philosophy to promote the necessary changes in the design process is significant. The essential lean construction principles

of integration and minimising design procedure conceptual changes, would increase buildability and lower the production costs of a project (Melhado, 1998).

2.2.3 Implications and Implementation of Lean thinking and Lean Production

The implications of lean thinking and production show that it is worth reflecting on how lean thinking coordinates action (Howell and Ballard, 1998). Specifying value by product to the customer shapes all actions around customer requirements and managing the work flow at the design phase of the projects. Focussing on the design phase is one of the challenges for the new discipline of lean construction. Historically in construction, specifying value has often come after design (Ballard, 2000)

Lean thinking is based upon principles of *flow* and *value* within the context of a *production oriented world*, whereas the more holistic approach to lean design management as explored by a few researchers over the last few years identifies additional significant design management factors. These researchers refer to the importance of, and the means to achieve sustainable development. They believe that whilst traditional design and construction focuses on cost, performance and quality objectives, sustainable design and construction by comparison, focuses on value generation, minimization of resource depletion, minimization of environmental degradation and the importance of information flow management.

Information management can be considered from a sociological viewpoint, however it has a significant effect on production factors/processes, if planned or implemented ineffectively. The decisions made, and the successful implementation of those decisions by all personnel, depend on regular and clear communications, whether verbal, digital or in the form of hardcopy documentation.

In summary, much of the lean design management research has been primarily concerned with sequential production and that a few authors are now in fact exploring a more sociological design management approach.

In terms of project implementation, this stage relies on commencing once the design or product development stage is complete. Garnett *et al.* (1998), suggested that *"using pre-planning, longstanding teams, would develop generic processes for designing developing and constructing the product on the basis of value stream maps",* leads to better overall integrity of the product/project, as it is operating as a series of teams

interfacing with key physical systems. The management of these interfaces is the responsibility of the ‘project integrator’ otherwise known as the design manager.

2.3 Design Management Discipline and Processes

Design management from within the disciplines of the built environment is a complex process concerned primarily with value generation, integration of specialist knowledge, and the timing of key decisions. In Chapter 1, design management was described as being fundamentally concerned with value generation, and that understanding what constitutes value is a difficult process. The design process has become more complex and more fragmented in recent years resulting in more actors who have design knowledge requiring integration (Tombesi, 1997). This impacts upon a number of factors, not the least being the difficulty of the development of a shared understanding of the objectives for a project among stakeholders. Identifying what is valued in the project impacts upon how critical decisions are made on design issues. This is an important point in the development of the design management field, as it is the integration of those who have knowledge that can contribute to the design, construction and management, which is critical to developing and achieving value on projects. It is suspected though, that the process is not simple and straightforward. Instead, design management is a complex social situation, as value can be a socially constructed phenomenon and decision-making to that end can be inherently unpredictable. Design decision making is often negotiated amongst groups and teams – it is an iterative process. The stakeholders of value can also change through the various stages of the design, construction and occupancy stages, and each group of actors may differ in perspective based upon their worldview. The power to negotiate and guide design decisions and assist with establishing building performance criteria changes at different times of the process. In many cases their voice is not heard at critical times (London, 1997, London, 2002).

Poor integration of specialist user and producer stakeholder knowledge can have far reaching consequences, such as inappropriate synthesis of the needs analysis leading to low value generation for the client and users. In many cases identifying value is a socially constructed process between the stakeholders, who incidentally are not just design and construction teams–but are those actors who can contribute to improved design and construction building performance (London, 2002).

In recent years the need for the role of design manager has become more apparent, as being a specialist who integrates and coordinates the design process. Gray and Hughes (2001) discuss design management and identify two levels of responsibility for the design and its production, one being the associated authority for decision-making, and the other being the responsibility for the interface with other organizations. They maintain that the task of the design manager is to ensure that the organisation of the design process is structured appropriately, to ensure that there are sufficient integrative and coordinating mechanisms for the work to progress meaningfully. They claim that a framework has to be established which keeps the focus on the tasks and objectives to achieve the value criteria set down in the initial stages. An alternate position was taken by Green (1994) when researching in the value management field. He adopted the approach of placing value generation at the centre of the design process rather than employing outside consultants to carry out a series of value engineering critiques throughout the various development stages. This is not unlike the study conducted by London (2002), whereby a design management model for the development of performance based briefing was tested and the group interaction between stakeholders was analysed. The premise was that there was no need for an external chief decision maker, however there was a need for a design manager to integrate and manage knowledge that is within the stakeholder groups. The nature of complex group dynamics affects design and building performance criteria.

When there is a strict timeline for the completion of a project, for example, a restricted window of constructability and accessibility to the remote site due to climate or other reasons, the timing of the decision to proceed toward the concept design stage and financially commit to the project is absolutely critical to the subsequent design and construction stages and completion of the project on time. The resultant of delays in making key decisions can mean that the entire project becomes unviable on remote sites, particularly where accessibility is limited by seasonal weather conditions.

2.4 Current Issues around Design Management Practice

Ballard and Koskela (1998), suggested that there was very little literature on design management theory, and claimed that the way forward for design management was to have *"a management philosophy and tools that fully integrate conversion, flow and*

value perspectives", and that "*the management of engineering and design on architectural engineering construction, (AEC) projects is problematic".* The most significant problems were seen as being poor briefing and communication, and a lack of technical knowledge and/or confidence in the preplanning stages of the design work (Coles, 1990). On the same topic, Sverlinger (1996) had found that the most "*frequent deviations"* as he called them were "*deficient planning and/or resource allocation, deficient or missing input information and changes"*, and Josephson (1996) conducted a construction defects study and found that from a cost perspective, in particular, "*design-caused defects"* were the largest category and specifically those resulting from a lack of coordination between disciplines. All of which supports the view that in depth and carefully coordinated pre-planning across the various disciplines involved on the project is essential to minimize design-caused defects. This also suggests a collective argument amongst design management researchers that there are currently shortcomings in the practice of design management.

One view on the reason for this was made by Ballard and Koskela (1998 & 2002) which was that *"that there is a lack of solid conceptual foundation".* As a means of addressing this, Ballard and Koskela (1998 & 2002) conducted a review of state-of-the-art practice and research concepts and models. They also proposed a new conceptual framework of design management. Finally, they analysed the implications of this framework and called for systematic research collaboration in order to improve design management.

The first review conducted and evaluated by Ballard and Koskela (1998 & 2002) involved the investigation of 'Design Management as Project Management', where they found that *"the conventional view on design management had essentially been the same as in project management*".

Empirically conducted research by organizations such as the Project Management Institute in 1996, in particular, and as promoted in best practice guidebooks by Gray *et al.* (1994) had suggested a lack of application of project management methods. However, Ballard and Koskela (1998 & 2002), in research findings that built on research done by Koskela in 1993, suggested that,

"project management concepts and techniques have proven incapable of solving the difficult problems of design management. The main reason being that project management concepts are rooted in the conversion model" which assumes that *"the work to be done can be divided into parts and managed as if those parts were*

independent one from another", and uses *"management techniques such as 'work breakdown structures' and 'earned value analysis'." "This is fundamentally a contracting mentality, which facilitates the management of contracts, rather than the management of (design) production".*

The second review conducted and evaluated by Ballard and Koskela (1998) investigated the concept and practice of 'Concurrent Engineering' which is concerned with the product development process within the area of product design and manufacturing (Ulrich & Eppinger, 1995). The fact that concurrent engineering aims to address the needs of multiple stakeholders in an integrated, almost simultaneous manner, whilst also considering multiple design criteria, was of particular value and interest when reviewing the literature, and trying to establish the need for a conceptual design management model for remote sites. The projects on remote sites usually involve multiple stakeholders, and multiple design criteria, so the question is whether there should be an integrated management approach, as design is usually an iterative and sequential rather than concurrent process. According to Ballard and Koskela's work in 1998, *"concurrent engineering concepts have just begun to enter the AEC (Architecture, Engineering and Construction) community*, for example, the *application of information technology. Another related trend is the use of cross-functional teams in construction projects such as 'partnering' , however, partnering alone has proved insufficient for the management of* production (Howell *et al.* 1996), and at the time of their research in 1998, *"no generally accepted model of concurrent engineering in AEC projects"* had been created or adopted in effect.

The third review conducted and evaluated by Ballard and Koskela in 1998, involved 'Design Process Models', and included a design phase process model by Roozenburg and Eekels (1995), that identified programming as a pre-design function, and a design constructability model by O'Connor (1993), that was developed in the process industry sector. Neither of these so-called AEC models was found to specifically address or present the process of generating and applying design criteria for the production of AEC facilities, whose cycle tends to be more about problem solving than the generation of aesthetics design associated directly with the design and production of buildings. In addition, Ballard and Koskela (1998) also concluded that *"constructability is really only one of many relevant process criteria".*

The fourth review into the current practice and problems associated with design management, by Ballard and Koskela (1998 & 2002) involved looking at 'Design as

Value Management'. They found that *"there is a tendency to disregard or underplay the extent to which value to the customer is created rather than simply revealed by questioning"*, and they suggested that value is most likely generated as a result of a learning process, that involves a detailed dialogue between the client and the service provider. Value engineering, is directly linked to and often simply referred to as value management, usually involves a peer review process conducted at the various project development stages by external consultants, to establish where the value is being generated, or potentially lost for the client.

Of particular interest for the remote site design management research literature review, was the comment by Ballard and Koskela (1998 & 2002), that *"conceptualizing value as a generation process and developing effective process tools is much needed by the AEC industry"*. Green (1994) offered a slightly differing angle on the creation and review of value for the client by suggesting that *"value generation be placed at the centre of the design process"* which ensures a continuous proactive approach at all stages of the project development and beyond.

The fifth and last review and evaluation, by Ballard and Koskela (1998) investigated problems associated with current design management practice involved 'Information Technology' and they found that support for design and management, had been significantly realized in practice and research, by the creation of Information Models for product and process, and yet a paucity of improved design process. Ballard and Koskela (1998) also noted that Fenves (1996) had called for *"a science base of application of information technologies,…..where one component of this base would deal with the understanding of the processes of planning, design and management,…"* and went on to say that *" we need to agree on an intellectual framework, in order to create a scientific understanding or abstraction of engineering practices in practice."*

Ballard and Koskela (1998 & 2002) concluded that whilst these five 'state of the art' (of design management) reviews had revealed several interesting and apparently effective new features, that *" the approaches were fragmented* and that *they lacked a solid conceptual foundation"*. They went on to suggest that the way forward was to simultaneously view design management, as applied to engineering in particular, as conversion, flow and value generation, rather than the more traditional view of engineering as a conversion. The 'conversion view' is basically about 'getting the task done' using practices such as 'work breakdown structure' and the 'critical path method', where 'flow and generation' and even the client are not considered in the

programming, or outcomes. Further, Ballard and Koskela (1998) noted that *"in the conversion view, production management is the 'local' responsibility of those whom the various parts are assigned or contracted*, and the project is essentially considered to be successful if everyone meets their contractual obligations. Again of specific interest for remote site design management was the comment by Ballard and Koskela (1998 & 2002) that *"what is needed is a management philosophy and tools that integrate the conversion, flow, and value views."* In addition, they called for a collaborative and integrated exploration of the design management domain, in order to improve the conceptual framework, including the testing of potential tools, the validation of hypotheses and theories.

Building on Ballard and Koskela's (1998) previous work, Koskela *et al. (*2001) then published design management research involving the empirical findings from their selected cases studies. The findings suggested that there were still deficiencies in design management, in terms of process transformation (previously referred to as conversion), from inputs to outputs, the flow of information and the process of generating value for customers/clients. They further argued that what was required to create effective design management methods were relevant conceptualisations informed by empirical data. Koskela *et al*. (2001) compared the findings with those of Lindkvist (1996), where construction professionals were identified the five most significant design and management issues in the early phases of projects were all related to client decision–making. The issues ranged from the decision-makers initiating the project too late on short duration projects, to not articulating their actual needs either at all, or being unclear, to leaving insufficient time for accurate and methodical planning to occur, to a lack of coordination, and follow-up between documented information. These findings also concur with those of Sverlinger (1996), previously referred in this chapter, particularly in reference to what he termed "*frequent deviations"*, that were made up of *"deficient planning and/or resource allocation, deficient or missing input information and changes."*

The resultant being a lack of management and production performance on AEC projects, in particular.

2.5 Project Management

Project management theories and practice have been researched and documented for at least two decades and according to Winter *et al.,* (2006) there is now evidence that

an increasing number of organisations, across differing sectors and industries are adopting project management standards and practices.

"No longer just a sub-discipline of engineering, the management of projects is now the dominant model in many organisations for strategy implementation, business transformation and continuous improvement" (Winter *et al*., 2006).

However, one of the most significant and ongoing concerns raised by Winter *et al.* (2006), was that "the current conceptual base of project management continued to attract criticism for its lack of relevance to practice". The Project Management Institute's (PMI) 'Guide to the Project Management Body of Knowledge' was criticised by Morris (2003), as *"containing nothing detailed on project strategy, nothing on project definition, and little on value management"* and essentially suggested that project management was viewed by many organisations as essentially an 'execution' discipline that was required to simply 'deliver a project on time to budget and to scope'. He further suggested that *"project management, like all management, is contextual, and it is managing projects in their changing modern contexts that is the real challenge"*. Another criticism raised by Geraldi *et al*. (2008), when discussing the need for innovative approaches in project management, was *"the* (current) *lack of consideration of social skills in projects and just as importantly, its lack of contextualisation"*.

Research conducted by a new research network called ' *Rethinking project management – developing a new research agenda'* was funded by UK's Engineering and Physical Sciences Research Council (EPSRC) and undertaken from 2004-2006 by Winter *et al.* (2006). The main objective of the funded research was to create an inter-disciplinary network of practitioners, researchers and academics to improve real world project management practice and establish a relevant future research agenda, from the analysis of the collected data. Findings established that the new research network needed to go beyond the previous intellectual and academic project management approaches, and be more closely aligned to the challenges encountered in project management practice in-the-field. Further, a framework comprising five future research directions was produced by Winter *et al.* (2006, p642). This framework called for "new models and theories which recognise and illuminate the complexity of projects and their management at all levels", "concepts that focus on the interaction amongst people and the framing of projects within an array of social agendas, practices, stakeholder relations, politics and power," and "concepts and

frameworks which focus on *value creation* as the prime focus of projects". A further relevant observation for this remote site management research was the comment made in the *research network* findings that *"theories about practice can also be used as theories for practice"*. The *network* project also established from the data analysis that future research needed to specifically focus on creating theories and concepts which were closely aligned with 'in the field' realities, and which provided project practitioners with realistic and contemporary management frameworks.
The data collected from the practitioners by the *research network* referred to the complexity of projects, created in the main by 'the multiplicity of stakeholders and their differing agendas', and 'theories, practices and communications operating within the different interest groups'. They suggested that concepts and frameworks which would help them deal with the project complexity issues 'in the midst of practice' would be useful, and which recognised an interdisciplinary approach, social process, project conceptualisation, value creation and value management (Winter *et al*., 2006).

2.6 Value Management

There are three different yet related approaches and thinking associated with value management, that of 'value engineering', 'value management' and 'SMART value management'.
Green (1994), in his published work on SMART (simple multi-attribute rating technique) value management for building projects, discussed the ways in which value management and value engineering differ in terms of their approach to project management thinking in particular. He suggested that *"value engineering is perhaps the epitome of what has become known as 'hard systems thinking'* where the aim is to find efficient ways to achieve an objective that is firstly clearly defined, is assumed to be well structured, and stays constant over time. Interestingly too, the process of value engineering tends to be retrospective, and takes place toward the end of the design process. The 'hard systems thinking' approach is generally considered to be totally unrealistic in terms of real- world projects and their associated challenges, which are dynamic and forever evolving by nature. However, 'hard systems thinking' according to Green (1994) is a legitimate approach for 'static problems', where outside influences or variables do not/cannot affect a situation where conditions can be controlled for example. But according to Green (1994), *"it has consistently failed when applied to real-world problems, which are messy, dynamic and ill-defined"*.

As already discussed under the principles of design management, one of the very first aims is to try and establish shared and agreed objectives across a range of stakeholders. What was being argued by Green (1994) was exactly that point, and that was that the hard thinking systems do not work for building and design related projects. He went on to argue that *" the continued failure of hard systems thinking as applied to social problems, has led to the evolution of and alternative paradigm,…*described as *'soft systems thinking'*. This approach involves embracing the full range of views held or objectives sought, by the various stakeholders and then in certain circumstances, recording and at times modelling the stakeholders' perceptions, in order to learn how to work with the rest of a team to achieve a mutually agreeable set of objectives, referred to by Green (1994) as a *"shared social reality"* which came out of research work on 'requisite decision models' by Phillips (1984). This then is the basis of the value management approach versus that of value engineering, as it involves a team or teams of decision-makers and/or designers running workshops with agreed and structured processes that undertake to work through all of the issues, perceptions and consequences of the entire team on a particular project. Interestingly, this approach also describes the design review process undertaken by design managers in their role as coordinator of the design team(s). This then makes useful links with the published research literature and findings herein by Ballard and Koskela (1998), where they referred to their investigations into design management as value management, in subsection 4 of this chapter. Value management appears to demonstrate strong links with design management as it usually occurs in the early design stages of a project, and involves the major stakeholders in order to establish differing perceptions of what the issues are on a project, any project. A new approach to value management mooted by Green (1994) but originally developed by Edwards (1977), is based on the multi-attribute utility which theory, and is known as the 'simple multi-attribute rating technique' (SMART), is considered useful for problem structuring according to Edwards (1977), and for value management as it embraces 'soft systems thinking'. Central to this technique is Phillips (1984) concept of the requisite decision model as mentioned earlier in this section of the literature chapter, and according to Edwards (1977), *"SMART provides the basic framework for the decision model"*, which is then constantly revised until such a time as it accurately represents the *'shared social reality'* of the group, *" the model is then* considered *to be 'requisite'"*, and forms the

basis for all the social aspects of the decision-making, and acting as a common reference point, to effectively guide the actions associated with the project. Green (1994) alluded to the implications of the various value management debates as to which approach may be more plausible for project managers. He suggested that whilst some researchers believe that successful project management relies on both soft and hard systems thinking, that in fact the SMART technique for value management, provides project managers with an opportunity to get involvement at the early stages of the design and play an important role, and exercise more control over the pre-planning design stages of the project. This suggests that there are mutually inclusive outcomes emerging between the SMART value management approach, and that of remote site design management.

2.7 Humanitarian Aid Management

Literature relating to management processes includes documents such as the UNHCR (United Nations High Commissioner for Refugees) Handbook (1999) which tends to be very strong on objectives, but not so clear on how the objectives can actually be achieved. The UNHCR Handbook guidelines state for example that *"there is no single blueprint for refugee emergency management: each refugee emergency is unique. However, experience shows that emergencies tend to evolve according to certain recognizable ad documented patterns."* This suggests then that disasters tend to have discernable patterns, and one would perhaps expect there to be a specific management process that can be applied for each situation across the range of disaster pattern(s). This is not the case. The UNHCR Handbook basically sets out the desired outcomes, and then leaves it for the 'reader' to select the necessary management processes to achieve those outcomes, and further suggests that *"there is no single obvious right answer."*

The current management situation in humanitarian aid agencies appears to demonstrate significant gaps in the understanding of disaster management within the human aid community, with Fitz-Gerald *et al.* (2002), reporting that, "*The humanitarian aid community is also a 'slow follower' in the adoption of management tools and techniques"*, and that,

> *this can be explained or defended on the basis that humanitarian aid is delivered in an environment where no two situations are the same. Consequently, there is no single model that can be applied, and the absence of*

effective lessons-learned mechanisms that ensure positive and negative experiences are addressed throughout all levels of the organisation encourages reinvention with each deployment.

Humanitarian aid organisations and the inter-relation between participants within the aid community tends to be very complex, as there are several stages to disaster response efforts, and differing emergency and recovery phase, operational or field relationship variations that can occur, according to Willitts-King and Harvey (2005), and Manfield (2001). The aid industry as reported in Fitz-Gerald and Neal (2002), discussed the debates regarding management issues within the humanitarian aid sector stating that,

"the view of management is often either taken to mean traditional development project management, or is equated to experience and knowledge of the aid system", and went on to suggest that *"the aid system is very much a value chain requiring a different management approach, one that takes greater account of the activities of different players participating in a chain that should be viewed as a whole."*

In addition, the legal and political status of those directly affected by the conflict, and therefore the potential recipients of the aid, is considered critical in the determination of what aid assistance can or cannot be given (Kestle *et al*. 2006). Research conducted by Potangaroa and Kahn (2003), looked at the project management issues, and the approaches taken, when constructing refugee camps in Pakistan and Afghanistan in 2001-2002. In their work they referred to work by Bohn (2000) who wrote in the Harvard Business Review on the topic of emergency response management 'fire fighting rules', suggesting that *"organisations develop many rules of thumb for 'fire fighting' rather than problem solving, and that when that organisation is under stress, adoption of these 'fire fighting' rules will not be constructive and will actually add further to the original problems"*. According to Potangaroa and Kahn, a significant number of the problem-solving approaches that Bohn (2000) suggested were in conflict with the general management approach submitted by Fordham (2000). For example, the suggested participatory approach of consulting widely and being inclusive of all those affected by an issue was challenged by Bohn (2000) as being a 'drain' on people's problem solving time and particularly on those who were the best 'fire fighters' in the organisation.

The project management methodologies specifically adopted for the refugee camps, used simple system type approaches, in conjunction with a strong

> *objectives management approach. Each camp was typically a small town of 20,000 people, in remote locations, with difficult timelines, different cultures and dire consequences should they* (the camps) *not be constructed in a timely manner.*
>
> (Potangaroa & Khan, 2003).

Two main management issues apparently arose in terms of the construction of these refugee camps in Pakistan, being a lack of on-site co-ordination that created delays, and a lack of appreciation for planning timelines and scheduled deadlines on site, due in the main to a paucity of professional personnel employed by the NGOs. Potangaroa and Khan (2003) went on to conclude that *"the crucial aspect is on-site management and planning, with the emphasis being on- site rather than at some distant regional or sub-office"* such as is the case where many of the agencies and NGOs have their offices (and therefore the control centre) located some distance away from the actual site(s). Interestingly, the findings of Potangaroa and Khan's (2003) research, resonate with the remote site design management research, particularly where they say that two of the important 'lessons to be learned' from a management perspective are that timely decision-making is crucial, and that decision-making on-site is a necessity, and that regular on-site meetings and progress updates are essential for effective communication. The research conducted by Haigh *et al*. (2006) on the levels of disaster preparedness, response and recovery after the Indian Ocean Tsunami in 2004 for example, supported the findings of previous researchers when they identified *a lack of effective information and knowledge dissemination as one of the major reasons for unsatisfactory performance levels of current disaster management practices"*. They continued by suggesting that *"Future research must aim at increasing the effectiveness of disaster management by facilitating the sharing of appropriate knowledge and good practices"*.

2.8 Environmental Sustainability

One of the underlying concepts of 'sustainability' is that our relationship with the built and natural environments is permanent, and that there is an interdependent relationship between our activities and their effects on the planet. This is particularly relevant as many of the remote sites are pristine and therefore environmentally sensitive. At the initial stages of a project, consideration of, and responses to the environmental sensitivity of remote sites may often be paramount to the overall

design development, construction or implementation stages for these often hostile sites, as the impacts created by any development activities can have long-term effects on the local and unique ecosystems. In recent years, governing bodies have accepted that upholding certain principles in relation to sustainable development is their responsibility. There have been varying attempts to operationalise such high ideals and philosophies. Environmental sustainability refers to biodiversity, sustainable environments, sustainable development and ecological design, and when the New Zealand Resource Management Act was implemented in 1991, it was the first time that environmental protection and sustainability had become a legal requirement in any Act of Parliament internationally. This Act promotes the sustainable management of the development and protection of natural and physical resources in a way, or at a rate, which enables people and communities to provide for their social, economic, and cultural wellbeing and safety, whilst "*sustaining the potential of natural and physical resources (except minerals), to meet the needs of future generations; safeguarding the life–supporting capacity of air, water, soil and ecosystems; and avoiding, remedying, or mitigating any adverse effects of activities on the environment"* (RMA 1991). Interpretations of the intent and meaning of the RMA in terms of sustainability range across the spectrum of cultural, social, economic and developmental realities (Low, 1999). The UN defines sustainable development as *"the development with which the needs of the present generation are filled without jeopardising the possibilities for future generations to fulfil their needs"* (Low, 1999), whereas the World Business Council on Sustainable Development effectively breaks the term into 'sustainable' meaning continued, and 'development' meaning growth, hence 'business as usual' almost without ecological constraint.

Many articles, papers and governmental acts and policies make value judgements when referring to sustainability. "*The goals of sustainability are ecological and social, and the two issues are not separate"* (Rogers, 1995). Diverse biological and natural environments have intrinsic values in terms of their visual, educational, heritage and spiritual qualities. As an example, Antarctica is frequently referred to in terms of its intrinsic value (Article 3, Antarctic Treaty, 1959) and is described as a 'polar wilderness' (Dingwall,1998). These environments are reliant on high levels of biodiversity and evidence of mature ecosystems which are rare within pristine sites, and the management of these environments has largely been associated with various legal instruments, such as international treaties and national acts, for example the

Antarctic Treaty (1959), and the NZ Environmental Protection Act (1994), which designates Antarctica as a natural reserve devoted to peace and science. Associated with such legal instruments are policies and protocols that give guidance, which are sometimes legally binding or simply advisory. Consequently, those that have been recognised as having attributes to be preserved for future generations have been awarded World Heritage listings, and are Tongariro National Park New Zealand and Fraser Island Australia.

Regulatory frameworks such as the Antarctic Treaty (1959), the Environmental Protocol (1991), the Resource Management Act (1991), the Nature Conservation Act (1994) and the Burra Charter (Heritage Council, Australia), ensure that any person wanting to visit, develop or alter the nature of particular remote sites, adhere to strict criteria that protect the physical or heritage values of the sites for present and future generations. Once environments are established as worthy of sustainable management, then the development of these unique environments is critical. Under the Antarctic Treaty (1959), and the associated Environmental Protocol (1991), environmental principles have been established for the conduct of all activities, and all activities are subjected to prior environmental assessment, giving priority to scientific research that contributes to the understanding of the global environment and prohibits, for example, mineral resource extraction and the introduction of non-indigenous animals. Projects conducted in Antarctica (such as the Cape Roberts Drilling Project, refer Chapter 6), have to go through rigorous and constraining Environmental Impact Assessment (EIA) procedures. These EIA procedures cover all activities, including the inception, viability, methodology, implementation and overall monitoring stages. Each and every potential environmental impact has to be identified, addressed and monitored.

2.9 Sustainable Development

Literature related to the management of the Ross Sea Region of Antarctica in terms of sustainable development included documented regulatory organisational structures and obligatory multilateral agreements. These are all agreements that are created under the Antarctic Treaty system.

"Activities in the Ross Sea Region are regulated through the national administrative and legal structures of the states active in the region, giving effect not only to their domestic legal obligations but also international obligations", (Waterhouse, 2001).

The Antarctic Treaty System comprises the actual Treaty of 1959, Conventions for the Protection of Seals and Marine Living Resources, and also the Protocol on Environmental Protection to the Antarctic Treaty (1991), which covers the area south of 60ºS and *"establishes the guiding principles for all activity in the Ross Sea region."* All of these agreements are 'in force' internationally, and

"Although the Treaty itself does not include provisions relating to the environment, it does provide the administrative structure to do so. Antarctic Treaty Consultative Meetings (ATCMs) have adopted in excess of 100 legally binding environmental recommendations (known now as resolutions or measures) *aimed at furthering implementation of both Antarctic Treaty and its Environmental Protocol."*

(Waterhouse, 2001)**.**

These ATCMs occur on an annual basis and consequently many more 'measures' and 'resolutions' have been implemented since 2001, requiring that any participants involved on scientific or other Antarctic programmes to familiarise themselves with the latest legal and/or compliance administrative processes and requirements.

In terms of the retrospective case study conducted on the Cape Roberts Project (refer Chapter 6 of this thesis), the Protocol was not even ratified until 1998, so the literature review has therefore been limited to an overview of the Ross Sea region's sustainable development compliance requirements.

Sustainable development as it applies to Humanitarian Aid programmes falls under the jurisdiction of the United Nations Division for Sustainable Development (UNDSD). The UNDSD acts as an authoritative resource on sustainable development for the various UN agencies within the UN system, by promoting and operating as the 'secretariat to the UN Commission on Sustainable Development (CSD)', and as a facilitator for the reporting, monitoring and evaluation of the implementation of sustainable development at national, regional and international levels, (www.un.org/esa/sustdev).

"The context for the Division's work is the implementation of Agenda 21, the Johannesburg plan of Implementation and the Barbados Programme of Action for Sustainable Development of small island Developing States"

(Agenda 21, n.d).

Within Agenda 21, two chapters in particular are the cornerstone references for sustainable development in the UNDSD and the Humanitarian Aid sector(s), and these are Chapter 40 and Chapter 8. Chapter 40 of Agenda 21 focuses on 'indicators of sustainable development' in terms of what they are, how they can be achieved and how they will be monitored. These indicators are required to increase the UN agencies' international focus, in particular, on sustainable development and assist decision-makers to adopt rigorous and plausible policies regarding sustainable development. The third revised set of CSD indicators was finalised in 2006 by a representative group of experts from developing and developed countries and international organisations. This revised edition comprises 96 indicators, which includes 50 subset indicators and all, their associated reference and methodology sheets, to assist in meeting the sustainable development objectives for the specific geographical and/or agency specific area(s) of operation. Particularly pertinent to the UN Sudanese and Aceh Humanitarian Aid projects is in Chapter 40.3 where it refers to 'information for decision-making' - and there being a general lack of capacity for gathering and assessing data to inform decision-making information in developing countries, whether that is environmental, demographic, social and developmental data (Agenda 21, n.d). Chapter 8 of Agenda 21 focuses on 'national strategies for sustainable development' (NDS) that build on the relevant sectoral economic, social and environmental policies and plans that are operating in the particular country. The formulation and enhancement of the national strategies for sustainable development began in earnest in 2002, and the commencement of their implementation began in 2005. In addition, *"integrating the principles of sustainable development into country policies and programmes, is one of the targets contained in the United Nations Millennium Declaration to reach the goal of environmental sustainability."* (Agenda 21, n.d). The sections within Chapter 8 of Agenda 21 that are relevant to the Humanitarian Aid projects, focussed on in this research, are Chapter 8.1 and Chapter 8.2 in particular. The areas of Chapter 8.1 that are specifically related to the Humanitarian Aid Project are the programme areas a) and b) which relate to the integration of the environment and development, at the policy level and also at the planning and management levels, and then the provision of an effective legal and regulatory framework, respectively. Chapter 8.13 states that ,*"Laws and regulations suited to country-specific conditions are among the most important instruments for transforming environment and development policies into action,"* and then in Chapter

8.14 that, *"while there is continuous need for law improvement in all countries, many developing countries have been affected by shortcomings of laws and regulations."* (Agenda 21, n.d). This is especially true in regards the UN Humanitarian Aid project in West Darfur Sudan, where the conflict is political and the idea of sustainable development is a distant dream still.

CHAPTER 3. METHODOLOGY

3.1 The Research Question

"What are the key factors and drivers that constitute a plausible theoretical conceptual design management model for remote site projects?"

3.2 Choice of Methodology

One of the first tasks involved reviewing and thinking through the possible choices of methodology given the nature of the research question. The decision to adopt a qualitative approach to the research was made because the researcher is developing a conceptual management model, and needs to gather and analyse 'in the field, real-life context' data from project personnel, in order to then test that data against the developed theoretical conceptual management model. This in turn suggested that personnel with remote site project experience, and involvement with the management of those collaborative international projects, potentially held the key to the rich in-depth data sought to provide valid and reliable findings. The various qualitative research methods include Ethnography, Action Research, Unstructured Interviewing, Grounded Theory, Historical Research and Case-Studies. In addition, researchers can incorporate Surveys, Questionnaires, Structured Interviews and Document Analysis when gathering the qualitative data.

The reviewed literature yielded no single theoretical model or framework that specifically or completely addressed remote site design management. The suggested reason for this is that the design management field, and specifically remote site design management is still an emerging phenomenon. Therefore exploratory empirical research methods, including historical research, case studies, document analysis, in-depth interviewing, grounded theory, and case-study methodology were considered to be useful developmental and testing approaches.

Ethnography was considered at the early stages of the research process because it uncovers social, cultural or normative patterns, it is concerned with generating theory, and *"ethnography accepts that human behaviour occurs within a context"* according to Burns (2000). However, ethnography was discarded as this method is primarily observational and requires that the researcher play an active part of the group being

observed and written about over a significant period of time, and is probably more suited to research in the educational or health disciplines.

Historical Research was undertaken at the exploratory and later at the model testing stages of the research process, using a document analysis approach with reports written by the project personnel as a part of their official roles. Historical research is *"used for synthesising or comparing old data with new data"* and *" is intended to help understand , explain or predict through the collection and objective evaluation of data relating to occurrences in order to explore research questions, that may help to explain present or anticipate future events"* (Burns, 2000).

Grounded Theory has been adopted given its relevance to the research approach during the initial development stages of the theoretical conceptual model and associated typology for remote site projects, and later when analysing the interview transcripts (refer Chapters 6 and 7). Grounded theory is a qualitative research method, originally developed by Glaser and Strauss (1967). 'Theoretical sensitivity' was specifically described by Glaser (1978) as being an important feature of grounded theory for researchers aiming to develop theory, and *"as a process of developing a researcher's conceptual insights by working in the actual area being researched to obtain experience and expertise, and the researcher is then able to recognise important data and formulate conceptually dense theory"*. Strauss and Corbin (1990), further claimed that *"it is a theory which is inductively derived from the phenomenon it represents"*. The theory is considered useful as a general methodology when developing theory that is grounded in data systematically gathered and analysed, and that *"the result of a grounded theory study is the generation of a theory, consisting of a set of plausible relationships proposed among concepts"* (Strauss and Corbin, 1994). Further support for the choice of grounded theory for this particular research project was cited in Denscombe (2003, p.113), stating that *"researchers usually adopt grounded theory when the topic of interest has been relatively ignored in the literature or has been given only superficial attention"*. All of which fitted well with the objective at the exploratory research stage, of using a selection of primary and secondary data from earlier research and reflections on personal experience around scientific base projects in the Ross Sea Region of Antarctica, Tongariro National Park New Zealand projects, and the Kingfisher Bay Resort Project on Fraser Island, Australia. These data could then be tabulated as benchmarking attributes and dimensions, when developing the remote site typology (refer Chapter 4).

These particular sites were specifically selected because of their contrasting physical attributes, their significantly different developmental priorities set by the clients and stakeholders, and the researcher's previous links with them. Reflection on the likely and real stakeholder and client expectations, and the issues and realities occurring on these particular project sites, helped frame some of the thinking when synthesising theoretical and practical contributions in the development of the conceptual design management model for remote sites. A further consideration when selecting suitable methodologies was that personal access to a range of remote site projects was limited, and therefore case-study methodology was considered to be an appropriate and valid research approach, in the development and testing of the theoretical conceptual design management model for remote site projects.

Case Study Methodology has been adopted for this research as it involves empirical enquiry that investigates a phenomenon within a real-life context. The phenomenon in this instance is remote site design management, which includes the study of collaborative international projects that are remotely located, and which are frequently environmentally sensitive world heritage sites. According to Creswell (2002), *"case studies may include multiple cases, called a collective case study"*, and these are then described and compared to provide insights into an issue or occurrence. The comparative collective case (or multi-case) study approach can also provide insights into processes, practical realities of theoretical premises, and whether the researcher's interpretations of issues, processes, data or theories are plausible (Burns, 2000). Case-study design and selection are considered to be two of the most critical aspects of case-study methodology (Yin, 2003), as is the choice of case study data collection according to Burns (2000), suggesting that several sources of evidence should be considered to *" improve the reliability and validity of the data and the findings, and make the case-study reporting more convincing"*. Hence the decision to analyse records/reports directly associated with the case study projects, and conduct in-depth semi-structured interviews with project personnel.

3.3 Testing and Further Development of the Conceptual Model

Following the development of the typology and conceptual design management model for remote sites from the reviewed and analysed literature, document analysis, case study data and experiences on previous research projects, the literature review continued to focus in the areas of design management, sustainable development, and

environmental sustainability, but later included humanitarian aid project management. The next stage of the process followed the decision to test the conceptual model on two major projects with distinctly different stakeholders' desired outcomes, and methods of management, one in Antarctica, the other in Sudan, to try and establish whether the theoretical model was rigorous and capable of representing the two diversely different real-life contexts of the remote site projects selected.
The four main aspects of the research methodology involved :
1. Establishing and deciding on the questions to be answered in order to answer the overall research question.
2. How the data would be collected.
3. Participant selection.
4. Data analysis approach.

3.3.1 Case Study Selection Process for Testing the Conceptual Design Management Model

The multi-case study approach (Yin, 2003), allows valuable comparisons and contrasts to be made between project case-studies. For this research the choice of case studies was not restricted to Antarctic projects alone, as this was considered to be too limiting potentially, given that the remote site design management model needed to be robust and yet responsive to a range of remote site project situations. Therefore the cases selected to test the developed model were to be representative of both current and past projects, and from diversely different disciplines in order to enrich and validate the research process. The selection criteria for the two main case studies to be used when testing and further developing the conceptual management model, were based on the decision to collect and analyse data from relevant current and historically significant projects, that the researcher had had no prior involvement with. The cases selected to test the model were the Cape Roberts Drilling Project in Antarctica (which originally ran from1995 -2001), and the UN Humanitarian Aid Project in West Darfur, Sudan (2004 onwards). The Cape Roberts Drilling Project case-study involved reviewing the previously published data (Cowie, 2002), and the researcher deciding to conduct a retrospective historical case study approach in 2003/4/5, with selected participants who had previously been involved on the project. The UN Humanitarian Aid Project case-study in West Darfur, Sudan (2004), was selected as

an active and current project, and the intention is to interview a range of management and managed personnel.

3.4 Sampling and Participant Selection

The sampling approach taken for the two main case–studies aimed to involve a cross-section of personnel that focussed on managers and 'the managed' to achieve a representative cross-section of the various roles on both of the case-studies. After approaching potential participants to be involved on this research, a Participant Information Sheet and Consent Form was prepared for each participant that agreed to be interviewed in terms of their official role/capacity on the particular case study project. There was a genuine willingness to be involved on the part of the organisations and the participants who were approached, many commenting on the value of having an 'outsider' (this researcher) conduct this particular research. Interviews were conducted with senior and middle management, and operational staff in terms of their official roles on the Cape Roberts Project (1995-2001), so as to give a rigorous and representative cross-section of the personnel who were originally involved on the project. On the UN Sudanese Humanitarian Aid Project in West Darfur interviews were conducted with a representative cross-section senior and middle management, and operational staff.

3.5 Human Ethics Process and Approvals

The Human Ethics Committee (HEC) of the University of Canterbury was established in 1992, to evaluate research conducted by staff, research associates and students at the university to establish the need and value of the research, to ensure the validity of the design, procedures and methodology to be adopted, whilst protecting human rights and the cultural values of participants in the research.The committee also evaluates the ownership and use of the findings of the research, confidentiality and effective monitoring procedures, and any legal issues that may arise.

The HEC needs to receive an application for any research or teaching activity in which persons are subjected to experimental procedures or observation or questioning or otherwise used a source of information or data, unless excluded by the scope and exemptions in the Human Ethics Committee Principles and Guidelines.

Within the Principles and Guidelines document Section 3 deals with exemptions, and in particular,

3(b) states: "*Research projects or teaching assignments involving interviews with public figures or professional persons in the areas of their duties or competence , provided that the interview protocols and the eventual use of the gathered information complies with the Privacy Act"*.

The particular research design, methodology to be undertaken by the researcher for this doctoral research was therefore originally understood and interpreted by the researcher and the senior research supervisor/head of department, to be exempt under section 3(b) of the Human Ethics Principles and Guidelines, given that:

1. All of the participants to be interviewed on the Antarctic Drilling Project, and the UN Sudanese Humanitarian Aid projects would only be interviewed in terms of their official or professional roles on the projects.
2. Interview protocols would be followed particularly in terms of ensuring that the participants voluntarily agreed and consented to being interviewed, and knew that they could withdraw from the interview at any time, and withdraw approval to use the collected data at any stage as well.
3. The data collected would be factual and would comply with the Privacy Act in all respects and particularly in terms of maintaining the participants' anonymity and confidentiality of the detailed data collected.

However, in late 2007 the senior supervisor advised the researcher that the Human Ethics Committee now required that all research projects and assignments go through the Ethics evaluation process, even if considered exempt. Therefore an application was submitted to the Human Ethics Committee in late 2007, seeking their review and approval of the research proposal 'Thesis: Remote Site Design Management – Project A and Project B'. A letter dated 4 February 2008 advising that the research proposal had been considered and approved by the Human Ethics Committee was received the following week by the researcher and the senior supervisor. (Refer Appendix B for the full application including the Interview Information sheets, and the Interview Questions asked of the participants for Projects A & B).

3.6 Data Collection

Once the conceptual model and typology were developed (Kestle & London, 2002), the testing stage of the research process began, and the decision to adopt face-to-face semi-structured interviews as the preferred data collection method for this stage of the research process resulted from reviewing the range of qualitative processes used to

collect data. Essentially the choices were surveys, questionnaires, interviews, case-studies, fieldnotes/observations, or a combination of these.

3.6.1 Interviews

"The research interview has been defined as a 'two- person' conversation initiated by the interviewer for the specific purpose of obtaining research-relevant information" (Cohen & Manion, 1994).

An advantage of interviewing participants is that it allows a greater depth of information to be gathered from participants' experience, knowledge and perceptions, that are directly related to the research objectives, but a disadvantage is that interviewing can be prone to subjectivity and interviewer bias, according to Cohen and Manion (1994).There are several types of interview, being structured, non-directive, focussed and semi-structured and unstructured.

The structured interview is a closed situation in terms of the sequencing of procedures being slavishly adhered to, and the questions being set in advance with little or no opportunity for the interviewer to make spontaneous yet relevant modifications, or ask for elaborations on answers during the course of the interview(s).

The non-directive interview is most frequently used in the health sector as there are no set questions and the respondent is free to speak freely and spontaneously. The focussed interview gives the interviewer some control in a non-directive situation as the researcher/interviewer will have conducted a preliminary analysis of the situation in which the participants have been, or are, involved and therefore has some fore-knowledge of the situation. This allows the interviewer the opportunity to distinguish the objective facts of the subject from the subjective definitions of the situation.

The unstructured interview is open-ended and is basically a conversation between the interviewer and the participant, to allow experiential information to be shared in an interviewing environment that is focussed and directional yet flexible (Cohen & Manion, 1994).

The semi-structured interview sits between structured and completely unstructured interviewing techniques as it allows more flexibility than structured interviews in terms of the content and sequencing of the questions, even though the main questions regarding the key issues are pre-planned (Burns, 2000). The decision to use semi-structured interviews for this research resulted from the decision to gather detail-rich

data from professionals and their experiences in-the-field to better inform the findings and subsequent analyses. The semi-structured interviews include common sets of questions for each participant that are open-ended so that the participant can expand and elaborate on their answers, as relevant to the questions being asked. Similarly, the researcher can follow up on participant responses to gain further insights and apply them to the research objectives. All of the in-depth interviews conducted with the participants will be voice recorded (with their prior approval), and then fully transcribed by the researcher.

The potential problems associated with the use of interviews include 'invalidity', 'leading questions', adopting 'satisfactory recording methods for answers', and reliable and complete 'interpretation of unstructured interview data'. In terms of the two main case-studies selected (the Cape Roberts Antarctic Drilling Project in Antarctica and the Sudanese Humanitarian Aid Project in West Darfur), to test and further develop the conceptual model as necessary, the data was collected using semi-structured interviews with each of the participants, all of whom were, or are, involved on the two main case-study projects. The participants were formally invited to take part in the research project and interviewed strictly in terms of their official capacities and/or roles on the project(s). Information Sheets were provided to participants before the interviews take place, regarding the actual research being conducted. Participant Consent forms were prepared and provided to each participant, and needed to be signed off by each of the participants. A set of ethically approved, and research question relevant interview questions were asked of each of the participants (refer Chapter 6, 7 & Appendix B). The specific approach to the data collection for the Cape Roberts Drilling Project and the UN Humanitarian Aid Project in Sudan is written up in Chapter 6 and Chapter 7 respectively.

3.6.2 Interview Questions for Projects A and B

The Interview Questions for the two main case study projects are noted attached to the Ethics Application made to the University of Canterbury Human Ethics Committee (HEC) , (refer Appendices), and are also identified in Chapter 6 and Chapter 7 of the thesis. In the HEC application **Project A** referred to 'The Cape Roberts Drilling Project in Antarctica' and **Project B** referred to the 'UNHCR (Humanitarian Aid) Red R project in Sudan (West Darfur). For case study Project A the interview questions for the Interview Schedule were drawn from the literature review, and the 'Final

Report Document' findings edited and published in 2002, in terms of the management framework at the pre-planning and operations stages. For case study Project B, the interview questions for the Interview Schedule were drawn from the literature review and the document 'Lessons Learned' (Minear, 2005), about Humanitarian Aid agencies generally and the UNSHA project in West Darfur in particular.
The Interview schedules for projects A and B also included questions directly related to testing the exploratory conceptual design management model for remote site projects in terms of the participants' experiences on Projects A and B specifically.

3.7 Validity, Credibility and Dependability of the Collected Data

"The most practical way of achieving greater validity is to minimise bias as much as possible" (Cohen & Manion, 1994). The main sources of bias in collected and findings can result from the real value of the collected data being over or understated by the researcher, or from the attitude and/or behaviour of the interviewer, the characteristics of the participant and/or the way in which the questions are designed, worded and delivered to the participants. To reduce bias, Cohen and Manion (1994), suggest the use of clearly written questions that can be readily interpreted, and that the interviewer(s) are thoroughly trained in interview procedures, so as to minimise possible misinterpretations or the use of biased questioning techniques. Cohen and Manion (1994), also identified a further potential problem when conducting interviews, suggesting that with increased validity there was the potential for 'diminished reliability'. This occurred when the questions were more definitive, and inflexible, meaning that the participants' answers were less forthcoming and the interview process risked becoming a sterile process if the balance was lost between trying to attain reliability and validity of the data.

3.7.1 Credibility

When conducting qualitative research credibility has to be established in terms of how the accuracy and truthfulness of the research findings can be defended. 'member checks', according to Ary *et al.* (2006), is one method of establishing credibility, and this was adopted when gathering and writing up the data for this research The transcripts were checked for accuracy and completeness by the participants in order to maximise credibility of the collected data.

3.7.2 Dependability

Methods used to establish dependability, which is considered to be the qualitative research equivalent of reliability according to Ary *et al*. (2006), include 'replication logic'. This method involves conducting the research in multiple locations with different settings and time periods. When the gathered findings from significantly differing contexts and disciplines are similar, Ary *et al.* (2006) suggests that this should add to the researcher's confidence that the findings are dependable.

This was one of the main reasons why the diversely different case studies, and associated stakeholders in very different environmental and political settings were selected and undertaken, to test the conceptual model.

A discussion on problems around validity when conducting interviews, suggested that there could be a risk of reduced validity where there is more control (and therefore reliability), of the elements of the actual interview (cited in Cohen & Manion, 1994,). p282). When conducting face-to-face interviews it is generally considered necessary to create a conversational environment to get the best responses from the participants, as they 'feel at ease', and that *"the distinctly human element in the interview is necessary to its 'validity'*, and *the more the interviewer becomes rational, calculating and detached, …the more calculated the response is likely to be"* (cited in Cohen & Manion,1994, p.282).

3.8 Data Analysis

The data and literature reviewed at the exploratory stage of the research were analysed in terms of fitness for purpose and relevance to the development of the typology and the conceptual model. The relevant attributes were then categorised and tabulated or included within the typology (refer Table 2 Chapter 4). In terms of the interview process associated with the two main case study projects A and B, once the interviews with all of the participants were completed, the next stage of the process was the transcription of the tapes. Taping the interviews rather than writing field notes ensured that every comment and response was captured in order, and within the actual context that they were made. Tapes and transcripts are a formal record, available to the researcher after the interview events to review, replay, and then analyse and critique in terms of revealing every feature and nuance of the individual and collective interviews. According to Silverman (2003), the preparation of transcripts should not

be assumed to be just a technical process that the researcher undertakes prior to the analysis of the transcripted material. Writing up the transcripts involved listening to the tapes on several occasions to be certain that every utterance and attitude of the participant was accurately and completely recorded in context. *" the two main social science traditions which inform the analysis of transcripts of tapes are conversation analysis (CA) and discourse analysis (DA)"* (Silverman, 2003). Discourse Analysis generally refers to the language used in the interview, and pertains to the terminology specific to, and in everyday use in the particular discipline. The use of Conversation Analysis is systematic rather than intuitive analysis which aims to maximise validity, credibility and dependability. Conversation Analysis requires that the following rules be followed according to Burns (2003), *"Always try to identify sequences of related talk* (answers) *and look for particular outcomes in the talk* (answers) *whether that is a request for clarification* or a further statement or question from the participant *and work backwards to trace the trajectory through which a particular outcome was produced."* In terms of what to avoid Burns (2003) recommends that the researcher does not try *"to make sense of a single line of transcript or utterance in isolation from the surrounding talk"*. In other words never take participants' statements out of context. The transcripts were subjected to 'member checks' as already noted in 3.7.1 to ensure completeness and accuracy, and therefore maximised credibility of the data and findings. The transcripted data was coded to ensure confidentiality of the participants' responses, as per the HEC approved ethics application for the interview process on projects A and B, and as referred in Chapter 3.5. The primary transcribed and coded data and findings from the two main case studies (A and B) - Cape Roberts Drilling Project Antarctica, and the UN Sudanese Humanitarian Aid Project in West Darfur) was tabulated and analysed within each of the relevant case study Chapters (refer Chapters 6 and 7), and are discussed and compared within Chapter 8. The discussion within Chapter 8 includes comparisons being drawn between the primary data and relevant published secondary data from the reviewed literature. The primary data was also reviewed in terms of enhancing, further developing and/or validating the conceptual design management model (refer Chapter 8). The next chapter though involves the development of the Typology for remote sites in order to clarify the interpretation and context of the research project.

CHAPTER 4. DEVELOPMENT OF THE TYPOLOGY

4.1 Introduction

The concept of remote sites refers to a number of different, and complex, dimensions and properties, and can therefore be developed in a categorical and comparative typological manner. For example, there are varying degrees of remoteness experienced in nearly all construction projects so a clearer definition of the characteristics of remote sites would be beneficial. Therefore a typology was initiated for the concept of remotely located projects related to environmental sustainability and the management of the design process.

4.2 Typologies

A typology is a form of categorisation of theoretical and analytical data that is often used in qualitative social research to clarify concepts (Kluge, 2000). The introduction of empirical social sciences, and the concept of types and their construction have assisted in the explanation, comprehension and understanding of complex social realities according to Kluge (2000), but essentially each typology is the result of a grouping process which can then be further defined as "*a combination of attributes*". A combination or grouping of attributes is generally supported by tables that can range from a simple tabulated format to a complex and multilinked model, which gives a visual overview of the theoretical landscape. Kluge's empirical type of construct was adopted for the development of a typology for remote site projects, which is one that is grounded in observations from the real world and from literature concepts. Kluge (2000), refers to Becker (1968) and Kelle (1998) who believe that there is a need for both analysis and theoretical knowledge when conducting empirical investigations (Kluge, 2000). She concluded that, "*It is only when empirical analyses are combined with theoretical knowledge that 'empirically grounded types' can be constructed."* This builds on and is aligned with the adoption of grounded theory to develop and test particular aspects of the theoretical model (as referred in Chapter 3). *Kluge's approach (2000) to systematically construct a typological framework generally involves four different stages of analysis for the process of 'type construction',* as identified in Table 1.

Table 1 Kluge's 4 stage approach to Typology Construction

The four different stages of Kluge (2000) Typological Approach	**Process involved**
1. Development of relevant analysing dimensions	Type defined as combination of attributes (properties and dimensions) Identifying similarities and differences between the various cases selected Constructed groups and types are described in more detail, during analysis of collected data and theoretical knowledge.
2. Grouping the cases and analysis of empirical regularities	Cases are grouped in terms of their defined properties and dimensions Cases are analysed and compared with each other in terms of empirical regularities and dissimilarities Checking for Internal Homogeneity (elements in type have to be as similar as possible) Checking for External Homogeneity (differences between types are as strong as possible) Looking for variation of data in the resulting typology.
3. Analysis of meaningful relationships and type construction	Analysing the first two stages of the typology construction Establishing whether there are any meaningful relationships developing between the various cases Searching for contradicting or deviating cases Discovering further attributes potentially
4. Characterisations of the constructed types	Writing the detailed descriptions of the constructive types in terms of their combinations of attributes Writing the detailed descriptions of the constructive types in terms of their meaningful relationships Identifying the criteria for the characterisation of types (for example, ideal, extreme, prototypes, empirical *et al.*)

"These four stages represent sub-goals of the process of type construction, and the cases can be grouped by contrasting single cases, or by a computer-assisted grouping procedure like cluster analysis" (Kluge, 2000). The model of empirically grounded type construction is particularly useful as it is flexible and open. Every stage of the analysis can be achieved using different analysis methods and techniques yet the model still works with a variety of qualitative research questions, and differing qualities of data according to Kluge (2000). Further, *"In spite of the different methods, the four stages of analysis* (1-4 above) *guarantee that the central sub-goals of the process of type construction are being realised"* and *"it is not only possible to compare different approaches with each other but also to achieve a combination of the different analysing techniques"* as required (Kluge, 2000).

4.3 Development of Attributes and Dimensions for the Remote Site Projects Typology

The empirically grounded typology model was adopted mainly because of the links with the use of grounded theory to develop the typology, and the conceptual model. The characteristics of the remote site typology were initially drawn from a selected literature review in the fields of typological constructs, and environmental sustainability, to understand how to develop and recognise the attributes and dimensions for these particular sites. The next stage involved an exploratory investigation mapping three previous case study projects in Antarctica, Australia and New Zealand to specifically establish their attributes and dimensions, to look for any meaningful relationships, patterns, similarities or differences, and then directly applied these in the development of the remote site typology (refer Table 2). These attributes needed to be explained, and to do this the fields of design management and environmental sustainability were drawn on, as remote sites are often environmentally sensitive, and the design process for these construction projects needs to be specific and closely managed across the various stakeholders. Sustainable development, maintenance of biodiversity, and an ecological approach to design concepts, were all potential attributes when constructing a typology for these sites and therefore global environmental philosophies and strategies were given further consideration (Kestle *et al*., 2002) in association with the development of the conceptual design management model for remote site projects.

4.3.1 Mapping the Properties and Attributes of a Selection of Previous Projects on Environmentally Sensitive Remote Sites.

The selected case study sites had a range of attributes that included:

- pristine environment
- governmental monitoring
- government as client
- evolving and mature ecosystems
- commercial value
- design stakeholders
- scientifically investigative activities
- global impact; historical conservation

- resource-rich
- hostile climate
- indigenous history.

The case study projects were relevant for the development of the typology for remote site projects, because of their contrasting physical attributes and different developmental priorities. The sites were in environmentally pristine regions, yet offered and generated quite different dimensions. The first study was of Antarctic sites where research bases have been built to support international scientific investigations in the Ross Sea Region (refer Figure 1), whilst the second study was an Australian Eco- tourism resort on Fraser Island, located off the east coast of Australia. The third study involved reviewing the attributes and dimensions of Department of Conservation (DOC) sites within Tongariro National Park, New Zealand, where DOC huts and ski lodges are located.

a) Scientific Bases in the Ross Sea Region, Antarctica

Prior to 1939 more than 20 nations were involved in research and exploration in Antarctica, seven of whom wanted to lay claim to parts of the continent for military or strategic reasons, related to its abundance of natural resources. The seven nations were Australia, Chile, UK, New Zealand, Argentina, Norway and France. Following the Second World War, USA and Russia became interested in Antarctica, calling in 1948 for a form of international trusteeship as a governance tool for Antarctica. In 1957 the International Geophysical Year created a worldwide research programme with a focus on polar regions, resulting in cooperative and collaborative science programmes being set up and conducted in Antarctica by twelve nations, including the original seven plus USA and Russia. In 1959 the Antarctic Treaty was signed by the twelve nations and ratified by their parliaments before being legally enforced in 1961. Any member of the United Nations can become a party to the Treaty provided they carry out ‘substantial research activity’ in Antarctica, and can then apply to erect a scientific research base (Crossley, 1995).

Figure 1 Antarctica and the Southern Ocean (Waterhouse, 2001)

Antarctica now has some 27 scientific bases and 46 countries who are signatories to the Antarctic Treaty (1959).

> *The New Zealand Government has maintained a long-term commitment to, and strategic interest in, the Ross Sea Region since the first British exploration in 1839 by Sir James Clark Ross. Maintaining a credible presence and research interest in the region demonstrates a commitment to the stewardship of the continent, and to meeting New Zealand's obligations under the Antarctic Treaty of 1959* (LINZ, 2003).

The scientific base stations of New Zealand (refer Figure 2), Italy and USA (refer Figure 3), and the historic hut sites in the Ross Sea Region fall under the stewardship of the New Zealand Government and are managed on their behalf by Antarctica New Zealand and the Antarctic Heritage Trust respectively, as any territorial claims have

been frozen under the Antarctic Treaty (1959). Consensus decisions by the Consultative Parties, who meet every year, are required for any changes to occur under the Treaty. Any activities and involvement, such as development work, has to occur within the framework of international agreements, such as international law, and comply with the requirements of the Antarctic Treaty system of governance, and the Environmental Protection Act (NZ) 1994, (Waterhouse, 2001).

Figure 2 New Zealand's Scott Base, looking towards Mt Erebus (Waterhouse, 2001)

Figure 3 USA's McMurdo Base, looking towards Mt Erebus (Waterhouse, 2001)

The following criteria form the basis of the client priorities when developing projects on these sites (Kestle, 1999):

- environmental impact must be minimal;
- scientific research is to be the prime activity on the 27 sites in Antarctica, with limited tourist activity being very strictly controlled;
- the intrinsic value of these sites must not be compromised;
- robust and reliable shelter is essential in terms of weather protection, as conditions can be life threatening;
- logistical support is essential during the construction process and intermittently at the operational stage(s);
- scale of building size and function is closely related and to be kept to a minimum in terms of area, weight (due to air transport to site), and budget;
- restricted window of constructability exists (late September to early February in any one year), with only marginal building temperatures and 24 hour daylight, hence building developments have to be capable of prefabrication for speedier assembly when on site;
- fire is the greatest threat and potential hazard;

- heating and cooling energy supplies should be minimised and retention maximised;
- accessibility for materials and personnel deliveries must meet the tight deadlines;
- budgets are always tight, as they are related to the fiscal policies of the government of the time and to the scale, nature and need for the building.

b) Kingfisher Bay Resort, Fraser Island (Australia)

The Kingfisher Bay Resort (refer Figure 4) is located on a large sand island known as Fraser Island that is free of any pathogens. It is located on the east coast of Queensland, north of Brisbane (refer Figure 5).

Figure 4 Kingfisher Bay Resort, Fraser Island (photograph courtesy of Kingfisher Bay Resort)

This site was inscribed on the World Heritage list in 1992. There are clear regulatory regimes that govern and restrict the development of these sites. Both are governed by international law, with the Australian site being governed by the 1999 Australian Burra Charter (governed by the Heritage Council), which is a national framework endorsed by the International Council of Monuments and Sites (ICOMOS) - the UNESCO advisory council on preservation of world heritage sites, of which there are 107 member nations.

Any project development has to comply with the criteria set down by UNESCO and the Australian Heritage Council (AHC), and includes the Recreation Areas Management Act 1988, and the Australian Burra Charter, which are both governed by the AHC, (ICOMOS 1999).

Figure 5 Fraser Island locality map (courtesy of Kingfisher Bay resort)

The client was the Queensland Government, and in particular the Department of Environment and Heritage National Parks and Wildlife Service (QNPWS). The value of the site to this particular client was in being able to develop this environmentally pristine site for restricted public access and be a working eco-tourism educational project. QNPWS undertake the day-to-day management of this area.

The following criteria were derived from conversations with the architects, to establish the client priorities in terms of value:

- an environmentally sensitive site development in terms of planting and built environment footprint
- an indigenously cultural focus in the design as a selling point to potential visitors,
- easy access for the construction processes and for the subsequent visitor population (now up to 300,000 per year)
- logistical support considered essential at construction and operational stages
- need to achieve 3-star comfort levels in terms of lifestyle, relaxation and entertainment, whilst at the same time being cognisant of the desire for environmentally sustainable principles at the design, construction and operational stages of the project
- a budget that was related to potential returns on investment in the project
- a customer and environs education focus.

c) Tongariro National Park (NZ) Huts and Ski Lodge sites on Department of Conservation Land.

The creation of national parks within New Zealand came from a desire amongst the new settlers to respond to the fact that large tracts of wilderness worldwide and specifically within New Zealand were disappearing (TNP Management Plan, 1990). Tongariro National Park (TNP) was essentially modelled on a United States of America concept dating back to the establishment of the world's first national park in 1872 when Yellowstone Park, Wyoming was created. National Parks were then created in Canada and Australia, followed by New Zealand. In New Zealand, National Parks are publicly owned tracts of land that are preserved in perpetuity for their intrinsic worth and for the benefit and enjoyment of the public (TNP Management Plan, 1990 & 2003).

The creation of Tongariro National Park, was however significantly different from the three preceding parks in USA, Canada and Australia in that *"the nucleus was a gift of an indigenous people"* (TNP Management Plan, 1990 & 2003).

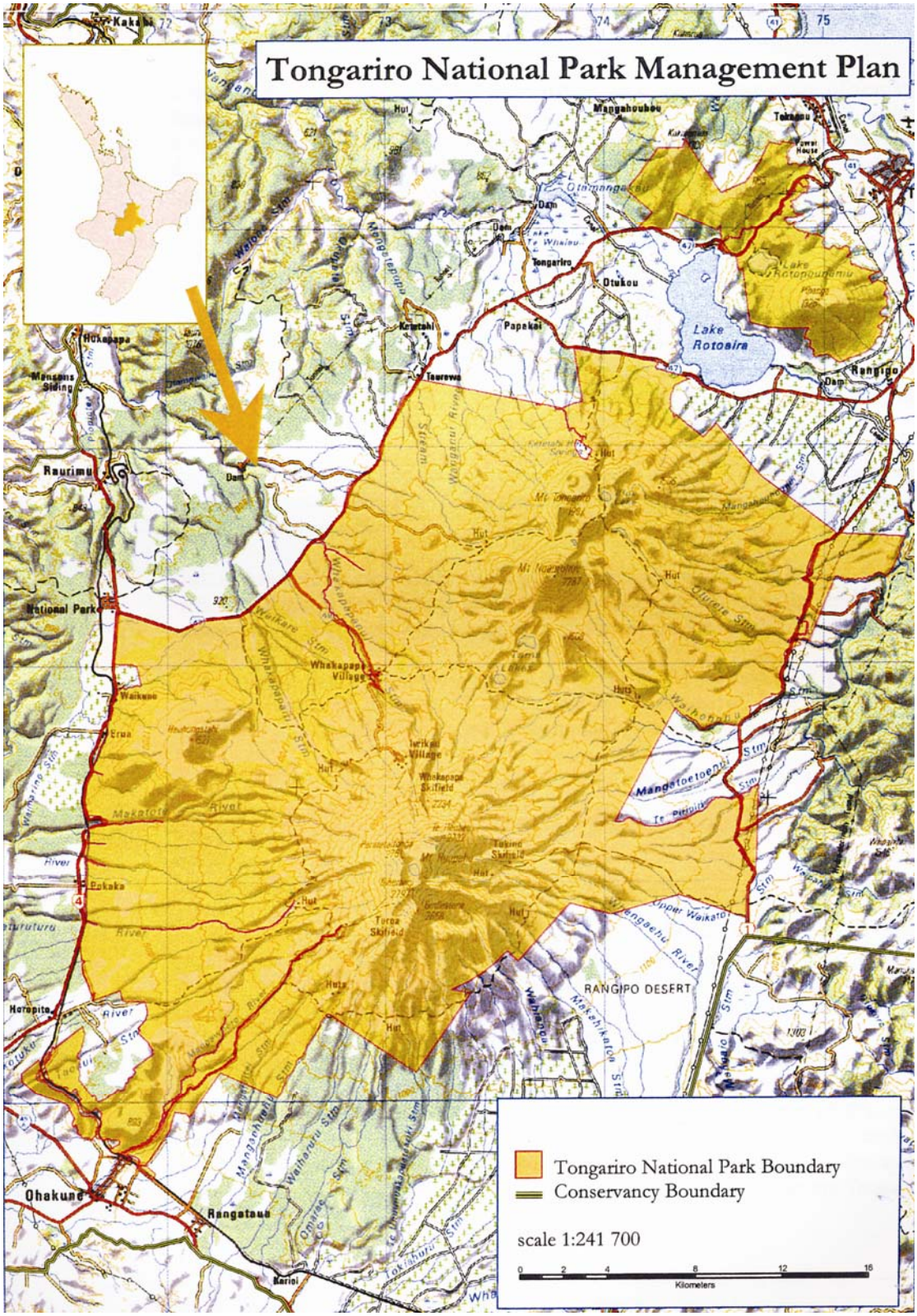

Figure 6 Map of Tongariro National Park and Conservancy locality plan

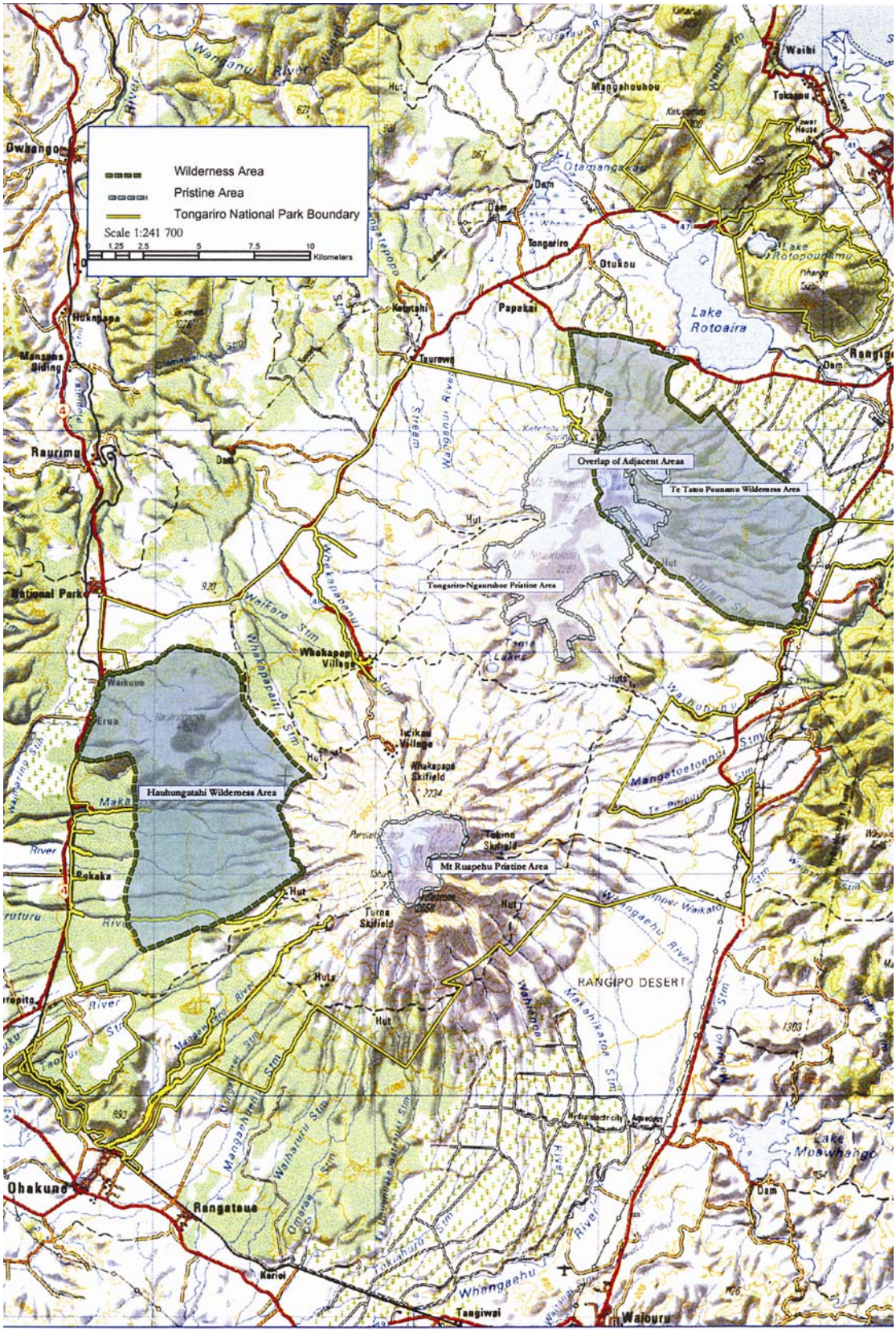

Figure 7 Map of Tongariro National Park special zones showing wilderness and pristine areas

The Gift – Te Koha – was first mooted at the Rangipo-Murimotu land hearings in 1881, where it was stated that, *"They shall be a sacred place of the Crown, a gift*

forever from me and my people." Te Heuheu Tukino IV (Horonuku), paramount chief of Ngati Tuwharetoa, 1881" (TNP Management Plan, 1990 & 2003).

Some six years later this promise was realised in fact, where, *"On 23 September 1887, a deed was drawn up in the court at Taupo in which, on behalf of his tribe, Te Heuheu Tukino IV paramount chief of Ngati Tuwharetoa gifted the summits of Tongariro, Ngauruhoe and Ruapehu to the Crown, thus initiating a process which led to the creation of New Zealand's first national park"*, and *"protected their tapu for all time"*. The gifted area amounted to 2,640 hectares, which was considered too small to create a national park by the Crown. Further land purchases were made by the Crown in the 1890s. When the Tongariro National Park Act was passed in 1894, the park area was comprised of approximately 25,000 hectares, growing further still after the completion of the legislated boundaries in 1907. (TNP Management Plan, 1990 & 2003). Tongariro National Park now comprised of approximately 79,600 hectares made up of the volcanic mountains of Tongariro (1968m), Ruapehu (2797m), and Ngauruhoe (2290m), and now included Mt. Pihanga (1325m), and the southern slopes of Kakaramea (1300m), (refer Figure 6).

> *Tongariro National Park is amongst the few sites which have World Heritage status for both their natural and cultural values .The natural landscape was acknowledged as a World Heritage Site in 1990, and its cultural values were recognised in 1993. Tongariro National Park was the first in the world to receive recognition under the revised cultural criteria describing cultural landscapes. This was advocated on behalf of all New Zealanders by Tumu Te Heuheu, at the UNESCO Conference in Berlin in 1993.*
>
> (TNP Management Plan, 1990 & 2003)

Tongariro National Park has the following attributes which are consistent with the UNESCO criteria for cultural heritage:

- contains values of outstanding universal value from scientific and conservation perspectives (refer Figure 7)
- is representative of the culture of Ngati Tuwharetoa and is vulnerable to impacts and irreversible change
- is directly and tangibly associated with events, living traditions, ideas and beliefs of universal significance
- contains superlative natural phenomena and exceptional natural beauty
- represents significant ongoing geological processes and geomorphic features.

In addition, UNESCO viewed Tongariro National Park *"as a stable site in a protective legislative framework capable of having its key attributes maintained in a pristine state in perpetuity"* (TNP Management Plan, 1990 & 2003).

Tongariro National Park is managed by the Tongariro/Taupo Conservancy of the Department of Conservation. Development and redevelopment of sites within the Tongariro National Park (New Zealand) have to meet strict guiding criteria contained within the following legislative and policy frameworks:

- National Parks Act (1980)
- National Park By-laws
- Conservation Act (1987)
- General Policy for National Parks (1983)
- Tongariro National Park Management Plan (reviewed every 10 years by DOC - currently 2003-2012 version)
- Resource Management Act (1991)
- Tongariro/Taupo Conservation Management Strategy (2002).

Visitor numbers exceed 700,000 per annum and are growing at approximately 2% per annum, (TNP Management Plan, 2003). This creates various and significant challenges in terms of managing the area to minimise environmental impact, whilst offering short-stay eco-tourism experiences.

The majority of the designated sites for development within the "on-mountain" areas of the national park have already been built on, despite difficult physical access and seasonally extreme conditions at Iwikau village (Whakapapa skifield), the around-the-mountain huts, and at Tukino and Turos skifields. Tukino at 1600m on the east side of Ruapehu for example, has just one remaining undeveloped 'designated site', but the access is difficult being via 4 or 6 wheel drive only on a roughly formed mountain road, that travels 17k in from SH1 on the Desert Road. Though further development, (and redevelopment) of the skifield areas is envisaged, this will be strictly monitored, with minimal infrastructure being created, other than that directly required under the National Parks Act (1980). The focus of attention is being moved away from the Iwikau village area in particular (refer Figure 8), to 'off-mountain' areas within the National Park in future, to minimise environmental impacts (Kestle, 1995).

The following criteria form the basis of client and DOC priorities when developing projects on these sites:

- An environmentally sensitive site development in terms of planting and built environment footprint and overall environmental impacts (both physical and visual)
- A robust and reliable shelter in terms of weather protection; conditions can be life threatening (for example, snow, gales, storms and ash eruptions), so safety is key
- That the scale of the building, its overall bulk and location, and its functions need to be closely related, and be kept to a minimum footprint area, to meet DOC and other legislative requirements
- Achieve 1-3 star comfort levels (hut to lodge), in terms of lifestyle, relaxation and entertainment requirements, whilst being cognisant of the desire for environmentally sustainable principles at the design, construction and operational stages of the projects
- The need to work with a restricted window of constructability (late November to April in any one year), due to heavy snowfall, gales, torrential rain and freezing conditions at other times
- The need for reliable access for materials and personnel deliveries, given the very difficult geographical mountain access, and a lack of locally available materials and labour, that is frequently specialist in nature.

Figure 8 Iwikau ski lodges, Mt Ruapehu, viewed from SH48

Figure 9 Tukino lodges, east side of Mt Ruapehu (Kestle, 1995)

Figure 10 Tukino Lodge, extreme winter conditions

Figure 11 Mt Ruapehu ash eruption 1995, viewed from Mountain Access Rd

Figure 12 Tukino lodges following Mt Ruapehu ash eruption 1995

4.4 Discussion in Reference to the Typological Attributes and Dimensions

The three case study projects referred to in 4.3.1 were investigated and analysed to look for empirical similarities, dissimilarities, and for any meaningful relationships that existed between the various properties and attributes as per the Kluge four stage typological construction approach. Typological attributes and dimensions specific to the three case study projects were then tabulated in a matrix under selected headings that essentially referred to the sites' geographical, physical, regulatory,

environmental, functional and design planning aspects to enable the categorisation of a range of remote sites and their particularities.

The headings selected, and as shown in Table 2, are:

- Proximity to major urban areas
- Regulatory framework
- Physical environment
- Functional, aesthetic and social aims
- Environmental impact/sensitivity
- Design, construction and logistical pre-planning needs.

Table 2 graphically identifies the attributes of the selected remote sites in terms of their properties and dimensions. Issues in common between the sites are that they are all considered to be pristine sites. In addition, their development and operational (post-development) impacts have to meet strict guidelines which are closely monitored by the New Zealand and Australian governments and their agents. Developmental activities in terms of the Antarctic sites have to be conducted in terms of supporting scientific activities or providing visitor life support for the duration of their time on the continent. Shelter and safety are the prime priorities alongside environmental impact minimisation. Scientific activities are restricted to six months fieldwork per year and cannot be carried out at any time in the protected areas designated as Sites of Special Scientific Interest (SSSI). Value, in terms of these Antarctic sites, lies in the pristine nature of the continent, and the fact that Antarctica acts as a global barometer in terms of climate change, and demonstrates the effects of global human activities on the world's atmosphere, oceans and ecosystems. New Zealand has ongoing commitment to the stewardship of the entirety of the Ross Sea Region (islands and territories below 60ºS and 150ºW), which includes the Italian, USA and New Zealand's scientific bases. The government is constantly reviewing its scientific strategies for the region, in line with the Antarctic Treaty system and associated environmental protocols. The Government's revised Statement of Strategic Interest released in 2002, which has been documented in the LINZ (2003) 'Ross Sea Region Strategy 2003-2012' document, is as follows:

> *"New Zealand is committed to conservation of the intrinsic and wilderness values of Antarctica and the Southern Ocean, for the benefit of the world community and for present and future generations of New Zealanders. This will be reflected in active and responsible stewardship, under the Antarctic*

Treaty system, that promotes New Zealand's interests in" a list of seven goals that essentially sit within the main goal of *"Ensuring that all activity is undertaken in a manner consistent with Antarctica's status as a natural reserve devoted to peace and science."* (LINZ, 2003)

Development of the Fraser Island eco-tourism resort in Australia had to meet strict criteria in terms of environmental impact minimisation and site responsive aesthetics, whilst offering visitor education on indigenous and environmental conservation.The main challenge was to manage 300,000 visitors per annum visiting this unique location, whilst endeavouring to keep the site in pristine condition.

All of the sites were remote in terms of their distance from a major urban area, with the Antarctic sites, for example, being completely isolated for up to six months of the year. Access is becoming slightly easier during the seasons of extreme weather due to advancing technology in terms of transportation and communications, but still remains a major hurdle for deliveries of supplies and personnel from April till October. The properties and dimensions of these remote sites are deemed to be unique, in part evidenced by the world heritage listings, and the development and implementation of an international Treaty protecting the sites in Antarctica. Long term protection and monitoring of these remote sites is under threat however, as a result of the increasing demand for scientific investigation, and eco-tourism. Significant for this research though, is how this empirical typological construct informs and supports the development of the theoretical conceptual management model for remote sites, in terms of categorising their attributes, and understanding the priorities and processes required when planning for the design, construction and management of projects on these sites.

4.5 Conclusions

The reasons and therefore the objectives for developing this typology for remote sites, was first to clarify the thinking around the term 'remote sites'. The first stage determined the characteristics of remote sites, and tabulated, grouped and compared the attributes (properties and dimensions) of the three selected case study remote site projects, as a starting point. The three remote sites selected represented quite different climatic regions that were geographically distant from each other, and all were considered 'pristine', and inscribed as World Heritage listed sites. The outcomes of constructing the empirical typology demonstrated the significant range of attributes,

yet also similarities of the selected remote sites, when viewed under the six headings of the typology. The headings decided on as a result of the literature and case study investigations and analysis were:

- proximity to major urban areas
- regulatory framework(s)
- physical environment
- functional, aesthetic and social aims
- environmental impact/sensitivity
- design, construction and logistics pre-planning needs (refer Table 2).

The comparative discussion of the typological attribute findings suggested that there were in fact attributes in common between the three selected remote sites that were not evident when they were initially selected, and that long-term protection of these (and potentially other) remote sites is under threat from increasing demands for eco-tourism destinations and scientific investigations. The results from the three selected case studies identified the key criteria that formed the basis of differing client and stakeholder priorities when developing projects on these remote sites, which in conjunction with the other noted findings, whilst constructing the typology, informed the development of the conceptual design management model for remote sites.

Table 2 Remote Site Comparisons (Kestle, London *et al*., 2002)

Site	**Proximity to major urban areas**	**Regulatory Framework**	**Physical Environment**	**Functional, aesthetic & social aims**	**Environmental Impact/Sensitivity**	**Design, Construction and Logistical pre-planning needs**
Antarctic sites-Ross Sea Region 4 bases	Isolated. Distances to major areas:- Sth America:1000km Australia:2500km NZ (Chch): 3850km Africa: 4000km	Antarctic Treaty (1959): 42 nations - 27 are the core base sites, within the Treaty. There is also a Protocol on Environmental Protection (Madrid Protocol 1991) + associated Environmental Protection Act 1994 (NZ) Treaty designed for peaceful and scientific endeavours (US space program) and to protect the resources from commercial gain and to keep it a continent free from military arms. Emerging regulations governing environmental sites Waterhouse, 2001)	Hostile climate, extreme cold temps, Coldest and highest continent. World's lowest temp of -89.6C at south pole. Extremely low relative humidity. Never rains. Desert conditions. 24hr daylight from Nov –mid - Feb. No access during winter months due to extremely low temps, 24/7 darkness and high winds. Temp range -5C in December – February to -35C (to -57C) in June-August. Mean wind speed at Scott Base is 6m per sec (11knots) with gale force southerlies in winter months. Ancient landmass. 2% exposed rock. Ice sheet up to 4km thick covers majority of continent (87%) and (11%) ice shelf.	Primarily scientific investigations. Emerging Eco and Historical Tourism Pristine with significant scientific profile. Research activities primarily quantitative. Aesthetics have been of secondary importance. Little thought to the human experience and the built environment except purely on a basic human needs basis related to physical survival. Threat of mineral resources exploitation averted till 2041.	Largely pristine and highly eco-sensitive Mature ecosystem Heroic Age: approx 1903-1917, explorers' huts still there. Limited access to 6 months of the year and highly restricted access to certain sites designated as scientifically significant internationally. Access to other locations is based upon the nature and approvals allocated to the various scientific programmes. Government concern re long term impacts (Wharton and Doran, 1999)	Detailed logistical pre-planning of construction phases including all equipment, personnel, materials to meet the minimal constructability deadlines due to limited access and deliveries only available occasionally by plane or ship. Specialised design and construction technology required to address extreme temperature ranges, high winds, and the unique marine and desert environment.

Fraser Island, Australia	Adjacent to Australian landmass. 270km north of Brisbane	World Heritage listed site (1992), due to unique sand ecosystem/ dune lakes geology (world's largest sand island: complex dune systems) etc. Coupled with other natural and cultural significance reasons. eg fauna (rare frogs, bats and glider species, as well as marine life) and flora ('wallum heaths') and complex peat swamps are of particular evolutionary and ecological significance, and to indigenous culture. UNESCO 1972 ICOMOS: 1999 Australian Burra Charter – governed by Queensland and Australian Heritage Council.	Subtropical, mild winters, hot and wet summers, high humidity, cyclonic zone etc Conditions are maritime subtropical with mean annual temperatures ranging from 14.1ºC minimum to 28.8ºC maximum. Rainfall is high, reaching 1,800mm on the highest dunes in the centre of Fraser Island (DASET, 1991; Sinclair and Morrison, 1990)	EcoTourism Aesthetics is critical to the resort development as is the relationship between the built environment and the total human experience. Threat of sand mining, mineral resources exploitation and various introduced fauna/flora species.	Pristine, evolving ecosystem and highly sensitive. Inhabited by Indigenous peoples: 1,200-2000 years ago, and historical significance has to be respected and maintained.	Levels of development only limited by restrictions on public access, new accommodation, and govt limits on environmental impact potential. Access limited to 'Permit' access only, and only accessible by boat, from Hervey Bay, Queensland. Detailed logistical pre-planning of the construction phases, including equipmt, personnel and materials.
Tongariro National Park NZ- huts and ski lodges	Located on three volcanic mountains, two of which are still active.	Resource Management Act (1991and amendments); NZ Building Act (1991 and amendments). National Parks Act (1980 and amendments); Tongariro National	High altitude hostile climate – 1500 up to 2300m, with temperatures ranging from 25ºC to minus 10ºC and winds from 5-40 knots (9.3 -74km/hr) Volcanic ash and lahar outpourings	Environmental protection of sites is the priority, given the levels of public accessibility. Primary activity is environmental and historical conservation. Limited levels of Eco	Limited number of sites for huts and ski lodges available on Department of Conservation (DOC) land, to minimise impacts. Whakapapa and Turoa set aside by	Limited access (4-6 months of the year). Limited number of sites for huts and ski lodges available on (DOC) land. Detailed logistical pre-planning of construction phases

		Park Management Plan (reviewed 5 yearly – latest is 2003); World Heritage Listing (1990 and 1993).	intermittently.	Tourism. Global value of site (World Heritage Listing as a National Park from 1990/1993).	government/DOC as the only commercially developed areas in Tongariro National Park.	including equipment, personnel and materials essential to meet the tight snowless deadlines. Specialised design and construction technology to address the extreme temperature ranges, high winds (at times cyclonic), and precipitation.

CHAPTER 5. DEVELOPMENT OF A CONCEPTUAL DESIGN MANAGEMENT MODEL FOR REMOTE SITE PROJECTS

5.1 Introduction

The research objective is to develop a conceptual design management model that answers the following research question:

"What are the key factors and drivers that constitute a plausible theoretical conceptual design management model for remote site projects?"

The initial planning for the model was developed in association with the development of a typology for remote site projects (refer Chapter 4).The exploratory stage drew on the key concepts and principles of design management and lean design management literature, and partially investigated three project case studies on remote sites in Australia, New Zealand and the Ross Sea Region of Antarctica, as discussed in Chapters 2 and 4, and also referred to in this chapter in sections 5.4.1 and 5.4.2. In addition the development process also involved reviewing current design management practice and supportive theories.

5.2 The need for a Conceptual Model for Remote Site Design Management

There was a collective argument amongst design management researchers, in the reviewed and analysed literature (refer Chapter 2), that there are currently shortcomings in the practice of design management. One view on the reason for this was made by Ballard and Koskela (1998) which was *"that there is a lack of solid conceptual foundation"*. As a means of addressing this, Ballard and Koskela (1998) conducted a review of state-of-the-art practice and research concepts and models, proposed a new conceptual framework of design management, and analysed the implications of this framework. They then improve called for systematic research collaboration, in order to design management, which supports this research, and in particular the development of a theoretical conceptual design management model (for remote sites) as a means of responding to this call for research collaboration to

improve the discipline of design management and provide a solid conceptual foundation for remote site design management. There were other findings in the analysed literature that supported the reasons for case study methodology in terms of developing the theoretical model, including the use of empirical data, and the way in which it could be useful as a process tool. The literature findings also supported many of the key aspects of the model development in terms of creating value for the client(s) and stakeholders.

5.3 Theoretical Contributions to the Development of the Model

One of the significant outcomes of the review and analysis of lean design management and design management literature was the important contribution of process integration and value generation to the development of a conceptual design management model for remote sites. Design management is fundamentally concerned with value generation however understanding what constitutes value is a difficult process. It is suspected that the process is not simple and straightforward, instead, design management is a complex social situation as value can be a socially constructed phenomenon and decision making to that end can be inherently unpredictable (Kestle & London, 2002).

Shared understanding towards identifying what is valued in the project impacts upon how critical decisions are made on design issues. This is an important point in the development of the design management field as it is the integration of those who have knowledge that can contribute to the design, construction and management, which is critical to developing and achieving value on projects for the client and stakeholders. Poor integration of specialist user and producer stakeholder knowledge can have far reaching consequences, such as inappropriate synthesis of the needs analysis leading to low value generation for the client and the end users. Design decision making is often negotiated amongst groups and teams – it is an iterative process. The stakeholders of value can also change through the various stages of the design, construction and occupancy stages and each group of actors may differ in perspective based upon their worldview. The power to negotiate and guide design decisions and assist with establishing building performance criteria changes at different times of the process and in many cases their voice is not heard at critical times (London,1997, London, 2002).

The more holistic approach to lean design management as explored by researchers such as Green (1994), and Garnett (1999), Huovila and Koskela (1998), and London *et al*. (2002), over the last few years identifies additional significant design management factors. These researchers refer to the importance of, and the means to achieve, sustainable development. They believed that whilst traditional design and construction focuses on cost, performance and quality objectives, sustainable design and construction by comparison, focuses on value generation, minimization of resource depletion, minimization of environmental degradation and the importance of timely information flow management. Information management can be considered from a sociological viewpoint, however it has a significant effect on production factors/processes, if planned or implemented ineffectively.

Design management is primarily concerned with value generation for the client, integration of specialist knowledge, and the timing of key decisions. This is achieved by means of an integrated team approach to the way in which the project is designed, constructed, implemented and managed, and in the case of remote site projects involves an interface between two quite different process perspectives.

The first perspective primarily involves and addresses the design phases. For example, the conceptual design phase is often marked by an iterative and creative process, which tends to be a *sociologically oriented world* where designers respond to a range of functional, aesthetic, environmental and even spiritual concerns. The second perspective primarily involves and addresses the strategic decisions that need to be made during the briefing and conceptual design stages, and how these may impact upon construction logistics and the sustainable development of the project site. Detailed design for the construction phase tends to be a *production oriented world*. In developing a conceptual design management model for remote sites, the approach aimed to suggest that there was a need for these two perspectives to interface, in order to theoretically address the way in which these remote site projects were managed in a practical sense. In order to try to create theoretical synergies between the ‘production oriented world view’ and the ‘sociologically oriented world view’ it was important to first identify and understand the underpinning principles and implementation problems of design management from current and relevant literature.

There was a significant body of literature that addressed the application of lean thinking to improving the interface between detailed design and construction production. There was little literature that offered a holistic view of how design

management for remote sites could be addressed, yet the lean design management field of research potentially had much to contribute to the design management of these remote site projects. The review of the literature indicated that much of the lean thinking has been primarily concerned with sequential production. However, lean thinking is based upon principles of *flow* and *value*, which was seen as being conducive to the complex process involved in design management for *remote sites*. The field of design management and the more focussed thinking associated with lean design management informed the development of a theoretical management model for design management for remote sites (Kestle & London, 2002). The topic of remote sites brought with it a range of other fields that could contribute to our understanding; for example international construction, online management and procurement and sustainable development. The field of international construction has in recent years emerged as a growth area, precipitated by the growth of multinationals and lowering of trade barriers which have increased globalisation of construction (Mawhwinney, 2001). The design and development process is frequently a team effort involving a number of informed and ill-informed decision makers, and is a complex natural system dependent upon initial decisions. Complex design management scenarios suggest that as areas of professional responsibility become fluid, the manner in which decisions are made by design teams becomes critical for understanding the resultant building performance (London & Ostwald, 1996). The added dimension of remote site construction increases the complexity and criticality of early decision making. The project team is required to address the traditional design problems, but also those that occur as a result of the location of the site and the team's lack of familiarity with the often uniquely social, physical, economic and sometimes spiritual criteria.

5.4 Practice Contributions from the Exploratory Project Case Study Sites to the Development of the Model

The added dimension of remote site construction increases the complexity and criticality of early decision making. The project team is required to address the traditional design problems, but also those that occur as a result of the location of the site and the team's lack of familiarity with the often uniquely social, physical, economic and sometimes spiritual criteria. Further, when there is a strict timeline for the completion of a project, for example, a restricted window of constructability and

accessibility to the remote site due to climate or other reasons, the timing of the decision to proceed toward the concept design stage and financially commit to the project is absolutely critical to the subsequent design and construction stages and completion of the project on time. The resultant of delays in making key decisions can mean that the entire project becomes unviable on remote sites, particularly where accessibility is limited by seasonal weather conditions, and where scientific projects for example, are funded for a specific twelve month period only.

The traditional lean design management principles of value stream, process integration, workflow and waste minimisation were seen to be potentially useful and applicable to remote and often hostile project sites in Antarctica, for example. These project sites are closely aligned to lean and functional production processes, as the main priorities for the client are shelter, a strict budget, tight timelines and a process driven construction programme. The development of these sites then potentially fits with the 'traditional lean thinking design management model', in terms of the sequential process and flow approach. However, under the Antarctic Treaty (1959) and the related Protocol for Environmental Protection (1991), all development projects on Antarctic sites also have to fully comply with the Environmental Protocol associated with the Antarctic Treaty (1959), particularly in terms of minimising environmental impacts. This means in effect that the traditional lean design management approach does not fully address all of the factors associated with remote site design management.

The decisions made, and the successful implementation of those decisions, by all personnel, depend on regular and clear communications, whether verbal, digital or in the form of hardcopy documentation. Clear and effective communications, whilst important on any project, become critical on remote sites, according to personnel involved on these particular projects (Cowie, 2002). Communications are discussed here in reference to remote site projects, where miscommunications may be absolutely critical to the viability and completion of the whole project, given the limited physical accessibility in many cases. Poor information management has the potential to create confused site and/or office personnel, resulting in mistakes requiring rework on an already tight timeline, costly overruns, lack of task completion on and/or off-site, and value degeneration from the client's and stakeholders' perspectives.

Given the characteristics (attributes and dimensions) of remote sites (refer Chapter 4, Table 2, and Chapter 5, Table 3), the principles and concepts of *value generation*,

knowledge integration, *timely decision-making* and *process integration* became the key factors and potential drivers of the exploratory design management model for remote site projects.

Table 3 Key factors/plausible drivers in the development of the CDM model for remote sites

Key Factors/Drivers	**Key Features**
Value generation	Value (often intrinsic and /or economic) that specific client and stakeholders place on each project and site. The 'value' expected is realized in the completed project. Primarily concerned (in this context) with 1. environmental protection of the site where public site access is restricted 2. the site's global world heritage and/or esteem value. Environmentally sensitive design approach applied to the site, at design, construction and implementation stages.
Integration of specialist knowledge (knowledge capital)	Specialist knowledge experience of remote (and often hostile) sites essential. Valuable asset in terms of design choice decision making at pre-planning stage on remote site projects. Often tacit not explicit knowledge. Process involves in depth pre-design briefing and pre-planning of construction (or aid phases), of all the specialist personnel.
Timely decision-making	Timing of financial and design decisions in particular, are critical to successful management of design, construction and implementation of remote site projects. Decisions frequently made within the context of: : 1. non-negotiable windows of physical access to the site(s) 2. buildability 3. fixed budgetary constraints 4. political agendas/directives 5. the need for environmentally sensitive development of these remotely located, pristine and often hostile sites.
Process integration	Involves construction planning methodology, logistics, information management, and the influence that the design stages have on the overall process

	management of the total project. Logistical planning and implementation complex and critical for remote sites or hours to pre-plan a mobilization. Access to Antarctic sites restricted to four months a year, and life threatening situations are the norm, means that logistical resources and their deployment need to be pre-planned up to a year ahead. On Humanitarian Aid projects there is frequently only a matter of days to pre-plan. Antarctic projects are predominantly prefabricated into their component parts (if building projects) in response to the tight timeline and adverse weather. Timing , costs and weight restrictions (for shipping or air freight)add to the logistical complexities

A design management model was needed that responded to and reflected the need for well integrated specialist design, construction and operational actors, when synthesizing the various theoretical and contextual contributions, as demonstrated in Figure 13. Alternative methods of procurement may also be, and often are, required when dealing with collaborative international stakeholders in the majority of remote site projects. This model, as already noted, was set up in terms of reviewing current practice in design management and establishing if any gaps existed in current practice and supportive theory. Design management was also reviewed in terms of production principles, sociological factors, revisiting the characteristics/attributes and dimensions of remote sites from Chapter 4, and then developing a conceptual model that identified the key factors or plausible drivers of design management for remote sites.

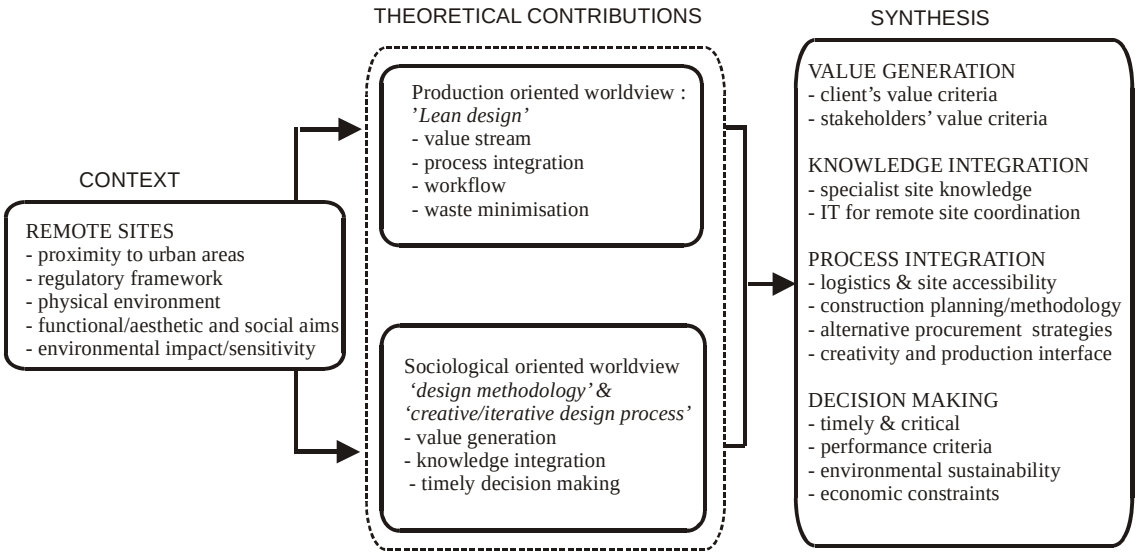

Figure 13 Exploratory design management conceptual model for remote sites (Kestle & London, 2002)

5.5 Assumptions and Limitations of the Model

1. That the projects involve international stakeholders working in a collaborative manner
2. That the sites fit with the 'remote' descriptor in terms of the attributes and dimensions of remote sites as described within the typology
3. That the projects are conducted on environmentally sensitive (and often world heritage) sites that are not easily, or readily accessible
4. That the projects are politically influenced in terms of funding and approvals
5. That the model is addressing the pre-planning and operational stages of the projects.

5.6 Conclusions

This chapter built on the gaps in design management practice that were identified in Chapter 2. The management of design and construction on remote sites, why the theoretical conceptual model is needed and would be valuable as a management process tool, are also discussed. The literature review and analysis indicated that much of the lean design management research had been primarily concerned with sequential production, and that a few authors were exploring a more sociological design management approach. The production oriented view assisted the sociological view to develop the conceptual design management model for remote sites. Exploratory case study projects, with references to other remote sites noted in Chapter

4, Table 2, highlighted the factors or drivers that needed to be considered in the development of a conceptual design management model for remote sites, which were *value generation, knowledge integration, process integration* and *timely decision-making*. These were arrived at by contextualising the typological descriptors for remote sites, identifying the contributions made by the sociological and production oriented worldview, and in turn became the synthesis described by the four factors/drivers for the theoretical model. The three sites investigated at the early stage of the research, ie Ross Sea Region scientific bases in Antarctica; Kingfisher Bay Resort, Australia; and Tongariro National Park huts and ski lodge sites, fit the sociologically oriented holistic design management model in varying degrees, and draw from the production oriented worldview of design management. The next stage was to test this newly created conceptual theoretical design management model on further remote site projects (refer Chapters 6 and 7).

CHAPTER 6. THE CAPE ROBERTS DRILLING PROJECT ANTARCTICA – A RETROSPECTIVE HISTORICAL CASE STUDY

6.1 The Rationale for Conducting the Case Study

The selection of this case study at Cape Roberts was made on its potential to represent the phenomenon of remote site design management. The Cape Roberts Drilling Project in Antarctica, was deemed to be a remote site project, as there was a lack of continuously available logistical support; the site was difficult to access in terms of geographical location, being approximately eight hours flying time from New Zealand, and several hours of overland travel time from Scott Base in the Ross Sea Region of Antarctica; the site is subjected to a seasonally hostile local climate, and there is a complete lack of local materials and local labour. All resources, whether materials or labour had to be either shipped or air freighted into Antarctica's Ross Sea Region and then transported overland with Hagglunds and sledges to the drilling site.

6.1.1 Methodology

The Antarctic Drilling Project at Cape Roberts (1995-2001) was examined and reviewed retrospectively, from data collected by the researcher using semi- structured interviews conducted with nine of the key personnel on the project. The data were then analysed within the context of the previously developed conceptual design management model for remote sites. The interviews explored the project in its entirety with the nine selected key personnel. The aim was to see how well the data matched, or added to the design management model in terms of the four key factors- *value generation; knowledge integration; process integration* and *timely decision making.* The analysis supported the conceptual design management model for remote sites.

6.2 Contextualisation/Introduction

The Cape Roberts Drilling project (1995-2001) (refer Figure 14), was initiated by New Zealand as an extension to the CIROS drilling programme in Western McMurdo Sound that can from 1974 -1986. This followed the discovery of strata buried deeply beneath the Ross Sea, and yet rising to the sea floor off of Cape Roberts (refer Figure

15), by New Zealand, the United States, and Italian seismic surveys. The camp and drill site(s) were located approximately 140km from the McMurdo and Scott Bases (over the ice). The drilling project, conducted from 1995-2001, was an international collaborative effort involving seven countries, being Italy, Germany, Australia, UK, United States, New Zealand and the Netherlands, each contributing to the scientific, management and/or operational aspects of the project. The final budget was in the order of NZ$12million. This collaborative approach created a complex regime of project personnel and tasks that needed to be sensitively integrated, coordinated, and managed.

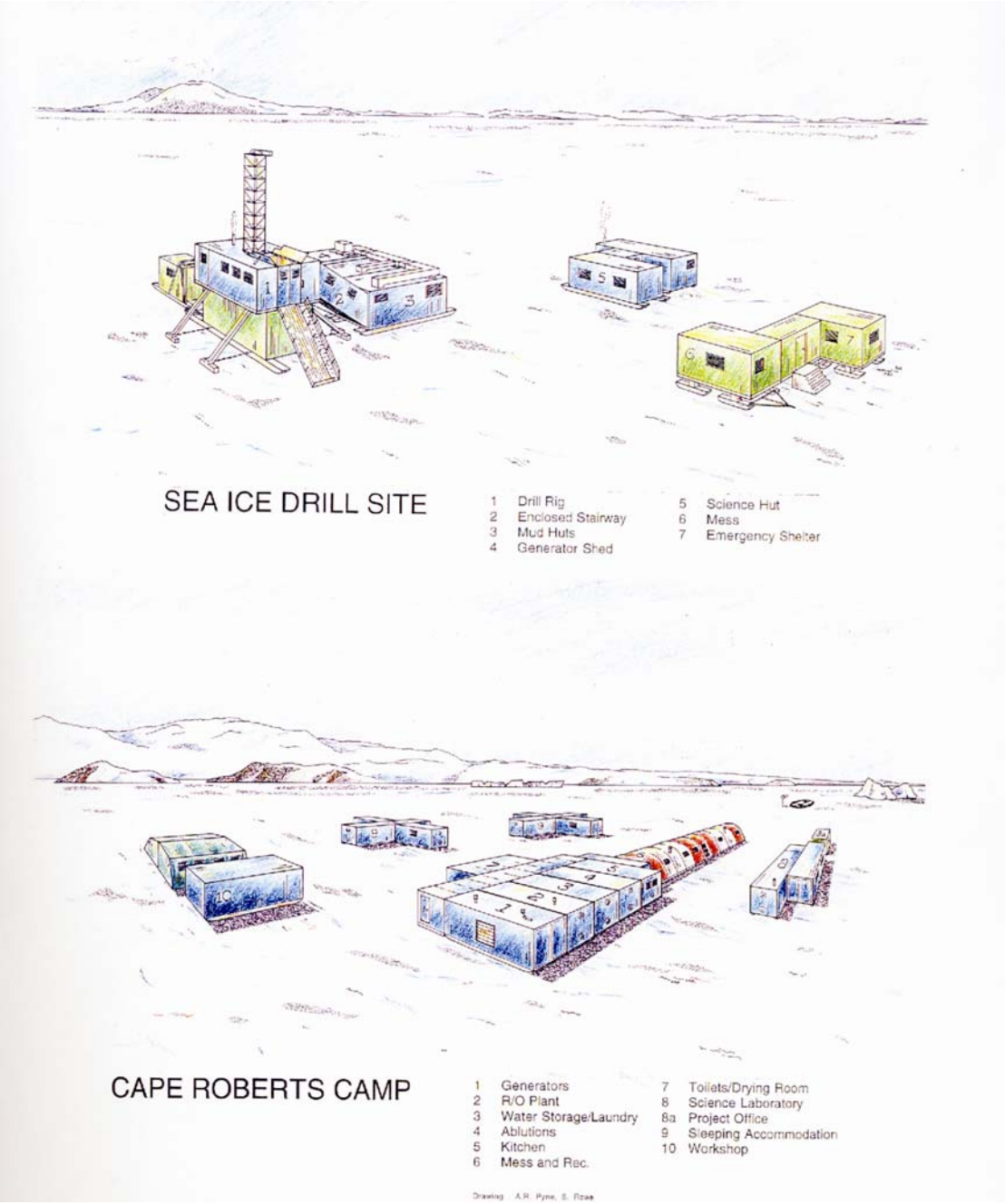

Figure 14 Cape Roberts camp and drill site (Cowie, 2002)

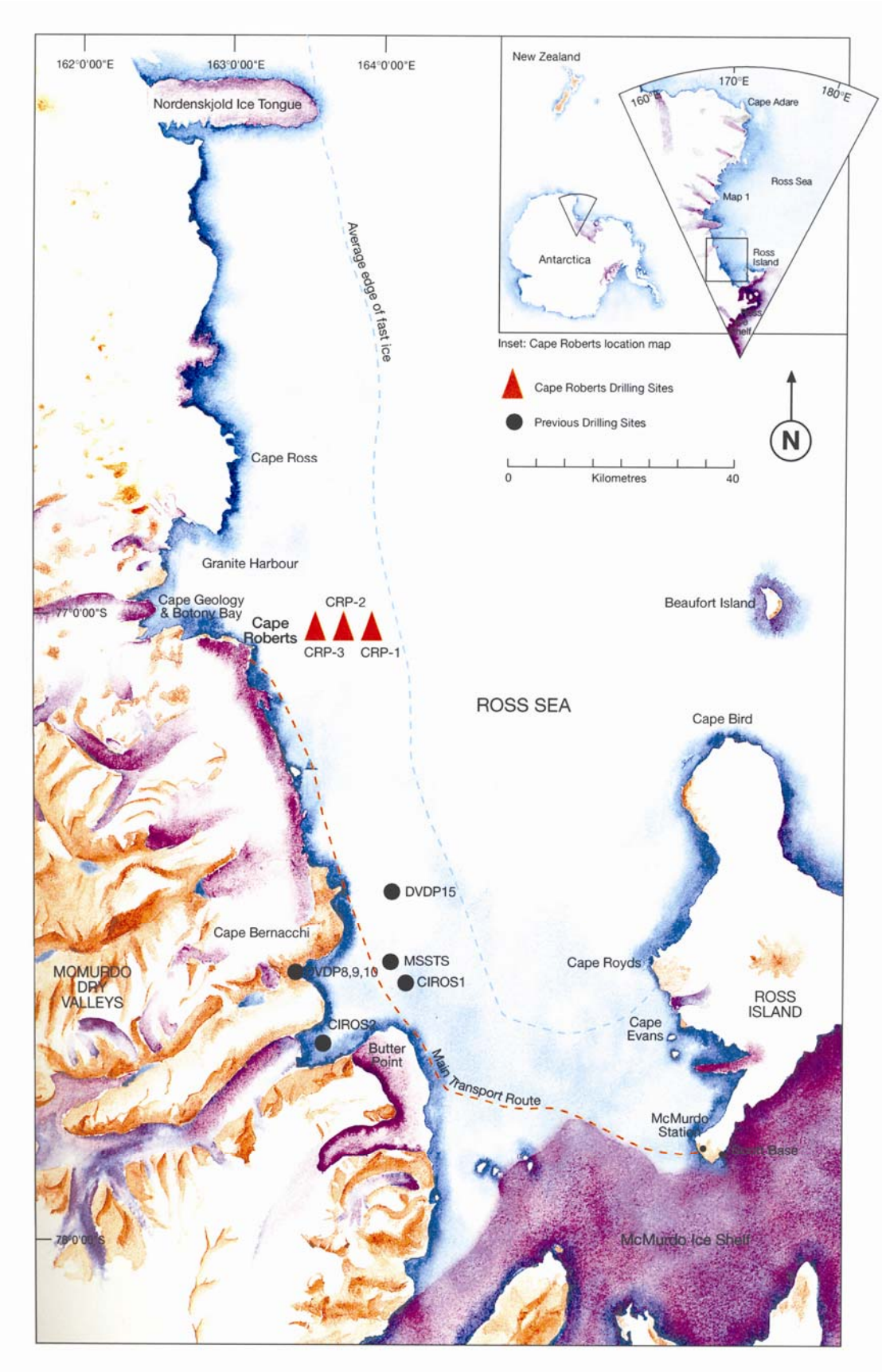

Figure 15 Cape Roberts drilling sites and scientific bases locations within the Ross Sea Region (Cowie, 2002)

The overall aim of the Cape Roberts Project was to recover sedimentary core from the 3 fast ice holes that were drilled to 500 m beneath the sea floor (refer Figure 15 and Figure 16), 13-16km off Cape Roberts (Barrett, 1993 & 2006), to improve the understanding of the climatic and tectonic history of the region. The core would provide information on the period 17-34 million years ago, however, they would have preferred to study the 0-40 million year period. The aim was to also study ice sheet behaviour, under differing global climatic conditions. The aims were further defined in 1994, by the International Steering Committee as being:

To investigate the early history of the East Antarctic ice sheet and the West Antarctic Rift System by drilling off Cape Roberts (77.0ºS, 163.7ºE) and then to completely drill a 1500m thick sedimentary succession into the western margin of the Victoria Land Basin.(Barrett, 1993)

The project addressed two main issues –

1. The possibility that sea level changes prior to 40 million years ago, were caused by the growth and collapse of ice sheets on the Antarctic continent

2. The history of the West Antarctic Rift system.

The first, offering improved understanding of ice sheet behaviour, the second – an understanding of the origin and relationships between rift mountains and basins. (Barrett, 1993)

The framework of the project was originally set out in the *Antarctic Stratigraphic Drilling- Cape Roberts Project- Workshop Report,* which was published as Report M23 by the Royal Society of New Zealand in 1992. The project was to have been carried out in three phases: The Project Planning and Camp set up phase in1995; the Drilling phase(s) from 1996-1997 inclusive and the Decommissioning phase in 1998. However, this timeframe became extended, for each of the phases due in part to rig issues and the challenges of extreme wind, temperature and snow-storm conditions (Figure 17). The final decommissioning did not eventually occur until 2001.

The success of the project has been measured in various ways. For example, the high quality of the 1.7km of rock core and the subsequent scientific outcomes, once the core had been analysed, and the way in which the project was managed by New Zealand.

"*The cores are a nearshore marine sedimentary record, 1500m thick, well-dated from volcanic ash, biostratography, Sr-isotopes and magnetostratigraphy"* (Barrett, 2006).

The scientific outcomes have been well documented, some of which have been published (for example, Naish *et al.* 2001). The detailed results from the drill holes were published in 10 issues of the Terra Antarctica Journal between 1998 -2001 (Cowie, 2002), and most recently in a special issue of Palaeogeography, Palaoecology, Palaeoclimatology (Barrett, Florindo & Cooper, 2006).

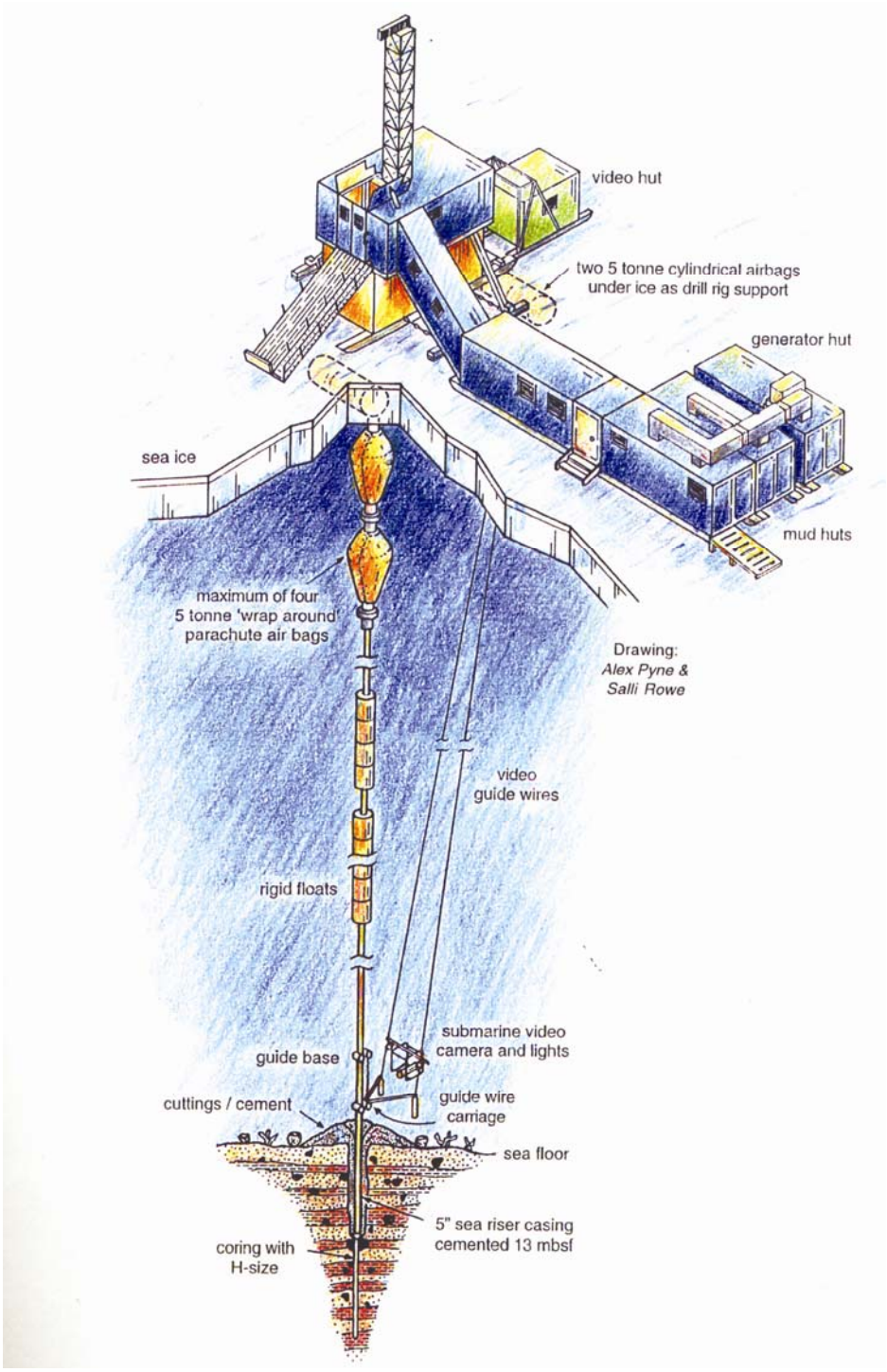

Figure 16 Cape Roberts drill site operational and technical detail (Cowie, 2002)

Figure 17 Cape Roberts drill rig and video monitoring hut in good and extreme weather conditions

6.3 The Management of the Project – the Original and Final Structures for the Pre-Planning and Operational Stages.

6.3.1 The Management Structure – pre-1996

In terms of the originally proposed management structure (Byrd Polar Research, 1993), the overall supervision of the Project was to be the responsibility of the International Steering Committee (ISC). The Logistical support for the Project was to be the responsibility of the Operations/Logistics Management Group (OMG).
The primary role of the ISC was to be responsible for all the scientific aspects of the project, from planning the project science, to implementation of those plans and then ensuring that the results were reported and documented. The decisions made by the ISC were to be consensual. The ISC was to be comprised of representatives of the Parties Contributors, who were to also serve as National Science Coordinators. The ISC could also co-opt scientific representatives from other countries on an individual or national capacity. The OMG was to be comprised of the National Logistic Coordinators, of the Parties Contributors, and be chaired by a representative of the New Zealand Antarctic Programme. The OMG was to review the logistics support requirements on an annual basis, and meet with the ISC to review completed activities, and the plans for future activities.

The New Zealand Antarctic Programme (NZAP) was to be responsible for:
1. Coordinating logistics support, and the drilling operation, including safety aspects;
2. Coordinating, and accounting to Parties Contributors for financial and other resources provided by the Parties Contributors; and
3. Developing Operational Plans for the three phases of the Project based on the requirements of the OMG (Byrd Polar Research, 1993).

The NZAP (which became Antarctica New Zealand in July 1996), was to appoint a Project Manager to manage the operations and logistics associated with the Project. This person was to also act as a point of contact for the national logistic coordinators of Parties Contributors and the Project Science Coordinator.

The original Logistics Budget for the Project was US$4million over a 5 year period. This figure was to be reviewed annually by the OMG, after the completion of each season's work. Each Party Contributor was to be entitled to a level of scientific involvement that was in proportion to their logistics support contribution (Byrd Polar Research, 1993). The actual budget, though, was a combination of cash contributions and contributions of resources-in-kind for example, helicopter and sea transportation support (Cowie, 2002).

The ISC was to use the Cape Roberts Workshop Report of 1992, as the basis for the Project Science Plan. This plan would then identify the key tasks needed to meet the Project Objectives, and also allocate responsibilities for the drilling and post-drilling programme. Each Party Contributor would then select their own scientists, and approve the Project research proposals.

The procedures for core processing, description and sampling were to be based on the previous CIROS Project, and the Ocean Drilling Programme for Leg 119 (Prydz Bay). There were also reporting and publication procedures to be followed on a progressive basis, by the scientific personnel, to and through the ISC (Byrd Polar Research, 1993).

A 'Record of Understanding of Parties Contributors to the Cape Roberts Project' was drawn up, to serve as an intention of long-term cooperation between the Parties' Contributors for a five year period. This was dated from when they agreed to the Record of Understanding. The timeframe could be increased to six years, if the ice conditions prevented drilling in one of the planned seasons (Byrd Polar Research, 1993).

6.3.2 Evolution of the Management Structure

The Cape Roberts Project (CRP), comprised two quite distinct, yet parallel parts - one being science the other logistics, both sharing the same overall objectives but having differing timeframes and critical criterion that needed to be met. In addition, there were two main phases, planning and drilling (operational).

One of the main challenges with the first and notional management structure (refer Figure 18) as published in the CRP Comprehensive Environment Evaluation (CEE) Report (January 1994), was the suggestion that the ISC be responsible for two areas where it had no direct control, that is the ISC had no budget for logistics and operations, as that came from the national programmes. Nor did the ISC have direct control, or authority, over the nominated Project Manager from NZAP. *"The ISC was central to the Project and its success, but it could not go it alone"* (Cowie, 2002). The ISC needed therefore to work with a parallel organisation, the Operational Management Group (OMG) in terms of funding the logistics aspects of the Project.

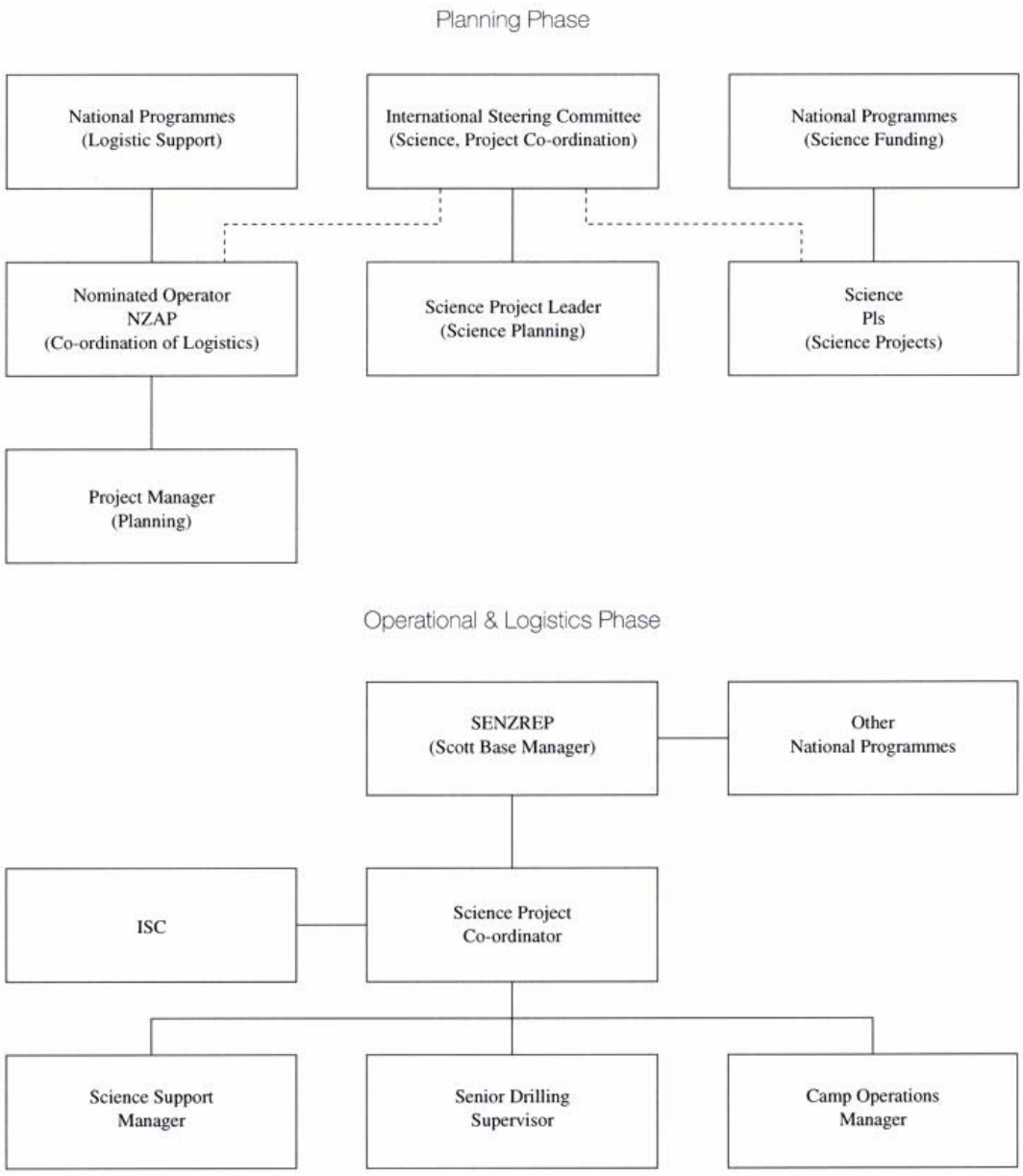

Figure 18 Management structure for the Cape Roberts Project published in the CRP Comprehensive Environment Evolution Report, January 1994

Another challenge with the CEE (1994) version of the project's management structure was that the planning and operational phases were centred on the ISC and the Science Project Coordinator. In the Planning Phase, this meant that the Project Manager (NZAP) and the Science Project Leader were only able to formally communicate via the ISC. There was no formal functional link or requirement as such, for the Project Manager, the Science Project leader or the Science Principal Investigators (PI's) to work together. (Cowie, 2002). In practice, a less formal and common sense approach

tended to prevail, and the limitations of the structure's implementation were largely ignored. However, this approach could only succeed for as long as there were no serious problems, or irreconcilable differences, between the parties.

In the Operational Phase, the challenges of the CEE (1994) management structure were, potentially, even greater, as the management plan involved splitting the scientists into two separate groupings. One group would be located at Scott Base and McMurdo Station, a relatively pleasant and safe working environment, but one which was remote from the drilling ice-face. The second group would be located 140km away, in a relatively hostile and isolated environment, at Cape Roberts. These scientists would be working immediately alongside the drillers and the support staff. They would have first-hand knowledge of conditions at the actual site, and the potential real-time expectations at any one time. There was, therefore, potential for the operational and scientific goals to be in conflict. Further, the NZAP was to be operationally responsible for logistic support and drilling operations, and needed, therefore to appoint one of their employees as a CRP Project Manager (initially termed the CRP Logistics Manager).

However, at Cape Roberts, the Science Project Coordinator, who was not an employee of NZAP, was expected to take on this responsibility, which in effect was responsibility for the total field operation.

The structure of the operational management plan needed to be amended, to remove the inconsistencies relating to operational decision-making, line management, and reporting, at such a critical stage of the overall Project. The proposed variations were adopted unanimously, by all of the interested parties, in June 1996. The agreed CRP Operations Plan (refer Figure 20)was basically a refined version of the original Washington Workshop structure (1993) (refer Figure 19).

There was an emphasis on an operational management team with recognition of the two distinct parts of the Project (science and logistics/operational) and therefore recognition of the need for joint or bifurcated leadership. Those leaders would be the Science Project Leader (later renamed the Chief Scientist) and the Project Manager. Each would report to the ISC and NZAP (Antarctica NZ), respectively. However, both would be responsible for coordinating their respective activities through, and with, the Drilling Manager and the Science Support Manager.

Each member of the management team had their roles and responsibilities clearly defined in the Operations Plan. (Cowie, 2002)

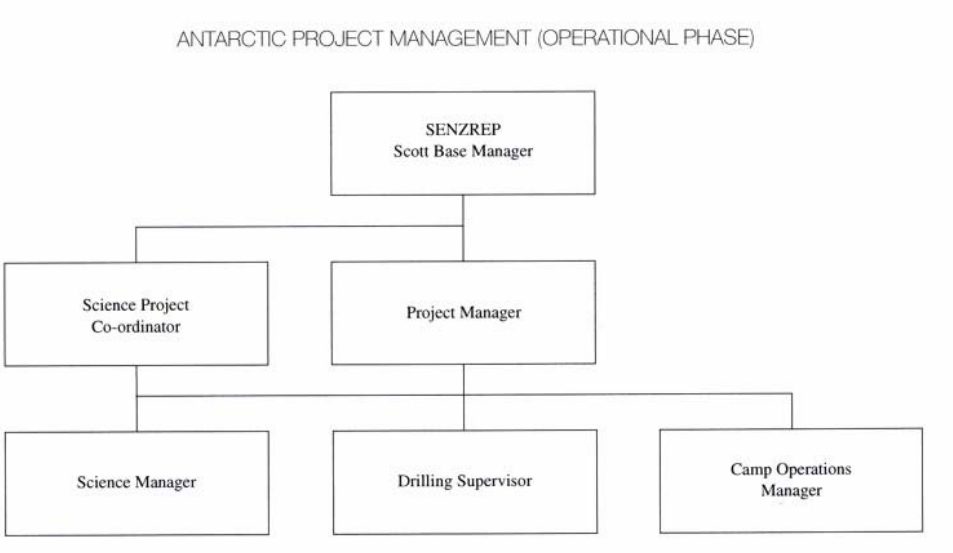

Figure 19 Original CRP management structure (1993)

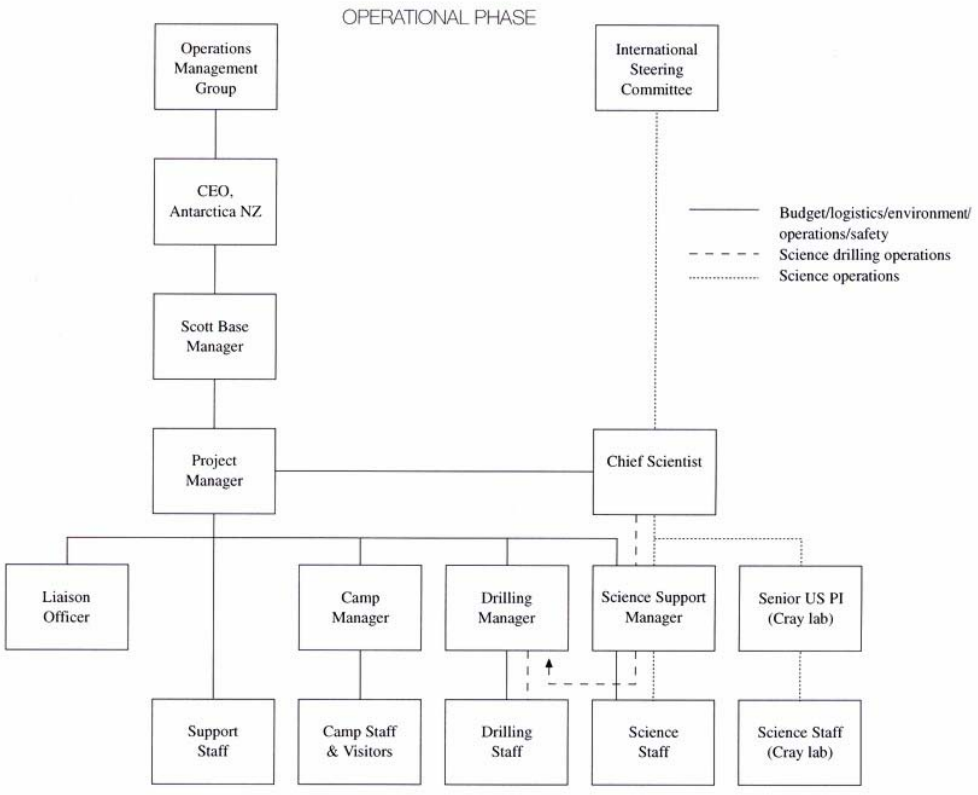

Figure 20 Management structure as adopted in the CRP Operations Manual June 1996

6.4 Management of the Environmental Considerations

Discussions regarding the environmental aspects of the project first began informally, in 1991, within the NZ Antarctic community, and later in consultation with the Office of Polar Programmes, National Science Foundation, Washington DC.

Dr Harry Keys (Department of Conservation) presented a paper to the May 1992 CRP Planning Workshop outlining environmental concerns and recommendations associated with drilling in Antarctica, under the new Protocol to the Antarctic Treaty (1991). Dr Keys recommended consultation with the international Antarctic community, and that a Comprehensive Environmental Evaluation (CEE) be undertaken.

Resultant from these recommendations, the NZ Antarctic Environmental Assessment and Review Panel (EARP), recommended the CEE process be followed, rather than the Initial Environmental Evaluation (IEE), given the potential scale of the environmental impact(s).

The final draft of the CEE was published in January 1994, and tabled at the ATCM XVIII/INFO 21. The CEE laid down the conditions that would apply, in principle, at the set-up and operational stages of the CRP. The detailed documentation was to be prepared by the CRP Project Manager, and be an interpretation of the CEE conditions.

The key conditions involved:

a) Identifying specific environmental risks and the need for these to be eliminated or mitigated by means of operational procedures and educational training.

b) Formulating a CEE compliance checklist for the key stages of the Project, to include site inspections, to gauge the level of actual compliance.

c) Setting up a monitoring programme to identify any potential and/or real long-term changes.

d) Setting up reporting systems to track compliance levels and gather generic information.

e) Creating mechanisms that allowed amendments to be made to the original CEE document (Cowie, 2002).

Following the 1992 CRP Workshop, the Environmental Risk Assessment approach was mainly concerned with mitigating the concerns raised at the workshop. The concerns were associated with the unstable sea-ice, the remoteness of the drill sites

and the perception that the scientific drilling may in fact have been explorative drilling.

> *All the drillers employed on CRP demonstrated a very positive attitude toward the environmental objectives of the Project. Had they not, they would not have been employed. The adverse impacts were identified as 'disturbance', 'destruction or contamination of', and 'cumulative impacts' on Cape Roberts itself, and contamination of the marine environment.*
> (Cowie, 2002)

The potential environmental impacts would emanate from, for example, fuel or toxic spills; equipment falling through the sea ice; noise pollution, a blow-out on the drill rig at the sea-floor, and vehicle and/or foot traffic.

Antarctica New Zealand (originally the NZAP) already had a set of operational and environmental procedures that required compliance by all approved national programme activities in Antarctica. These documents included the Environmental Code of Conduct, the Operations Manual and the Waste Management Manual. These documents were then modified, in terms of documenting the environmental operating procedures that would specifically apply to the CRP (Cowie, 2002).

The environmental compliance of the CRP to the CEE in Antarctica was the responsibility of the CRP Project Manager. However, this responsibility was delegated to the Science Support Manager (Antarctica NZ's Environmental Manager), during the operational stages at the drill site.

The Science Support Manager, in consultation with the CRP Project Manager prepared, and then conducted, the CEE Compliance Checklist; On-site Inspections; Monitoring and Environmental Reporting, respectively.

Reports were then written up independently, by the CRP Project Manager, and the Environmental Manager. These individual reports were then collated, by Antarctica New Zealand, and sent to EARP, and also to the Committee for Environmental Protection (CEP), to be tabled at the ATCM (Cowie, 2002).

6.5 The Key Project Management Recommendations by the CRP (1995-2001) Personnel

After the decommissioning of the Cape Roberts Drilling Project (CRP) was completed in 2001, the 'Final Report' was compiled and edited by Cowie (2002) and published by Antarctica New Zealand. The report drew on written contributions by the project science coordinator (and chief scientist), the science support manager and the overall project manager. Reviewing this report provided the researcher with clarity on the details of the project and which personnel to potentially select and approach as interview participants for the doctoral research. In addition the following summary of recommendations from the CRP personnel served as a basis for designing the subsequent interview questions, and provided the opportunity for direct comparisons with the collected data(2003/4) and findings, refer section 6.6.

6.5.1 Summary of the lessons learned and recommendations for future projects

1. Project Management – Structure

a) Agree a 'responsive/flexible project management structure' in the earliest stages of the project.
b) Trial the proposed management structure before the anticipated full implementation stage(s), wherever possible, to establish the potential trigger points and operational phase defects.
c) Involve all the key players and groups in the project, as early as possible
d) Employ and involve the proposed project manager/management team, at the planning or initiating phase preferably.
e) Agree realistic job descriptors, and be consistent in the use of these role/position titles.
f) Establish clearly defined dispute resolution process, at inception of the project.
g) The Management style(s) need to be responsive, and adapt to the various stages of the project.

2. Project Management – employment tactics/strategies

a) Recruit experienced Antarctic personnel wherever possible, and preferably locally domiciled in and around Christchurch.

b) Establish conditions of employment within the contracts that specifically acknowledge and recompense, the demands associated with working on Antarctic projects, such as the Cape Roberts Drilling (and now the projected Andrill Drilling Project). Within the limitations of the project's budget, institute innovative and flexible employment packages, particularly when the projects are seasonal

c) Offer incentives to 'valued staff' to return and be re-engaged the following season.

d) Institute a system of 'guaranteed payment/income' in the event of an unexpected and early project termination.

e) Provide a well run camp that affords reasonable, and reliable levels of communication with home, and office bases.

f) Make realistic and measurable provisions within the project's budget, for safety equipment and training, to encourage workplace safety and to minimise risk, on these potentially high–risk projects.

(Cowie, 2002).

3. Financial Management

a) Collaborative international projects increase the complexity of the financial and budgetary set-up phases of a project. Important for the contributing parties to understand and agree a basic set of financial guidelines/rules before the contributions are made and/or the expenditure commences. For example, agree the currency or currencies that will be used for the project, which may run for several years, across several currency fluctuations, potentially

b) Preliminary budgets need to include significant contingency sums, if they are to be used when preparing funding proposals. For example, for the CRP a 50% contingency sum would have been necessary

c) Preliminary budgets need to be accurately matched to preliminary detailed logistics, and operational planning, and so on through the various design, planning and operational stages of the project

d) Realistic and significant levels of cash flow is critical, particularly at the set-up phases of the project

e) Realistic lead-times and milestones need to be established in terms of the planning stages, which in turn need to be recognised as requiring significant time and cash inputs

f) Accurate and timely tracking of budget expenditure, which is easily accessible, is essential for good financial management. CRP for example, highlighted the need for differentiation between capital and maintenance costs and more rather than less budget codes to achieve high quality information

g) When considering managing a project on behalf of other interested parties/stakeholders, negotiate the terms under which that service will be provided, well before the commencement of any stage of the project

4. Operations

a) Detailed planning, design, fabrication, and deployment of equipment took almost two years to complete for CRP and this, set against a very tight series of timelines. More realistic timelines, or resourcing, or both, need to occur in future projects.

b) There is a significant difference between preliminary and detailed planning. Preliminary planning is concerned with feasibility studies, setting the objectives and associated milestones, applying for and securing funding, applying for CEE approvals, and establishing preliminary resourcing/logistical needs and links. A dedicated budget needs to be included for this fundamentally important phase of the project, to ensure that quality information is gathered, resulting in well informed decision-making.

c) Adjudging the need for, and timing of the recruitment of a Project Manager for a specific project, requires experience. For example, when does an idea actually become ‘a project’. This decision is of paramount importance to the long-term success of a project, as the earlier the appointment of the project Manager is made in the project, the better.

d) “*The importance of effective coordination, communication and control in all phases of project management, cannot be overemphasised”* (Cowie, 2002)

e) Ship off-loading of heavy equipment on to sea ice, is considered to be a high-risk operation. Prior contingency plans need to be drawn up and in place. The further the ships are from the land at the time of off-loading, the greater the risk, particularly in the transition zone or tide crack areas.

f) Project managers could be held liable for accidents to individuals, or the environment, where insufficient testing or trialling of equipment can be proven. Trialling equipment would minimise safety issues and ensure environmental compliance measures were met.

g) The use of fitted-out shipping containers, for camp accommodation, utilities, laboratories, and storage buildings, whilst cheap, are heavy and are not as flexible in-use as for example, purpose-made demountable structures.

h) The forecasted estimations of the number of helicopter hours support required for the CRP (2 seasons) was set approximately 20% too high. This meant that these 'resource-in-kind' contributors were potentially overcompensated by the credits attributed to them, relative to the project's cash contributors.

i) The Communications Network at CRP was considered to be totally inappropriate. The only means of communication with the original CRP-1 and CRP-2 drill sites was by open-broadcast channel VHF radio. This type of communications network is really only suited to low level operational usage, such as skifields, and is subject to strict codes of conduct and language. When potentially confidential and critical drilling, scientific and operational discussions and decisions are being made, a more discreet, yet diverse range of communication systems are required. Time and reliability of information is also of-the-essence.

   On future projects, the expectation would be that high quality, diverse and fast communications ranging from emails, fax, data transmission, telephone calls et al, and individual computer access, will be accommodated by the (pre-trialled) communications network.

j) Provisions for inter drilling operation phase maintenance, and associated budgets need to be made on future projects.

k) Projects similar in scope and size to the Cape Roberts Drilling Project should have a process and live archiving system that documents and/or records all collected data, all decisions and recommendations made. This central and live archive should be accessible to all project personnel 24/7 and be continually updated on an hourly/daily/weekly/monthly basis, as appropriate.

5. Environmental Management

a) For future projects, attention needs to be given to: Issues associated with the CEE process in terms of allowing sufficient lead times, and amendments time; the need for a separate and significant budget for the CEE process from the application preparation to the compliance and monitoring stages; the need for ownership and buy-in to the process by the stakeholders and the project personnel; on-site environmental management and associated ground-rules for

compliance inspections establishment and the perceived need to achieve balance between compliance and cost.

b) Also on future projects, the issue of Project staff and Environmental Compliance needs attention. The implementation and achievement of a CEE is only possible with the willingness and buy-in of the project personnel to embrace and involve themselves in good environmental practice.

As a footnote, the CRP drillers in particular were somewhat and unexpectedly environmentally conscientious, both in terms of their attitudes and their on-site practice.

6.6 The Cape Roberts Drilling Project - the Realities of Managing

The nine selected participants represented a cross section of the personnel involved on the Cape Roberts Drilling Projects. All of the participants were approached prior to the interviewing process, to establish their willingness to participate in this research. All agreed to be interviewed using taped verbal responses to the interview questions contained in parts A and B.

Part A involved a question related to the participants' official responsibilities that were associated with their roles on the Cape Roberts Drilling Project. Part A also involved a question regarding the main issues that arose during the project, from their perspectives, and the impacts that the issues may have had on the project and their individual roles.

Part B involved a question regarding the four key factors of the conceptual design management model for remote site projects. The question was aimed at establishing how well the theoretical model, and the four key factors therein, represented the realities of the Antarctic Drilling Project at Cape Roberts, from the nine participants' perspectives.

6.6.1 Interview Questions Part A – Associated with the Retrospective Case Study of the Cape Roberts Drilling Project.

In reference to the Cape Roberts Drilling Project in Antarctica,

(i) what were the official responsibilities associated with the key roles played by the nine selected participants, and how did these change during the course of the project;

(ii) what were the main issues that arose during the project, and to what extent did they impact on the individual and distinct role, and/or the project.

This two part question, aimed to also review the 'lessons learned' and the 'recommendations' made in the 2002 (Cowie) report, with the participants, in respect of the Cape Roberts Drilling Project for future projects, and particularly in terms of:

- The management framework and approaches
- Funding
- Pre-planning
- Detailed planning stage(s)
- Communications
- The operations stage
- Human Resources

6.6.2. Managing the Clients and Stakeholders

The terms Client and Stakeholder were interpreted differently, according to which respondent/participant was being interviewed.

The Client, as perceived by the selected interview participants from the Cape Roberts Drilling Project, was considered to be *"whoever was paying for/or driving the project"*, and this ranged from being considered to be Antarctica New Zealand (funded to support science), to the Scientists (funded to conduct the science) or the ISC (International Science Committee) who essentially wanted the 'core' to conduct the science on.

The Stakeholders, as perceived by the selected interview participants from the Cape Roberts Drilling Project, were considered to be *" the various organisations with a direct interest in the scientific 'outcomes' from the project"*, and who these were also ranged from being considered to be the 7 collaborative nations' governments, (USA, Italy, Germany, UK, the Netherlands, Australia and NZ); the NZ economy and society; the Minister for the Environment; the Minister for Research, Science and Technology; The Ministry of Foreign Affairs; Victoria University of Wellington; the OMG (Operations Management Group) and all the Antarctic Treaty Consultative partners.

The Management Framework and Approaches

According to the interview participants selected for this research, there were 'sector' managers but it was unclear as to who was, or should be, in overall charge of the project, at the operations stage in particular. There was a sense that no one person or group was in overall charge of the entire project, and this resulted in a series of challenges around communications and ongoing project expectations throughout the duration of the project.

The project management of the project was primarily the responsibility of Antarctica New Zealand, and the OMG (Operations Management Group). The OMG partially funded the logistics of the project, as a result of representing the Antarctic Agencies from each of the collaborative countries, who were providing that funding.

The responses from the selected participants were totally consistent in that they believed the management of the project did not reside solely with one person, nor with just one group. The participants were of the general opinion that they would have preferred a less fragmented management approach, as was the case at the initial stages of the project. The participants acknowledged though, that after the first year or so of operations, Antarctica New Zealand (and their appointed project manager of logistics and operations), together with the chief scientist, were seen by all of the project personnel as being the parallel/collaborative project management duo.

The Funding

In the initial stages the CEO of Antarctica New Zealand headed up the Cape Roberts Drilling Project, and Antarctica New Zealand was driving the costings of the project and feeding this information back to the collaborative countries. These costings were directly related to how much funding the Project would need, for what and when. In particular the Project needed cash, not just resource time and/or resources-in-kind. The resources-in-kind also had to have costs attributed to them in order to be equitable for the countries that provided that type of contribution. The NSF (National Science Foundation), wanted every American dollar contributed to be set against a tangible asset that could then be returned to the Americans at the completion of the project. The sourcing and provision of logistics funding and science funding were two separate activities and entities, yet the representatives from each grouping were required to work together to achieve the required and common prime outcomes.

The science funding was the responsibility of each individual country and their scientific teams. This was a challenging prospect from a project management perspective, as the scientific leadership identified certain objectives and priorities within a particular timeframe, as did the logistics and operational leadership/management, in attempting to support the scientific goals and timeframes. Given there were two separate funding streams, and differing timeframes for those funding streams to come-on-line and be utilised, a few of the project management challenges become immediately obvious.

However, the infrastructure usually evident in organisations to set up and support the handling and processing of, for example, financial matters such as loans, contributions, purchasing etc did not exist at the initial project stages.

> *Nobody had thought about how you actually receive monies from overseas, let alone set up an accounting procedure to handle those kinds of things"* (Participant E). *"At that stage we were just a branch of the Ministry of Foreign Affairs and Trade, so we had to negotiate with the accountants in Wellington regarding how to bring this money in* (to the country)…..*how do you accommodate large sums of foreign money?"* (Participant E).

The project partners were also experiencing difficulties on how to transfer money to the Antarctica NZ programme,

> *There's a story that the first cheque from the British as part of their contribution arrived in a brown paper envelope, was delivered to the Antarctic Centre, and was made out to cash, not to the Cape Roberts Project or the NZ Antarctic Programme. It went back to the post office then to the Americans and finally 3 weeks after it arrived in New Zealand, it came to me.* (Participant E).

The Pre-Planning Stages

There is a suggestion from the interview data collected that the project "grew like Topsy" and that the initial scoping exercise conducted by the client(s), the various stakeholders, and operational personnel, did not accurately describe the project that Cape Roberts later became in reality. This was due, in the main, to the fact that prior experience on a project of this complexity, scope and size within an international environment, was non-existent amongst the New Zealanders, in particular.

The Operations Stage

Communications between the scientific and logistics representatives on the project varied both in terms of the individual expectations, the nature of the communications and the timing and /or regularity, which resulted at times in miscommunications. The main cause of communicational issues was the geographical locations of the personnel. One group of scientists were located in the Crary Laboratory at McMurdo, whereas another group of scientists were working alongside the drillers and associated site personnel 140km away at Cape Roberts.

The expectations of the Science Steering Committee regarding the daily outputs and report updates, were apparently out of sync with the realities of what was possible at the drill hole sites in terms of the timing and availability of core material for scientific logging and investigation. Urgent on-site decision-making regarding the drilling process, at times precluded the preferred process of full consultative scientific involvement, prior to any drilling changes being made.

Suggestions for Managing Clients and Stakeholders on Future Projects

Chairing the OMG –

Interviewed participants questioned whether the OMG should be chaired by Antarctica NZ, when they were also the project manager, or whether it should be chaired by someone else. The fact that the Americans are the project managers, this time, in terms of the current Andrill project, was also noted by the participants.

On the Cape Roberts Drilling Project, the advantage of Antarctica NZ chairing the OMG was that those personnel were “right up with the play on all counts”, and therefore they knew what they wanted, and needed, from the OMG meetings. One of the disadvantages was that the six other collaborative project members did not have the same level of ownership in terms of the project as that of the chairing project member. The suggestion then was that there should be a rotating chair amongst the Project Country members, on an annual basis. Further, there needs to be a separate Project Manager, who attends, and contributes to, all of the meetings from the early stages of the project, but the Project Manager should not chair the OMG. The advantage of (the Project Manager et al) not chairing (and therefore controlling) the meetings, is the opportunity for direct involvement in the discussions and therefore the outcomes.

Another disadvantage, or potential issue, with Antarctica NZ being both the Project Manager for the Cape Roberts Project, and the OMG chair, was the need to be seen to be adopting an equitable and transparent funding approach when reviewing or discussing the cash and in-kind contributions from the collaborative project partners.

6.6.3 Managing the Science

The Management Framework and Approaches

The overall management and supervision of the Science aspects of the project, from planning the project science, to implementation of those plans and then ensuring that the results were reported and documented, were the responsibility of the International Steering Committee (ISC).

The decisions made by the ISC were to be consensual. The ISC was to be comprised of representatives of the Parties Contributors, who were to also serve as National Science Coordinators. The ISC could also co-opt scientific representatives from other countries on an individual or national capacity.

The ISC was responsible for creating the Project Science Plan which identified the key tasks needed, to meet the Project Objectives, and also allocated responsibilities for the drilling and post-drilling programme. Each Party Contributor then selected their own scientists, and approved the Project research proposals.

A Project Science Coordinator, who later became known as the Chief Scientist, was formally appointed by the ISC.

The formalisation and recognition of the role of the Project Science Coordinator was stated in the founding document of the project, otherwise known as the 'Record of Understanding', drawn up to serve as an intention of long-term cooperation between the Parties Contributors for a five year period. This was dated from when they agreed to the Record of Understanding. The timeframe could have been increased to six years, if the ice conditions prevented drilling in one of the planned seasons (Byrd Polar Research, 1993).

Each party Contributor was entitled to a level of scientific involvement in the project, in general proportion to their contribution to the logistics support of the project. However, the costs associated with the scientific work and attendance at meetings connected with the project were to be met by the relevant Party Contributors. Each country compiled their lists of preferred scientific personnel,

And then basically it was horse-trading, but there was still a sense of commitment to the project. For example, there was strong interest from Italy and the US, and a couple of initial clashes, in the area of paleomagnatism, but a collaborative agreement was worked out between the scientists themselves that really benefitted the overall project (Participant A).

The Funding

The science funding was the responsibility of each individual country and their scientific teams. There were two separate funding streams, being scientific and logistics/operations, and there were differing timeframes for those funding streams to come on-line and be utilised.

The scientific funding was won on application and then allocated to teams of scientists, or in a few cases to individual scientists, to be completed within a set timeframe. Failing to conduct the science and deliver the scientific outcomes within the agreed timeframe (usually one or two years duration) to the funding organisation(s), meant that the funding would be lost. The scientist would therefore now be unemployed, unable to conduct the science, and was possibly professionally chastised, as well.

The Pre-planning and the Detailed Planning Stages

In the pre-planning stage, specific science personnel involvement, and the associated proposals and processes, were dealt with by the national science coordinator for each participating country.

We had already identified the areas of science we were particularly interested in receiving proposals from, and of course, this was a negotiated process. We had people who were specialised in palaeontology, tectonics, geophysics and sedimentology, who had considerable Antarctic experience, and who were established figures in their communities and countries they came from.
(Participant A).

Scientific areas were frequently oversubscribed with at times up to 5 people wanting to do petrology, from 3 different countries.

Another group in sedimentology, which was necessarily large because we had to describe core 24/7. It was probably oversubscribed, but it was interesting, because there were two fundamentally different philosophies in sedimentology,

and we had representatives from each. By the end of the first season one group was not talking to the other, by the second season there was a better understanding and some negotiation happening" (Participant A).

The Operations Stage

Relative to the first drilling season were these quotes from a number of the participants,

> *We had planning delays, in the sense that I said, we just cannot do it in the time available, we haven't got the money, and we just haven't got the lead times to fabricate, manufacture and purchase things. I did not appreciate the grief that that caused the scientific fraternity.* (Participant E).

Most countries run on a 2 or 3 year (funding) cycle. A scientist applies for funding and, if successful, the expectation is that the science and the funding will occur within the set timeframe.

"When a project is delayed by a year for example, the scientists get out of sync, they are either unemployed or they have to apply to have the funding rolled over for a year" (Participant E).

Challenges, sometimes referred to as problems or failures by the selected interview participants, that had occurred on the previous drilling projects of CIROS1 and CIROS 2, occurred again in the first drilling year of the Cape Roberts Drilling Project:

"There were problems that we should have foreseen, and didn't. Quite significant failures in terms of mud supply, and the failure of the sea-riser, for example. There was a very fine line between success and failure" (Participant A).

Another view, regarding the scientific management at the operational stage of the project, referred to the politics and power issues that arose in the third year of the project, and the impacts it had on the otherwise cohesive team of scientists:

> *In the third year we had this senior overseas scientist, who was a specialist in our particular discipline, suddenly arrive, telling us how it was going to be, and expected because of his seniority, that we would listen to him. He fundamentally disagreed with the interpretations we had made, …and it was a majority view held by the rest of the team on a fundamental and publishable issue* (Participant A).

Given his seniority and late appointment (in the project timeline), to write up the findings, he was in a powerful position. The resultant impacts on the team were that of

frustration, and also determination to prove their case to this particular person. They succeeded.

There were successes too, though, in terms of the management and outputs of the science, and in particular that of the scientists.

> *What we succeeded at sufficiently, I won't say we did it well, was creating a community of scientists, that were actually pretty tolerant of being told what their role was, and this was an environment where the scientists had control of their own money, so they could choose to walk if the going got too tough!! The successes, well these are represented in the 10 volumes, stacked about that high, which is the product, the reporting of the project"* (Participant A).
>
> *So, the short story is that Cape Roberts really, I think, succeeded amazingly well in documenting its science* (Participant A).

"I think it works really well to have an integrated science team on the ice, getting as much done as possible at that initial stage, before you lose the momentum" (Participant F).

The Scientific Reports prepared by the 30 or so scientists on the Cape Roberts Drilling Project were peer reviewed and published in Terra Antarctica - a biennial earth science journal. Several scientific journal papers have subsequently been published from this project, and continue to be prepared and published in high profile journals such as 'Nature' and 'Geology' (Participant A).

6.6.4 Managing the Logistics

The Management Framework and Approaches

The management framework/structure evolved over time from that initially proposed in 1993, as did the safety allocations required by the project management organisation.

"The reporting lines for the project manager was another interesting management issue within Antarctica New Zealand, complicated by the fact that we had some organisational restructuring, and there were people leaving, particularly in the operations management role" (Participant H).

The expectation would have been for the Cape Roberts Manager to report to the Operations Manager, as this was an operations' task, but with the Operations Manager (personnel) changing, this was not the case. Instead a member of the OMG, who had

considerable and pertinent previous knowledge worked directly with the Project Manager. The Project Manager of the Cape Roberts Drilling Project, was initially employed by Antarctica NZ as the Logistics Manager, responsible for the total logistics operations side of the project, except for the drilling operations. These were to be conducted under a separate contract with GNS (Geological Nuclear Sciences), a Crown Research Institute. However, 1994 was a period of widespread government restructuring and GNS decided to relinquish the drilling arm of the organisation. This situation led to the Logistics Manager taking on the responsibility for the entire logistics operation, including the drilling operations.

The Pre-planning and the Detailed Planning Stages

According to the selected participants, acknowledgement or rather, perhaps, the realisation of the complexity and scope of the Cape Roberts Project as a significant and stand-alone project, was never realistically addressed or evident in the associated time allocations for planning, or in the account budget.

"There was no account, no Cape Roberts account" (Participant E).

In addition, data collected suggests that the project team may not really have understood the essential difference between pre-planning, and detailed planning, seeing them as potentially one and the same thing, involving estimates and few specifics.

> *Pre-planning I'd argue, can often be done within already existing resources in your office, or your organisational structure. But there comes a point where you've got to consciously move from preliminary planning and guesstimating, to some seriously detailed planning which is going to take people's time and expertise. It's going to start costing* (Participant E).

The Funding

Initially, it was Antarctica New Zealand that was driving the costings of the project, and feeding this information back to the collaborative countries. These costings were directly related to how much funding the Project would need, for what and when it was required to come on stream. The Project needed cash, not just resource time and/or resources-in-kind. The resources-in-kind though, had to have costs attributed to them in order to be equitable relative to the countries that provided that type of contribution (New Zealand and Italy, for example).

As mentioned earlier in this chapter, the sourcing and provision of logistics funding, and science funding, were two separate activities and entities. The logistics, and

operational leadership/management, key focus was to support the scientific goals, and their timeframes. The logistics funding came from cash, and resources-in-kind contributions from the collaborating countries. This was problematic due in the main to the conditions put on the contributions by some countries, the variable currency exchange rates, and the timing and nature of the contributions not always matching the actual equipment required and/or the transport/task timelines.

The NSF wanted evidence of tangible assets in return for their monetary contributions, that could then become American property at the completion of the project. This initial requirement, if adhered to, would have meant that other countries' contributions would have had to be used to pay for consumables, such as labour and fuel, with no right of, or ability for, a 'return' at the end of the project.

Resources-in-kind, rather than cash contributions were made by at least two of the collaborating countries, being New Zealand and Italy. These resources ranged, for example, from providing logistical support for the various project teams to providing equipment. One of the challenges associated with equipment being supplied by contributing countries was the need to establish whether the resources (for example, equipment), would match the set performance criteria for the Cape Roberts Project. One of the other challenges was establishing and agreeing the 'value' of the resources-in-kind in dollar terms, in order to make comparisons with the inputs from cash contributions. The participants identified one example of inappropriate and over-valued resources-in-kind which involved an offer to provide tents for the Cape Roberts 'site camp'. However, the tents were only single-skinned and would have been totally unsuited for the staff working 12 hour shifts, 7 days a week, in up to minus 30^{o}C conditions, and the actual value (in dollar terms) of the equipment was overstated by approximately five hundred percent. The tents were never used.

The Operations Stage

The project experienced a faltering start. After the first few weeks into the first year of drilling, the project was halted,

> *When a big storm came through carving off a huge section of sea –ice that we were perched on!! ….and the sea ice "looked suspect …we could have lost everything including, possibly, lives". We felt that the ice was so dangerous…and to have a 55 tonne drill perched out there? !! , so we gave it away* (Participant E).

The Project Manager and NZ team were criticised for this decision by one of the collaborative countries on the project, believing that *"the kiwis were being cowardly"* The reality was that the ice continues to grow through September and October, and the minimum operating standards for using a D6 bulldozer, was that the ice had to be at least 1.2m thick by around mid-September, in order to be at an operable depth by November onwards. In addition, there were planning delays associated with lead times to fabricate, manufacture and purchase resources. There was also a lack of funds. (Participants E, D and A)

Other factors that could have caused serious consequences were the assumptions regarding the force of current and tidal flow around the site. In fact when the currents were actually measured on site, they, together with the tidal flows, were found to be flowing much faster than expected.

"The drill rig was bending like a bow…and we were fearful of a break" (Participants E and D)

These events caused a total rethink of the drilling approach, particularly in terms of the sea-riser. The consequence was a $1million dollar upgrade of the sea-riser to cope with the current, before drilling recommenced the following year.

On-going sea-ice analysis based on satellite imagery was conducted every year prior to drilling operations, as the sea-ice had to be of a particular and sustainable thickness for the drilling operation to commence and continue for the whole season. In the first season the forecasted situation was that there would not be sufficient sea-ice for the season and the drilling was deferred. The fact that sea-ice information was an ever changing snap-shot scenario that could alter significantly over a short period of time, or between adjacent sites, was not always fully understood or appreciated by scientists new to Antarctic drilling programmes. *" (Antarctic) drilling is a continuous problem…you are constantly problem-solving"* (Participant D).

Further, and reflecting on the topic of the Cape Roberts drilling operation pre-planning, Participant D stated that,

> *We started off drilling at Cape Roberts believing that we knew more than we actually did from previous drill holes* (on the CIROS project), *we were really drilling in a new area, far away from the previous holes, and we should have expected more variability, so we did not quite plan for it the way that we could have. The whole strategy of drilling changed as we drilled one hole and found we hadn't gone deep enough, we then knew that the next two holes*

> *needed to be deeper and that the drilling system did not have quite the level of flexibility to allow us to drill deeper. The change in strategy was very successful…slightly different to what the scientists expected, but we got the results* (Participant D).

Communications

Communications between the scientific and logistics representatives on the project varied both in terms of the individual expectations, the nature of the communications and the timing and/or regularity. This resulted at times in miscommunications. From a project management perspective, one of the major priorities is safety, and this was not always understood or acknowledged by sectors of the project personnel.

Oversights, misunderstandings and miscommunications between the various Antarctic programme personnel on the project, meant that there were, at times, very tense periods, often fuelled by the realities of time and financial constraints and differing priorities and expectations.

> *Every project is going to be different, but I cannot overemphasise, and particularly in the early stages, of trying to understand the cultures that come together in projects, particularly the more remote you are. Once you go operational, you are living in each other's pockets so to speak. It has everything to do with the way you set up the structure down there…even down to how you set up the accommodation, sleeping and eating arrangements, all those sorts of things become quite important* (Participant E).

The way in which communications are conducted on and between Antarctic projects has changed over the last few years. Antarctica is now a part of world-wide communication globalisation that includes computers, internet, email and cell phones (Participant D). Expectations of project and stakeholder personnel have changed and increased as a result.

The Science Steering Committee expected twice daily updates from the drilling site regarding progress and outputs from the 'drilling hole'. There was a very high expectation, not only from the scientists but from all personnel for regular, reliable and up to date contact with other project personnel and family *et al*.

The *scientists at the Crary Laboratory* (at McMurdo Base) *didn't think that they were getting enough information, and this added a significant amount to the workload"* (Participant D).

Human Resources

In terms of the operational stages of the Cape Roberts Project, there was a drilling operation with the associated scientific and technological drilling expertise required, and then there was an Antarctic operation, which involved all of the support staff, before, during and after the operational stages of the project.

The logistics staff employed by Antarctica New Zealand on the project were essentially the drillers and the support staff. The support staff ran the camp, maintained the vehicles and equipment, and this included an electrician, engineer, plant operator *et al.* All had field experience in Antarctica, which was an essential requirement of their employment, as was a "passion to be there".

The drillers came from all over the world and from a range of drilling disciplines, to work on the Cape Roberts Project. Many had differing experiences and expectations to those that were associated with or required on Antarctic programmes, for example the supply of, and responsibility for equipment, and the "ways of working".

> *On the Cape Roberts Project, some of the senior drillers, needed an explanation as to why they had to take responsibility for something that normally in PNG or Australia, they would not have had to, as the client (running a mine, say),would usually have looked after that aspect"* (Participant D).

Whilst there was a work culture of "just working until the job got done", overworked staff became an issue, according to the interviewed participants. This was due in the main, they suggested, to a budget blow-out, which was basically linked to there being an initial unclear picture of the scope and complexity of the project.The resulting tight budget precluded the employment of extra staff, thereby exacerbating the situation further (Participants E, J and C), and did not measurably alter the fact that all of the staff had to be managed in a manner that would result in an harmonious team effort for the common goal–ice core for the scientists.

Participant D then reiterated an earlier view that,"*The big advantage we had on Cape Roberts, was once again, the operation side only had to answer to a small group of people…"*

According to a number of the participants, there was a big difference between the approach that New Zealand took to logistics staffing in comparison to that taken by other countries. The participants suggested that the New Zealand programme prided itself on having people that had good all-round skills, albeit a nucleus of multi-skilled

people that were employed on previous Antarctic projects and therefore added to a level of continuity between projects.

6.6.5 Managing the Design and Fabrication Process

This stage of the project encompassed specific engineering design and fabrication of specialist equipment, to support the drilling and scientific personnel, in particular. The design and fabrication work included manufactured or pre-fabricated shipping container accommodation units that had to be manoeuvred to and between sites; transportation sledges; drilling rig(s), and a number of associated engineering/scientific componentry that varied in scale from minor to significant. The engineering design personnel comprised a small group of specialist structural, mechanical and electrical engineers and draughtspersons.

The key design factor associated with every component was weight, and this significantly affected many, if not all, decisions regarding approximately forty items of equipment/componentry for the project, over the various drilling seasons. Certain items could not be airlifted to the site, as the maximum lift for a helicopter was 500kg per item. The drilling rig and associated casings and draw rods *et al*, weighed in excess of 40 tonnes and had to be sledged, on a sledge train to the site, and then attached to the sea riser via specially designed floats, so as not to be lost through the sea-ice.

The engineering support for the project then,

> *Was to provide the equipment with which the other parties could do the various things that they have been commissioned to do. Our role was to provide whatever mechanical equipment that the drillers' believed might make the drilling operation safe, or safer and provide warm accommodation, that was easily moved, and that was safe* (Participant B).

The Management Framework and Approaches

The role of a designer requires an ability to think creatively and three dimensionally; respond to, at times incomplete design briefs from the client, work with people who tend to see the world in black and white and meet tight timelines, at minimal costs, but not compromise on the required quality standards. The management structure that works best for most designers is one where there is a level of mutual trust, and understanding between the client, the project manager and the designer. This then

frees the designer to do what they are best at, conceptualising an idea right through to the reality of the finished item(s). The manager needs to be aware and understand how the design process works, and that there needs to be time made available for reflection on the part of the designer, in addition to the time spent actually creating the concept. On the Cape Roberts Drilling Project, the major equipment requirements were clearly defined and the designer was able to work unhindered, preparing the best design solutions for the componentry or equipment brief, until the completed designs were delivered, within the timeframe and at a very competitive price, according to the participants. The same respectful and realistic management approach applied, when additional equipment and componentry was necessary as the project progressed. Such an arrangement tends to be unique and needs to be acknowledged as such.

The Funding

Issues around the timing of available funding for manufacturing equipment were referred to by several of the participants. The relationship between scientific outputs and the need for funding up front was more readily understood and supported by the stakeholders, than the need for funding up front for the design, fabrication and purchase of equipment to conduct and support the scientific research.

> *Funding is the thing that can kill flexibility. When they start asking you, well why do you need two, when one will do? Sometimes you can answer that sort of thing, if you lose one down the hole, drilling will not start again until there is a new one. Sometimes it is more complex. Basically we needed options, as we might for example, be drilling into soft or hard rocks. Those are relatively simple justifications. They become a lot less simple when someone sees that as a cost of say $100,000 for having a piece of drilling or electrical equipment, 'just in case'* (Participant D).

Another aspect of funding is the expected life of the equipment being purchased, or designed and fabricated. The questions asked include whether the equipment should be designed to last one year or ten years.

> *For Cape Roberts, quite a lot of the equipment was hired, even the drill power pack was hired. We had to build specific equipment, but the Cape Roberts Project had a limited lifetime, so many things were done efficiently and cheaply in terms of that lifetime. It's a continuing battle to try and justify*

spending another 10% on something so that it will last ten years rather than just three (Participant D).

This participant then went on to explain the differences in expectations between oil and minerals industries investors, and the realities of government organisations funding drilling to support global science in a marine environment.

"To drill in a marine environment, we have got specific requirements and we are using certain parts of the oil industry knowhow, technology, and equipment" (Participant D). Investment in the oil and mineral industries is very high, and the returns are huge, for these high risk operations.

"*It's an industry where they expect to put big money in, but potentially their return is going to be very high. This does not sit well with science and with government organisations, and government funding, as they do not normally fund high risk ventures"* (Participant D).

According to the various participants, the national operators in Antarctica realize that working in a remote area generates additional costs, but the international collaborators familiar with the oil industry needed to be the convinced on a continual basis, item by item and event by event, regarding the seemingly high ongoing costs of particular equipment.

One of the key realities that impacted on this situation was the time between conducting the budgeting exercise to actually purchasing particular equipment. In some cases this may have been a year, and in that time the relativity of the US and New Zealand dollar exchange rates can and did alter the purchase price of the 'oil industry' equipment by up to 100-150% (Participant D). In a few instances second hand equipment was purchased, or equipment was hired, to reduce costs.

"The whole project was funding restricted, so for anything that we designed, we were always trying to provide a result that was simple and sufficient to do the job, but not a Rolls Royce solution " (Participant B).

Participants A and D identified a further funding related issue involving risk, and risk mitigation associated with equipment and sea ice operations specific to the operational stage of the Cape Roberts Project. This related to the fact that a piece of equipment could be airlifted to Antarctica in a matter of days from Australia, the USA or New Zealand, but this did not mean that the equipment would arrive at Cape Roberts when required. The trip from Scott or McMurdo Base to Cape Roberts could take up to a week or longer at times, due primarily to weather conditions. Losing 'the drilling

hole' during this downtime was always high risk, and a second chance would not always be possible in that current season.

> *In many cases, especially if you are making risky decisions and trying to identify where the big risks are, and where the funding has to be directed to ensure that you reduce those risks, it is actually very difficult sometimes, and part of that is driven by funding. For example, if you are coming from different positions, where some people are saying – we need this piece of equipment, we cannot afford, not to have it, whilst other people are saying that we cannot afford to have it because we do not have the money* (Participant D).

From the New Zealand's national designers' and fabricators' perspectives however, the invoicing phases were straightforward by comparison, as they were handled in a progressive manner, based on the budgeted estimates and were at all times within budget, completely transparent, and defensible in terms of their documentation (Participant D).

The Pre-Planning and Detailed Planning Stages

This can be described as the pre-design and pre-operational stages, when relevant investigative work was conducted, including the planning and forecasting that was required in terms of for example, whether there would be helicopter transport available, when required, for the various components or equipment to be delivered to site. On the Cape Roberts Drilling Project this pre-planning process took approximately a year to complete, *"often requiring some very hard decisions, definitely the right ones, there is no two ways about that"* (Participant B).

The pre-planning stage for the accommodation units, involved doing a cost comparison between using pre-fabricated 'Bondor-type'/'Portacom' buildings that were to be constructed using insulated wall panels, and second hand insulated shipping containers of comparable size. The cost per unit for pre-fabricated buildings (1992 prices) was $10,000, whereas the insulated shipping containers could be purchased for around $2,000 per unit, but they needed a coat of paint.

The cost advantages were immediately obvious, given that there was a requirement for 30-40 containerised buildings for the Cape Roberts Camp. These units needed to be transported on purpose designed sledges. Initially the proposal was for the sledges to be fabricated using bolted connections and this would have cost approximately twelve thousand ($12,000) per unit sledge. However, by welding the sledges together

the price per unit sledge dropped to around $5,000 per unit. (Participant B). This outcome fits with the notion that innovative solutions are frequently the norm concerning New Zealand designers across many if not all disciplines.

The pre-planning stages for the drilling operations, involved a range of people whose main task was to ensure that the scientific, drilling and operational aspects of the project would provide the best possible core and information to the scientists. This meant working very closely with the scientists to clearly define and prioritise their expectations and needs, and with the drilling personnel to establish how and whether these expectations could be achieved, what equipment would be required, set against a pre-determined timeframe. As mentioned earlier in this section under funding, oil industry equipment was purchased or hired given there were some similarities in the drilling tasks.

The design of the camp set-up of the operational drilling stage was planned and agreed in conjunction with the scientific pre-planning design stages as both involved being set up on sea-ice. References to, and use of, the significant amount of research conducted by new Zealand's Antarctic scientists and technologists regarding sea-ice behaviour, salinity measurements, temperature gradients, and current flows (direction and speed), in the proposed core drilling areas were essential. Data regarding current speed, in particular, was (and continues to be) considered very important, when planning and designing the drilling operations. They would prove pivotal to the success and/or failure of the entire drilling operation and the subsequent supply or non-supply of core, over the three main drilling operations, associated with the Cape Roberts Drilling Project.

In fact when the currents were actually measured on site, they, together with the tidal flows, were found to be flowing much faster than expected.

"The drill rig was bending like a bow…and we were fearful of a break" (Participants E and D)

As already mentioned in an earlier section of this chapter, these events caused a total rethink of the drilling approach, particularly in terms of the sea-riser. The consequence was a $1million dollar upgrade of the sea-riser to cope with the currents, before drilling re-commenced the following year.

Operations Stage

There were two distinct yet inextricably linked parts to the design and fabrication aspects of this project, from a management perspective. Firstly, there was the Drilling Operation running on site at Cape Roberts on the sea-ice. Secondly, there was the engineering support team of designers, including structural, mechanical and electrical engineers, who were initially engaged at the pre-design stage right through to the completion of the operations stage.

Once the power generation, water supply and waste disposal systems had been established at the Cape Roberts Drilling Camp site the design work involved mainly structural or structural-mechanical items, on an 'as-needs' basis.

> *I received enquiries, at maybe monthly intervals. When they were on the ice the telephone, fax or email would say, "Do you think you can come up with an object to do this or that". So we would then go back through the design, approvals and procurement processes all over again. It happened like this for approximately 40 objects/ items for the project* (Participant B).

The primary role at the drill site was to ensure that quality core was being produced for the scientists in a timely fashion.

There were a limited number of personnel involved at the site (scientific and drilling), or at the design office, all of whom were multi-skilled people, and this contributed to knowledgeable, effective and efficient decision-making as problems arose, according to Participants B and D. The suggestion being that if there are too many people involved in the decision-making process who do not have an overview of the project, then the resultant may not be fit-for-purpose, nor responsive to the problem.

Communications

These were considered by a selection of the designers to be *"as good a system as you would get anywhere"* in terms of telephone, fax and email facilities from New Zealand to Scott Base at that time. Documentation transfer was by fax. PDF was not yet available at that time,

"if we could not reduce it to A4 and fax it, it had to go by mail. One deficiency, and it was a real deficiency, was that they did not have access to digital cameras, initially" (Participant B).

Photos taken by project personnel have apparently disappeared without trace, so there are only about twenty digital photos on record that relate to the structural design aspects of the project.
Similarly, the documentation was prepared using manual sketching and draughting methods. AutoCAD was not widely used in the early 1990s, and digital information storage had not been generally introduced nor adopted by design organisations. There were however excellent paper trails, and paper records.

Human Resources

Human resources on the design and fabrication stages of the Cape Roberts consisted of a handful of very specialised personnel, who have had many years experience with previous Antarctic projects. This raised questions for the researcher regarding the need for 'successional planning'. In discussion with the various participants involved on this project in 2003 and 2004, apparently this topic had been thought about, in some cases discussed, but nothing had yet been formally planned nor implemented, in any of the key disciplines or roles.

6.6.6. The Managed Teams on 'Being Managed'.

The Management Framework and Approaches

The expectation would have been for the Cape Roberts Manager to report to the Operations Manager, as this was an operations task, but with the Operations Manager changing, this was not the case. Instead a member of the OMG, who had considerable and pertinent previous knowledge worked directly with the Project Manager.
Over time this situation evolved, as was discussed in Chapter 6.3.
Participants C and G were employed as support staff by Antarctica New Zealand for the duration of the Cape Roberts Project, on a year by year basis, and both referred to the 'differing rules' for the personnel at Scott Base compared with those at the site, and how this created communications and HR issues, amongst the teams in the first year of operation in particular.
The contractual arrangements meant that staff were on call 24/7, commencing work at 5.30am and finishing at 8.30 at night on a typical day, and that was for the whole drilling season of October to December.They were often working in minus 30-40 ºC temperatures during the set-up phase, prior to the drilling season commencing.

The main issue for the site support staff was the level of remuneration being offered. To put the matter in context, prior to the start of the Cape Roberts Project there had always been more people in search of work on Antarctic projects as support staff, than were ever required. This meant that supply exceeded demand and remuneration levels could be set quite conservatively. When the Cape Roberts Project came on line there was in fact a shortage of suitable applicants, and there was a need for support staff with previous Antarctic experience. Using the Scott Base Staff remuneration levels was considered inappropriate, by the interviewed participants,

> *We nearly did not go that first year, because it wasn't worth it, we were going to make more money here in NZ than they were offering. They were not taking into account the location, or the previous Antarctic experience. They couldn't do without us, but they had no idea what the private world was paying, I mean, in the drilling world the money was, and is phenomenal .They were expecting us to do the same work as we would do on a drill site platform but get paid the same as support staff at Scott Base* (Participants C and G).

The situation regarding more realistic levels of remuneration was resolved satisfactorily before the second year of operation commenced, and *"by the end of the project things were a lot better, we even had a day off here and there"* (Participant C).

There was considerable support voiced by the participants for the Project Management personnel, as managers, when reviewing the Cape Roberts Project period as a whole. The support staff, or any staff working on a project such as Cape Roberts, not only had to have the right experience, they had to be able to work well with other people in a difficult environment according to several of the participants, *"You do not have to be the smartest* 'professional' *in the world, you just have to fit in well"* (Participant G).

Another issue that came up in the first year of drilling that was later resolved satisfactorily, was the lack of awareness and compensation for the staff who gave up their jobs to work on the Cape Roberts Project, and then when the project was terminated for the year because of the huge storm, these people had no immediate /continuance of work or income. This was particularly true for those staff from Papua New Guinea and Australia.

The scientists too, struck problems as their funding is usually only for one year. When the project was postponed/stalled in the first year of operations, this impacted on the scientists' ability to do the science within the funded timeframe. Resourcing was

considered an on-going problem, both financially and labour wise. The nature of the people employed, meant that the job got done no matter how many hours they had to work, as they obviously were professionals who took pride in their work and had a strong work ethic.

Reporting lines were clear but the line managers were not always available due to the heavy workload everyone on the Cape Roberts Project team was under. This had two main outcomes, one was that decisions were often made on the site on an as needs basis, as time was of-the-essence, without waiting for every necessary approval prior to an action. This also meant that the line manager(s) were not always up with the play regarding the decisions being made on site on a daily basis. Trust and delegation is necessary in these instances, together with a no-blame working environment.

6.6.7 Summary of the Keypoints from CRP Interview Questions Part A.

The Management Framework and Approaches realities and issues according to the participants on CRP were that :

- The management of the project did not reside solely with one person, nor with just one group, no one person was in charge, and this was unavoidable and had benefits and disbenefits
- Fragmented management in the initial stages was disruptive, but after the first year of operations, this was largely resolved when Antarctica NZ (and their Project Manager), and the Chief Scientist, were seen by all project personnel as being the collaborative/parallel project management duo.
- The ISC was responsible for creating the Project Science Plan (the tasks) and allocated responsibilities for the drilling and post-drilling programme. Each consultative party contributor then selected their own scientists. The numbers selected were generally in proportion to their contribution to the project's logistics support.
- The reporting lines for the project manager within Antarctica New Zealand, complicated by the fact that there was some organisational restructuring occurring, and there were people leaving, particularly in the operations management role.
- 1994 was a period of widespread government restructuring and GNS decided to relinquish the drilling arm of the organisation. This situation led to the

Logistics Manager taking on the responsibility for the entire logistics operation, including the drilling operations.

- There was a uniquely rare level of trust afforded by management to the equipment designer, on this project. This meant that the designers were able to work unhindered, preparing the best design solutions for the componentry or equipment brief, until the completed designs were delivered, within the timeframe.
- The main issue at the early stage of the project for the site support staff was the level of remuneration. There had always been more people in search of work on Antarctic projects as support staff, than were ever required, and pay rates were low. When the Cape Roberts Project came online there was in fact a shortage of suitable applicants, and the remuneration levels had to be increased to attract (the right) staff.

The Funding realities and issues according to the participants on CRP were that:

- The sourcing and provision of logistics funding, and science funding, were two separate activities and entities, with differing objectives and timeframes, yet the representatives from each grouping were required to work together to achieve the required and common prime outcomes.
- The infrastructure usually evident in organisations to set up and support the handling, and processing of for example, financial matters such as loans, contributions, purchasing *et al* did not exist at the initial project stages, hence transferring money to the Antarctic programme for the project was difficult.
- The NSF (National Science Foundation), wanted every American dollar contributed, to be set against a tangible asset that could then be returned to the Americans at the completion of the project, and this was considered impractical and unwarranted.
- There were challenges associated with equipment being supplied by contributing countries, and there was the need to establish whether the resources (for example, equipment), would match the set performance criteria for the Cape Roberts Project.
- There were other challenges of establishing and agreeing the ‘value’ of the resources-in-kind in dollar terms, in order to make comparisons with the cash contributions. The participants identified one specific example of an

‘inappropriate-for-purpose’, and over-valued ‘resource-in- kind’ and that was the tents for the Cape Roberts Camp.

- There was a need for funding up front for the design, fabrication and purchase of equipment (and spares of equipment) to conduct and support the scientific research, was not readily understood nor supported by the stakeholders.
- Key realities impacted on this situation for example, there was the time between conducting the budgeting exercise to actually purchasing particular equipment. In some cases this may have been a year, and in that time the relativity of the US and New Zealand dollar exchange rates altered the purchase price of the ‘oil industry’ equipment by up to 100-150%. In a few instances, equipment was hired, to reduce costs.
- Funding related issues involving risk and risk mitigation associated with equipment and sea-ice operations, were related to the fact that a required piece of equipment could be airlifted to Antarctica in a matter of days from Australia, the USA or New Zealand, but the trip from Scott Base or McMurdo Base to Cape Roberts, could take up to a week or longer at times, due primarily to weather conditions.
- Losing ‘the drilling hole’ during any downtime was always high risk, and a second chance would not always be possible in the current season.

The Pre-Planning and Detailed Planning Stages realities and issues according to the participants on CRP were that:

- The project at the initial scoping exercise did not accurately describe the project that Cape Roberts became. Prior experience on and of a project of this complexity, scope and size was non-existent amongst New Zealanders.
- Scientific areas were often over-subscribed because there was no overall scientific resource planner, and each ‘party’ country selected their own scientists irrespective of how many petrologists, or sedimentologists for example, were there from other countries.
- Data collected, suggested that the project team may not really have understood the essential difference between pre-planning, and detailed planning, seeing them as potentially one and the same thing, involving estimates and very few specifics.

- The complexity and scope of the Cape Roberts Project as a significant and stand-alone project was never realistically addressed nor evident in the associated time allocations for planning.

The Operations Stage realities and issues according to participants on CRP were that:

- The expectations of the Science Steering Committee regarding the daily outputs and report updates, were apparently out of sync with the realities of what was possible at the drill hole sites in terms of the timing, and availability of core material for scientific logging and investigation.
- The main cause of communication issues were the geographical locations of the personnel, (scientists and drillers located at the drill site and other scientists at the Crary Laboratory at McMurdo Base).
- There were quite significant foreseeable failures on the project, in terms of mud supply, and the failure of the sea-riser, which caused delays and hence funding problems for the scientists in particular, who had to 'perform the science' in a set timeframe or they lost their funding.
- There were politics and power issues in the project, involving senior scientists from the collaborative party contributors, who arrived unexpectedly and assumed power (and rights) over the scientific interpretations and outcomes. (This behaviour seriously affected morale, particularly as this was an internationally important project, set in hostile climatic conditions, against tight timelines).
- The currents together with the tidal flows, when measured on site, were found to be flowing much faster than expected. This required a total rethink of the drilling approach, and a $1million dollar upgrade of the sea-riser was commissioned to cope with the currents, before drilling re-commenced the following year. This caused a major ripple right across all of the project personnel roles.
- There were a limited number of personnel involved at the site (scientific and drilling), or at the design office, all of whom were multi-skilled people, and this contributed to knowledgeable, effective and efficient decision-making as problems arose.

Communications realities and issues according to the participants on CRP were that:

- Communications between the scientific and logistics representatives on the project varied both in terms of the individual expectations, the nature of the communications and the timing and/or regularity. This resulted at times in miscommunications.
- Oversights, misunderstandings and miscommunications between the various Antarctic programme personnel on the project meant that there were, at times, very tense periods, often fuelled by the realities of time and financial constraints, and differing priorities and expectations.
- Antarctica is now a part of world-wide communication globalisation, that includes computers, internet, email and cell phones, and expectations of project and stakeholder personnel regarding communications' *modus operandi* have changed, and increased as a result.

Human Resources realities and issues according to the participants on CRP were that:

- There was a work culture of "just working until the job got done", but overworked staff became an issue, according to the interviewed participants. This was due in the main, they suggested, to a budget blow-out, which was basically linked to there being an unclear picture of the scope and complexity of the project, initially. The resulting tight budget precluded the employment of extra staff, thereby exacerbating the situation further.
- The drillers came from all over the world and from a range of drilling disciplines, to work on the Cape Roberts Project. Many had differing experiences and expectations to those that were associated with or required on Antarctic programmes, for example the supply of, and responsibility for equipment, and the 'ways of working'.
- There was a big difference between the approach that New Zealand took to logistics staffing in comparison to that taken by other countries. The New Zealand programme prided itself on having people that had good all-round skills, a nucleus of multi-skilled people that had been employed on previous Antarctic projects, and therefore added to a level of continuity between projects.

Recommendations from the participants for future projects in terms of particular 'personnel roles'

- That there should be a rotating chair amongst the Project Country members, on an annual basis. Further, there needs to be a separate Project Manager, who attends, and contributes to, all of the meetings from the early stages of the project, but the Project Manager should not chair the OMG.
- That the pre-planning and detailed planning stages should be accorded sufficient time and a separate budget, that is, it is treated as a minor project, so that when the project reaches the operational stage, most of the potential issues and therefore the problem-solving has already been done. This would create a more integrated and seamless form of management of the science and the logistics in particular.
- That successional planning, which is directly linked to knowledge capital and knowledge management, was considered a good idea by all participants. However, no detailed planning or implementation was evident, in any of the disciplines, at the time of the interviews.

6.6.8 The Interview Questions Part B - The Fit of the Cape Roberts Drilling Project, with the Conceptual Design Management Model for Remote Site Projects

The 'fit' of the project with the theoretical design management model, was addressed firstly, in terms of how well the four key factors of the conceptual design management model for remote site projects, and secondly how the data collected from the selected participants, (as written up in sections 6.6.1.to 6.6.7), represented the realities of designing and project managing projects such as the Cape Roberts Drilling Project in Antarctica. As already described in section 6.1 and 6.2, the selection of this case study at Cape Roberts was made on its ability to represent the phenomenon of remote site design and project management. As noted earlier, the examination of a report on the Cape Roberts Drilling Project contributed to by the Project Science Coordinator (and Chief Scientist), the Science Support Manager and the overall Project Manager and subsequently edited by Cowie (2002), assisted the researcher's overall understanding of the project, and assisted in the subsequent selection of preferred interviewees for a

series of retrospective semi-structured interviews. The interviews explored the project in its entirety with a cross-sectional representation of nine selected key personnel. The Cape Roberts Drilling Project being an international collaborative involved seven countries, being Italy, Germany, Australia, UK, United States, New Zealand and the Netherlands. Each country contributed to the scientific, management and/or operational aspects of the project. This collaborative approach created a complex regime of project personnel and tasks that needed to be sensitively integrated, coordinated and managed.

The overall aim of the Cape Roberts Project, as already noted, was to investigate the early history of the East Antarctic ice sheet and the West Antarctic Rift System by recovering sedimentary core from 500m beneath the sea floor off Cape Roberts, and then drill a 1500m thick sedimentary succession into the western margin of the Victoria Land Basin for the period 34 -17 million years ago (Barrett, 1993).

The complexity of the Cape Roberts Drilling project and the associated management of this internationally collaborative project, were strongly evident to the steering committee and subsequent management personnel, from the commencement of their engagement on the project, according to at least five of the participants. This stemmed in part from the fact that there were seven countries involved, with their associated stakeholders and scientific expectations. In addition there was a non-negotiable timeline to achieve the desired scientific outputs.

Environmental Impact Assessment (EIA) procedures required for every activity in Antarctica were also in place for the USA, New Zealand, German and Italian Antarctic Programmes. As such, this put significant and rigorous constraints on Antarctic projects such as the Cape Roberts Drilling Project, from its inception, viability, methodology, implementation and overall monitoring of every potential environmental impact on Antarctica.

6.6.8.1 Data Collection

Interviews were conducted over a period of ten months, with nine senior and middle management, and operational staff, in terms of their official roles on the Cape Roberts Project (1995-2001), to give a rigorous and representative cross-section of the personnel who had been involved on the project. A refereed and published paper by Kestle and Storey, (2005), had the aim of writing up a selection of the collected data in order to test the key factors and plausible drivers of a conceptual design

management model for remote site projects against the realities of managingCape Robert Drilling Project in Antarctica.

The Research Question of "How well do the four key factors of the conceptual design model for remote sites represent the realities of designing and managing projects such as the Cape Roberts Drilling Project ? ", was focussed specifically on the data collected from the nine interviewees, relative to the four key factors as established in the conceptual management model for remote site projects, which were:

1. Value Generation;

2. Knowledge Integration;

3. Process Integration;

4. Timely Decision-Making,

The aim was to establish how well the gathered data supported, challenged or added to the four key factors of the conceptual design management model, for remote site projects. The remaining data collected related to the participants' particular roles on the project and the impacts on their roles of the main issues during the course of the project, and is written up in sections 6.1 to 6.6, and 6.6.7.

6.6.8.2 Analysis and Discussion of the Findings

The 'four key factor' results were extensive and generally consistent across all of the nine selected participants. The following key points in Table 4 were drawn from that collected data:

Table 4 Key points from the Cape Roberts Drilling Project collected data in reference to the 4 key Conceptual Design Management factors

The Four Key factors	**Key Findings**
Value Generation as perceived or needing to be realised on the Cape Roberts Drilling Project was:	In respect to the technical and scientific aspects, and specifically the scientific outcomes from examining the cores. The value added through the scientific outcomes of the project, and the contributions on the international stage eg climate change, Kyoto protocol. The 1.7km of core provided at a very reasonable cost. This outcome was considered 'great value for money' by the 6 nations involved with NZ and in the fact that USA also saw NZ technology as 'great value for money'. In the need for low environmental impacts on the part of the project, and its personnel.
Knowledge Integration as perceived or needing to be realised on the Cape Roberts Drilling Project was:	Intellectual property issues preventing knowledge integration happening – seen as an inhibiting factor. Successional planning being the need for understudies for the people with key intellectual capital. 'Risk'on these projects is significant in terms of the personnel

	selected for the project(s). If you get the wrong people, it can break up the project. Problems that arise with 'patch protection', where people may not want to share their valuable expertise with potential successors for fear of becoming dispensable. The situation where a pool of specialist remote site personnel is created within organizations to design and manage these particular project sites. The potential weakness though, is where this knowledge capital is not documented explicitly, and a successional framework of specialist personnel is not fully established within organizations. Knowledge management using centralised data bases and consequent data management makes the creation of a website essential on future projects.
Process Integration as perceived or needing to be realised on the Cape Roberts project and future Antarctic projects:	The consequences of no process integration are dissatisfied staff, burn-out, budget blow-outs and an incomplete project. This is all about operational logistics and information management, and it is critical that this occurs in a timely and realistic manner. The secret is pre-planning and being aware of the other team members' needs, and the consequences of all the actions proposed.
Timely Decision-Making issues on the Cape Roberts and future Antarctic projects were that:	The key decision-makers have to be identified and recognised as having the appropriate authority to act and respond. The fact that fast, accurate and safe decisions were made in potentially dangerous situations, was the result of having a very good management structure that was responsive and responsible. The participants noted that "everything revolves around the environment on Antarctic project sites. The weather controls everything in terms of what, when, and if you can do anything. You have no real control; it's often called the Antarctic Factor". A lack of timely and critical decision-making may result in the loss of a whole year, (or more) of core production, as ships can only access Antarctica, in the Ross Sea Region once a year, between the late September and February.

One of the interesting outcomes, from the collected data on the 'key factors of the model' was the range of views held by the interviewees regarding who they believed were the stakeholders, and the client(s) on the Cape Roberts Project. Views were diverse, with the majority believing the scientists were their client, whilst others held the view that Antarctica NZ or the university, and hence the government were their clients.

There was consensus however, regarding what the value generation criteria were for the Cape Roberts Drilling Project. The primary purpose in their view was to drill and recover high quality, specific sedimentary cores to create globally significant (climatic) scientific outcomes.

Another finding was the suggestion that knowledge integration can be inhibited, to some extent, on these scientific projects, by the issue of intellectual property which may, and possibly does, work against the sharing of intellectual or knowledge capital nationally, and internationally. There was also evidence of a lack of succession planning across all disciplines and areas of expertise.

Reviewing the collected data regarding process integration, there was strong support for clear, effective, regular communications, and the centralized storage and management of data, on future projects.

Communications were considered critical on remote sites. Miscommunications occurring at times between the various stakeholders on and off site, caused perhaps by different interpretations of the issues, or decisions being made remotely from the site itself, and from each other.

Time delays in terms of decision-making, whether in terms of the design or financial commitment cause a flow-on affect across all disciplines and tasks. In the case of remote sites this can mean a delay of up to twelve months, until the site becomes accessible again.

In terms of the aims of the research question, the interviewees unequivocally supported the four key factors of the conceptual design management model, as being valid for Antarctic remote sites, and accurately representing their experiences on the Cape Roberts Drilling project (Kestle & Storey, 2005).

6.6.9 Concluding Statements

A summary of the key findings suggests that there is significant support for the design management model for remote site projects, and in particular the four key factors. Additional aspects, that may require future consideration, were discovered whilst conducting the case-study interviews. For example, issues around Human Resources such as, “only applicants with previous remote site project experience need apply”, and the suggestion that remuneration needs to reflect the specialization of the tasks, the remote location and acknowledge that personnel must be covered for ‘down time’ if the project stalls.

The data supports the notion that strategic decisions made during the briefing, conceptual design stages, and pre-planning stages in particular, can significantly impact upon the design, fabrication, construction, logistics, and the value generated in order to meet the expectations of the clients and stakeholders, and the final outcomes.

The international significance of the collaborative scientific research, innovative technical expertise and 'knowledge capital' associated with the Cape Roberts Project has helped place New Zealand in a position of strength in terms of influencing the Antarctic Treaty partners, and future collaborative international scientific endeavours.
The management of the project from the perspectives of the Science, Logistics, Design and Fabrication and on 'being managed' succeeded mainly because of a willingness on the part of strategic personnel to get the job done, and done well.
The project teetered at first, due in the main to a lack of experience with a drilling project of this scale and complexity, a lack of real and/or timely funding, and an over optimistic tasked timeline and resourcing plan.
The management issues that occurred during the course of the project were Operational, Technical, Political or Financial in nature (a view totally supported by one of the participants in particular). All, however, were solved in the fullness of time.
The fact that this was a collaborative venture meant that as with many collaborative working arrangements, there is always a tendency to make sure that the individual partner's needs and demands are met, as well as those associated with the agreed 'collective good'. This is where the situation can, and did become political, on occasion. Working to tight timeframes on a project, providing internationally significant scientific data, set in a hostile climatic zone, with fragmented groups of project personnel, with differing expectations both financially and in terms of the value of the outcomes to them professionally, resulted in a complex, exciting, at times frustrating, and rewarding project.
In terms of recommendations for the future from the data collected, there was support for the design management model for remote site projects. In particular, decision-making authority needs to be vested in the right people to get effective and timely outcomes for the overall project, the various stages of the project, as well as the discreet parts of the overall project. Managing by committee has always been problematic on projects, and this was particularly true on the Cape Roberts Project initially, but the management structure at the operational stage 'on-the-ice' evolved into one that was workable, as the project progressed. The differences of approach to the 'tasks-in-hand' by scientists and operations personnel were not easily integrated and required mediation and innovative approaches.
In the future, reporting and management structures need to be resolved, published and implemented well before the commencement of the operational phase(s) of the

project. For example, unified agreement on how financial reporting will be conducted needs to be set up at the early stages of the project and be totally transparent.

The Project Manager needs to be ‘on the team’ from day one of the pre-planning and strategic management meetings and processes, not drawn in when the project is about to go ‘live’ or into the operations stage at the site.

Language and cultural differences can cause unexpected and unintended friction and issues between collaborating partners on any project, and these were evident on the Cape Roberts Project from the published reports and data collected in discussion with the participants. Differing work and organizational structures both at planning and operational stages need to be acknowledged, and incorporated into an agreed document and action plan, well before the operational stages commence. There may never be full agreement, for reasons outside of the personnel actually involved on these international projects, but a level of professional consensus should however be the main goal to minimize risks, and maximize quality outputs. The politicization of international projects such as the Antarctic Drilling Project at Cape Roberts, adds to the management challenge across all aspects and stages of the project, whether it impacts on the stakeholders, the client, the finances, the logistics, the science, the designers, the drillers, the support staff, or the final outcomes.

The participants’ data, once analysed, specifically supported the overall conceptual design management model, and particularly the four key factors, as being valid for Antarctic remote sites generally, and as accurately representing their experiences on the Cape Roberts Drilling Project. This therefore provided significant support to the validation of the conceptual design management model for remote sites, and to the associated typology for remote sites. Further, the decision to conduct a retrospective review of an historical case-study to see how well the realities of managing this particular Antarctic Project matched or added to the theoretical design management model has been vindicated.

CHAPTER 7. THE UN SUDANESE HUMANITARIAN AID (UNSHA) PROJECT WEST DARFUR – A CURRENT CASE STUDY

7.1 The Rationale for Conducting the Case Study

Once the conceptual design management model for remote site projects had been developed and tested on the Antarctic Drilling project, the question asked next was whether such a management model work in other operational situations such as in the often desperate situations associated with humanitarian aid. Certainly, the present model was not originally developed with the Humanitarian Aid sector in mind, however the opportunity arose and was taken up, to test and potentially further validate the model (though that was not completely apparent at the outset). The results of the test appeared to further validate the model. This then opened up the notion of portability of the model. The area of West Darfur in Sudan is 'remote' according to the typology for remote sites, with the best access being a three day flight from Khartoum, given the lack of any formed roads.

7.1.1 Introduction

A similar methodology as used earlier by Kestle and Storey (2005), was adopted for the UNSHA study (refer Chapter 6). Seventeen senior and middle management who were operational staff with NGOs (Non-Government Organisations), and UN (United Nations) Agencies in West Darfur were interviewed over the two months of June and July 2004. No special criteria were applied, other than that they were representative of active Humanitarian Aid Agencies in the area, and available and willing to be interviewed. Initially it was thought that the differences of management styles, the projects themselves, with their differing objectives, geographical locations and differing groupings of stakeholders, would make such an application of the theoretical design management model unworkable. Surprisingly, the model was found to match and organise the management experiences of those interviewed, and this is highlighted throughout this chapter.

7.2 Contextualisation and Introduction

Darfur is a large area of approximately 256,000 square kilometres, consisting of 3 states that occupy the western area of Sudan (refer Figure 21), and an estimated population of 5 million people made up from a complex tribal mix. Large parts of Darfur are prone to drought, and desertification that intensifies demands on its more fertile lands, and water supplies. In recent decades, areas of Darfur have been subject to sporadic inter-tribal clashes over the use of such resources.

Figure 21 Map of Darfur region, Sudan (Source: http://commons.wikimedia.org/wiki/File:Darfur_map.png)

From early 2003, fighting intensified in the region following the emergence of two armed groups, the Sudan Liberation Army (SLA) and later the Justice and Equality Movement (JEM), and the commencement by them of hostilities against the Government. Following a string of SLA victories in the first months of 2003, the Government sponsored a militia composed of a loose collection of fighters, apparently of Arab background, from the Darfur region. This militia became known as the 'Janjaweed' or 'men on horseback', who wore uniforms but no name-tags. In certain areas of Darfur, the Janjaweed have supported the regular armed forces in attacking and targeting civilian populations suspected of supporting the rebellion, while in other

locations it appears that the Janjaweed have played the primary role in such attacks with the military in support.

Figure 22 Conditions in West Darfur camp for IDPs, 2004

The humanitarian fallout of this situation in Darfur (and the border regions of Chad) was an estimated one million Internally Displaced Persons/People (IDPs) by May 2004 (compared with 250,000 in September 2003), with over half of these (some 570,000) being located in West Darfur (Gharb Darfur) (refer Figure 22). The rest were divided between North (Shamal) and South (Janub) Darfur (290,000 and 140,000, respectively). By July 2004, this had increased to 601,096 in camps in West Darfur (based on estimates from the UN Agency Organisation for Humanitarian Aid (OCHA). IDPs would become 'refugees' if they crossed the international border and would be covered by international covenants. However, the IDPs are not covered by such covenants, and fall outside of the mandate of the United Nations High Commission for refugees (UNHCR). In such circumstances the IDPS come under the jurisdiction of OCHA. If the IDPs suffer genocide then they fall under International Law. Such a large displacement of people also impacts on the 'host' community. Scarcity of water, firewood and animal feed before the crisis inflamed tensions and fighting. Against such a back drop, UN Aid Agencies and Non-Governmental Organisations (NGOs) work to get aid into remote locations. The main aim of the UN SHA Project in West Darfur (and of the various agencies), as already noted was 'to make a difference'. Provision of basic shelter and the necessaries of life were at the core of the project's aims.

In late January 2007, aid groups suspended operations in Darfur, and planned to pull out of the province completely, following the first ever sexual and physical attacks on western aid workers in Gereida. Seventy aid workers left Darfur as a result, leaving

only ten Red Cross workers there. There were 14,000 aid workers in Darfur, most were Sudanese and worked for foreign NGOs and UN agencies delivering US$1 billion of aid per year. It remains today as a complex humanitarian emergency.

7.3 The Current Management Context in Humanitarian Aid Agencies

7.3.1 The Management Approach

There appear to be significant gaps in the understanding of disaster management within the humanitarian aid community. Fitz-Gerald *et al.* (2002), reported that "The humanitarian aid community is a 'slow follower' in the adoption of management tools and techniques". In some ways this can be explained or defended on the basis that humanitarian aid is delivered in an environment where no two situations are the same. Consequently there is no single model that can be applied, and the absence of effective lessons-learned mechanisms that ensure positive and negative experiences are addressed throughout all levels of the organisation, and encourages reinvention with each deployment. Therefore, humanitarian aid organizations are not only slow learners, but also do not have the basis for a learning culture, thus giving credibility to the adage that "a humanitarian worker is only as good as their last assignment".
In addition, the United Nations High Commissioner for Refugees (UNHCR) 1999 guide lines for example are circumspect and state that ,"*There is no single blueprint for refugee emergency management; each refugee emergency is unique. However, experience shows that emergencies tend to evolve according to certain recognizable and documented patterns."*
Thus, the management process applied to each disaster is different, but disasters themselves do have discernable patterns. One would expect there to be a link between the management process and the disaster pattern but this and the identity of the patterns is not explicitly explained. The Handbook works by setting up desired outcomes and then leaves it for the reader to select the management processes required to achieve those outcomes. The UNHCR Handbook (2000) does say that,

> *While emergency management shares many of the characteristics of good management in general, there are a number of distinguishing features:*
>
> - *The lives and well-being of people are at stake*
> - *Reaction time is short*

- *Risk factors are high and consequences of mistakes or delays can be disastrous*
- *There is great uncertaint,*
- *Investment in contingency planning and other preparedness activities is crucial*
- *Staff and managers may be under particularly high stress because of, for example, security problems and harsh living conditions, and*
- *There is no single obvious right answer.*

(UNHCR, 2000).

Thus, the present literature tends to be strong on objectives but weak on how that is achieved, and which management processes could be used. Moreover, it suggests that each disaster is different, and that perhaps there is no single answer, nor process. Hence the initial thoughts that there would be no fit (nor even a minimal fit) between the 'experiences in the field' and the developed theoretical model.

7.3.2 The Organisational Context

The organisation and inter-relation of players within the aid community is complex and this is shown in Figure 23 (Willitts-King & Harvey, 2005), which covers the general NGO/UN situation, while Figure 24 (Manfield, 2001), covers the operational field and sectoral situation. This arrangement is being revised to become a 'cluster' setup to streamline the flow of aid to beneficiaries and is based on what occurred in West Darfur (HRR, 2006). Thus, the complexity of the organizational structure through which aid is provided is underlined.

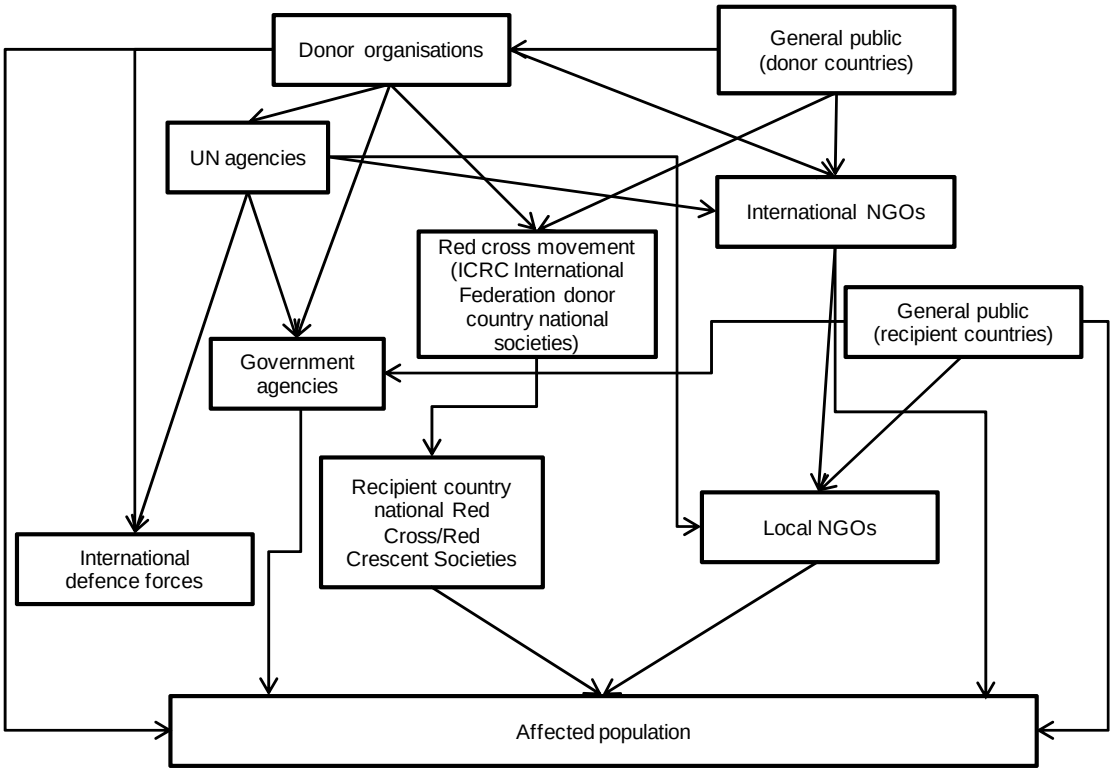

Figure 23 The Relief Response

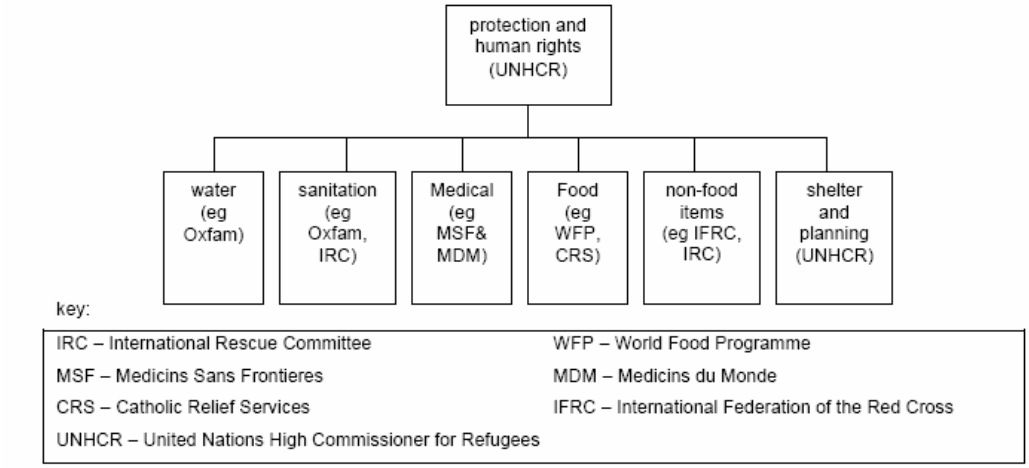

Figure 24 Field and Sectoral Organisation

7.3.3 Disaster Phases

There are distinct phases for a 'disaster situation', namely:

(i) The Emergency Phase (first response being medical treatment of survivors)

(ii) The Recovery Phase (stabilizing the population)

(iii) The Rehabilitation phase (return to 'normality').

In a natural disaster, these phases are more evident than in a conflict situation, as was(and still is) experienced in West Darfur. The gains from the week before, can be easily lost in a conflict situation, if core issues are not resolved. Increasingly, humanitarian aid workers are called upon to assist in natural disasters that are also conflict situations. For example, Banda Aceh and Sri Lanka, after the tsunami in 2004, and Kashmir after the earthquake in 2006, are consequently increasing the complexity of such situations.The relevance of these phases will be evident in the analysis section of this chapter.

7.3.4 Human Resources and how Staff are Employed on the Humanitarian Aid Projects

The problems associated with high levels of humanitarian aid staff turnover is further aggravated at the Emergency Phase, in terms of finding the right people at very short notice, and then establishing their availability. These staff arrive from all over the world, and are usually referred to as 'first needs people' who conduct 'needs analyses', by establishing the immediate needs for water supplies, food, sanitation, shelter and safety. Then they depart the scene. Head Office (the various UN agency head offices), often appoints personnel from their own staff, and from within their own agencies, to fill the gaps, and to provide essential local knowledge and experience within the overall team's profile. There may be two emergency teams set up for any one aid intervention, with a six month maximum time commitment required. Hence there is a regular turnover of staff, who frequently have only 24- 48 hours notice of a 'call-up' from the various agencies.

7.3.5 The Briefing and Training of Humanitarian Aid Staff at the Pre-planning Stages of an Aid Project

Each agency trains their own staff. There are government agencies (UN), such as UNHCR and UNICEF, and there are Non-Government agencies (NGOs) for example, CARE International, the International Red Cross , MSF (Holland, Belgium *et al.*), and Red-R. The UN generally has a different management and training approach to the NGOs, as the UN staff are usually professional career people who are following a particular career path and basically have to "play it by the rules", and be politically correct essentially. The NGOs tend to be a mix of very valuable and/or specialist

personnel, who either have no technical skills but understand the complexity and realities of humanitarian emergencies, or they do not understand all of the complexities associated with these emergencies, but have excellent specialist technical skills, and a few have the full range of skills. Normally, all of the Emergency Phase 'needs analysis' people would be highly trained specialists in their field, from around the world, or from the local agencies, with high levels of previous humanitarian emergency experience.

7.4 The Review

As a basis for interrogating the interview transcripts effectively, a comparison of the present management model was undertaken with specific areas of concern raised in a documented review for ALNP on Humanitarian Aid Action in the Darfur area in 2004 Minear (2005). Eight thematic areas of major recurrent concern to the humanitarian aid agencies, were reviewed by Minear (2005), of which six were considered relevant to the research being conducted (by researcher Kestle) into the operational management of the UNSHA at West Darfur project, and the associated personnel. Six of the eight thematic areas referred in the report by Minear (2005), were reviewed and are discussed here. These were later compared with data collected for this research. The selected theme areas are:

1) Mobilising humanitarian action,
2) Supporting IDPs and refugees,
3) Managing the tensions between humanitarian and the political,
4) Situating humanitarian action in relation to the conflict,
5) Improving coordination,
6) Crafting an appropriate and accountable international presence.

7.4.1 Mobilising humanitarian action

There is broad agreement that the humanitarian apparatus was very slow in gearing up for action, nor was the extent or significance of the emergency fully or accurately measured and realised (Minear, 2005).

"*The distinguishing feature of the Darfur crisis has been the lateness and inadequacy of the humanitarian response. It has been so serious, that it amounted to 'systemic failure'* (cited in Minear , 2005, p.77). This observation agrees with the findings of other Darfur studies, and Minear (2005), notes that the first signs of the imminent

conflict in the region were in early 2003, when fighting broke out between the Sudanese government and two insurgent groups, the Sudanese Liberation Army (SLA) and the Justice and Equality Movement (JEM). Significant displacement was evident from April 2003, with the numbers reaching over 500,000 by May 2003 in the Darfur region. "*Estimates of deaths related to the conflict varied from 7000 by the Sudanese authorities in 2005, to 300, 000 by a UK parliamentary committee in, to 180,000 by the UN Secretary-General in March 2005, where highly politicised emergencies often involve debates about the numbers of people affected"* (Minear, 2005).

The need for Aid in the Darfur region pre-dated the humanitarian crisis, as drought had undermined food security. At the time when the violence flared up in early 2003, there were several agencies engaged on developmental activities in the area, but they freely admitted to being slow to 'read the signs' of the growing emergency.

Human Rights NGOs signalled one of the first alarms to the situation in early 2003, but there was a significant time-lag before the UN systems swung into a fully committed action initiative in mid to late 2004.

The UN's 'Greater Darfur Initiative' was launched in September 2003, with US$23 million in requested funding. By April 2004 the funding requested had risen to US$115 million and by June it was US$236 million. This was deemed a "runaway crisis" by this time."*The MSF-H evaluation found a lack of leadership from the UN, which paid little attention to the Darfur crisis, and whose Khartoum presence seemed a veritable revolving door of itinerating personnel"* (cited in Minear, 2005, p79).

The MSF-H evaluation concluded that:

> *The early UNICEF response, along with that of other UN agencies, NGOs and institutional donors was by and large inadequate"... "eighteen months into the mobilisation, and despite documented successes in the areas of health, education, and potable water, continuing problems raised serious questions for the evaluation team about UNICEF's capacity to deliver and coordinate emergency operations* (cited in Minear, 2005, p80).

There were deemed to be four main reasons for the delayed mobilisation:

1. Agencies had difficulty establishing and monitoring the extent of the need in Darfur, as it was a vast region, with difficulties associated with access, and the situation fast-moving from both military and political perspectives.

2. Governmental and military restrictions on the information (as received by Khartoum officials), that could be made available to the various agencies, was a very limiting factor for the mobilisation effort. The granting of visas for expatriates and import licences for relief material was apparently used as a means of exercising political control over emergency activities.
3. The fear of alienating Khartoum, whose cooperation was essential in achieving North-South peace. According to one evaluation, *"When the crisis emerged, agencies in Sudan were like rabbits caught in the headlights"* with their focus being clearly on post-peace rehabilitation and development (cited in Minear, 2005, p81).
4. The effort to mount a major humanitarian aid mobilisation for Darfur was hampered by competition from higher-profile emergencies elsewhere for resources for example, Afghanistan and Iraq.
The combination of these four factors, delayed the mobilisation of an international humanitarian response for twelve months, that is, until around February 2004. *"If the timeliness of the response to the crisis was the overriding concern of the evaluations, its inadequacy was a close second"*. This suggests that international assistance was unable to effectively respond to the challenges faced, did not realise how best to respond to the challenges for example, siting the camps too close to the border, and never quite catching up or taking control of the crisis (Minear, 2005).

7.4.2 Supporting IDPs and Refugees in Darfur

Sudan has the largest number of internally displaced persons (IDPs) of any country in the world, approximately six million in 2004. The numbers resulted from the conflict in Darfur, and also from many years of civil strife, particularly between North and South. The evaluations urged that the UN agencies not be allowed to repeat the mistakes made in relation to the IDP policies in the 1990's, as refugees tended to be treated better than IDPs in terms of their human rights, services and care available to them (Minear, 2005). IDPs are people displaced within their own country. This is the situation in the Darfur crisis, and despite clarification of the legal position of IDPs in the UN Guiding Principles for Internal Displacement in 1999, there is still no identifiable institutional patron of the IDPs, nor any lead agency for IDP camp management.

7.4.3 Managing the tensions between humanitarian aid activities and the political context

"There is almost no action that cannot be interpreted as political," observed one evaluator of humanitarian activities in the Darfur crisis (Minear, 2005).

Developing a framework for managing the tensions between humanitarian action and politics in the Darfur crisis had two main aspects:

1. Insulating such action from the political context so that humanitarian aid based activities could proceed
2. Finding appropriate political connections that supported the need for aid without losing political 'face' in the current political context.

Advocacy was a recurrent theme in the Darfur evaluations. All of the agencies were concerned about whether speaking out on the conflict and related political issues may have jeopardised their operational presence or their perceived neutrality.

"The Sudanese government threatened to expel the Save the Children UK and Oxfam Great Britain in November 2004, following their statements to the UN Security Council on the need for tougher political-military measures" (Minear, 2005).

7.4.4 Situating Humanitarian Action in Relation to the Conflict

The relationship between the humanitarian aid activities, and the conflict itself preoccupied humanitarian practitioners and their evaluators in Darfur, according to Minear's report (2005). According to aid agency analysts, *" Recent crises have shown clearly that emergency aid inevitably affects political and economic processes in war-torn countries, and in turn aid operations have been profoundly affected by these processes" (cited in Minear, 2005, p102).*

The presence of international humanitarian personnel created an embarrassment in a country trying to implement and prove itself to be capable of self definition.

The conflict provided the required rationale for imposing constraints on aid activities, as there was a nervousness around the possibility that the inner most workings of the country, and any human rights abuses for example, would become public knowledge via media attention. Aid organisations responded in different ways to the security-related restrictions imposed upon them. The NGOs were regarded as being resourceful and lateral in their approach, which was quite different to the UN which tended to be quite risk-averse, and more willing to take 'no' for an answer (Minear,

2005). The conflict also politicised aid work by concentrating activities in government-controlled areas, *"Due to prolonged insecurity, travel restrictions prevented UNICEF, and other agencies from distributing emergency supplies to IDPs in rebel-held areas"* (cited in Minear, 2005, p104). However, NGOs, such as the MSF and CARE, again demonstrated more flexibility than the UN agencies, as they did not have to abide by the UN Security regulations, and therefore managed to achieve more extensive aid coverage in the rural areas than UNICEF.

A third effect of the conflict was the reduction in quality, and increase in the cost of aid, with examples cited by CARE of food deliveries being raided by the guards responsible for the security of the aid supplies. High value items were also removed by the guards, according to the evaluative reports.

7.4.5 Improving Coordination

According to Minear (2005), the weaker the government in a crisis, the greater the need for an outside coordination role. A strong international connection was not present in the Darfur crisis, and an example of this was the lack of an institution prepared to specifically focus on the needs of the IDPs, with thirty nine NGOs involved in camp coordination. Minear noted that *"even in a non-conflict situation such a weakness and lack of authority at the centre would create confusion"*.

The UN-centric system of humanitarian coordination resulted in major geographical and sectoral gaps (cited in Minear, 2005, p107).

There appears to be a recurring picture, following a decade of reviewing UN humanitarian agencies, of governance structures, funding sources, weak management, and institutional cultures being some of the main obstacles to effective coordination (cited in Minear, 2005, p109).

7.4.6 Crafting an Appropriate and Accountable International Presence

The six Darfur evaluations identified the most useful levels and scope of involvement by an international presence in terms of humanitarian intervention. The Darfur response *"suffered from a shortage of field staff with the necessary knowledge and experience of starting-up an acute emergency response"* according to the MSF evaluation. These comments were also echoed by OCHA's evaluation, where they reported that one of the major weaknesses associated with high levels of expatriate

personnel involvement in humanitarian interventions, was the poor understanding of local contexts. Although there was an understanding of the complexity around the Darfur situation, no agency or organisation undertook a thorough analysis which resulted in weaknesses in strategic planning initiatives.

These are of particular interest as the research aim is to develop the theoretical design management model for remote site collaborative international projects and then conduct ongoing tests of the model on real-life projects.

7.5 The UN Sudanese Humanitarian Aid Project in West Darfur – the realities of managing the pre-planning and operational stages of the project

There were two parts to the interview questions put to the participants. Part A asked questions about the actual project in terms of the participants' official roles, and Part B asked questions about their perceptions of the fit of the conceptual model with the realities of managing UNSHA project in West Darfur.

7.5.1 Interview Questions Part A – the Overall UN Sudanese Humanitarian Aid Project in West Darfur

Part A comprised a three part question that related to the participants' official responsibilities associated with their official roles on the UNSHA Project in West Darfur. The question also sought to establish the main issues that arose during the project, from the participants' perspectives, the impacts that the issues may have had on the project and their individual roles, and whether there was support or disagreement with any or all of the six themes noted in the 'Lessons Learned' document by Minear (2005) and referred in section 7.4.

The questions were:

"In reference to the UNSHA Project in West Darfur,

(i) What were the official responsibilities associated with the key roles played by the seventeen selected participants, and did these change during the course of the project.

(ii) What were the main issues that arose during the project, and to what extent did they impact on the individual's particular role, and/or the project.

(iii) *How did the realities of managing the UNSHA project support or challenge the six (out of eight) 'lessons learned' themes,"*

The data collected in relation to parts (i) and (ii) of the research question were reviewed under the following headings:

- The Management Framework and Approaches
- Funding/Budgets
- Pre-planning and the Detailed Planning Stage(s)
- The Operations Stage
- Communications
- Human Resources
- Suggestions for managing future projects.

The data collected in relation to part (iii) of the research was collected using a voice recorder, and captured the interview participants' perspectives, in respect of the UN SHA Project in West Darfur, for future projects, and was comparatively reviewed under the selected headings from the ('Lessons Learned') Minear (2005), concerning:

- Mobilising humanitarian action
- Supporting IDPs and refugees
- Managing the tensions between humanitarian aid activities and the political context
- Situating humanitarian action in relation to the conflict
- Improving coordination
- Crafting an appropriate and accountable international presence.

The seventeen selected participants represented a cross section of the personnel involved on the UNSHA Project in West Darfur, in terms of their official roles on the project. All of the participants were approached prior to the interviewing process, to establish their willingness to participate in this research and all agreed (in writing) to be interviewed using taped verbal responses to the Interview Questions (A and B).

7.5.2 Managing the Clients and Stakeholders

The terms Client and Stakeholder were interpreted differently according to the particular participant being interviewed, dependant on whether they were UNHQ or UN Agency staff, or NGO staff.

The Client was generally considered to be the IDPs (Internally Displaced Persons), however depending on who was being interviewed, the client was also considered to be the UNHQ, particularly if the interviewees were UN agency personnel.

The Stakeholders were generally considered to be the various government authorities, and the local Khartoum politicians, as without their permission the NGOs and UN agency personnel were denied access to the overall emergency area, the Camps and the IDPs.

The management of the clients and stakeholders is complex, as already noted in section 7.3, and for UN HQ personnel has to follow set guidelines in the UNHCR (United Nations High Commission for Refugees) Handbook (1999), in particular. The clients in this instance did not fall within the 'management of refugees' guidelines as they were not refugees, they were IDPs and no one agency has responsibility or takes responsibility for them. From the governmental perspective, the legal and political status of those to whom aid is directed in conflict situations is critical (compared to natural disasters), in the determination of what aid assistance can or cannot be given. The IDPs exist because of a lack of security within their particular country. The IDPs needed (and still need), shelter, water and food, and to be safe, and then to be able to move back to their own areas once the conflicts abate.

The aim is to not only protect and facilitate the return of the IDPs to their villages, but also, *"to give them the means to sustain themselves. This is not just a survival package, the whole thing is based on sustainability and durability"* (Participant 12).

According to one of the participants, *"The IDPs are quick to give feedback, as they always make their needs known, and noisily!!"* From the management perspective, "*The priorities have to be filtered out, from the psycho-social needs. Mostly this is about food, water and shelter"* (Participant 8)

One participant suggested that IDPs be used as resources and not just be regarded as victims, given that more field staff are needed (Participant 7)

The management of the clients and the stakeholders whether at the pre-planning or the operations stages always came back to who the particular personnel had to report to,

whether it was HQ in Khartoum or HQ in Geneva for example, or to the individual NGOs. The Sectoral Organisations (refer Figure 24) met regularly and were the coordinators and immediate managers of all the field personnel.

7.5.3 Managing the Camps

The management of the camps was a major issue in the six evaluations, as noted in section 7.4. One of the recurring comments was the fact that up to 39 NGOs believed that they were responsible in some way for managing the camps, and the IDPs. In terms of who was considered to be officially responsible for managing the Camps and IDPs, no particular institution focussed just on the IDPs as already noted, but four representatives from the UN agencies of UNHCR (Participants16, and 2) and the IRW (Islamic Relief Worldwide) (Participants 10 and 15), were specifically interviewed in terms of this research (Participants 15, 16 and 10).The group of selected interviewees who took part responsibility for the management of the camps, were asked their views on the management approach taken in terms of their official roles. A selection of their quotes as relevant to the management of the camps question follow:

"Khartoum makes the decisions, hence we are not in control, which hampers the work 'in the field'" (Participant 16)

"You need to know a bit about the culture beforehand", and *"you need to be very modest and swallow your pride, and be prepared to do anything that is needed to be done", "how things are done is not so important, it's just important to get the jobs done"* (Participant 2).

Management of the Camps' Pre-planning Stages

Very little was known by the interviewees in terms of what they knew about the emergency situation before going to Darfur, other than that there were IDPs there who needed care and protection.

> *The biggest problem was that the Darfur situation evolved and no-one knew what magnitude to plan for, and no-one geared up in time. Had we had 6-8 months we would have been better organised on the ground, because everything would have been there. So we are basically playing 'catch –up' now* (Participant 8).

One interviewee arrived to Darfur from another agency office, and had no terms of reference except *"assess and fix it !!"*

There was no reliable information in terms of how many IDPs there were, nor their levels of vulnerability (and therefore their immediate needs were unknown). All the interviewees involved with the managing the camps and IDPs knew where Sudan and Darfur was, and that there would probably be a severe lack of amenities, but the extent of the actual problem was not specifically known. One participant was just told that they "were going on a mission to Darfur", and that was the extent of the communiqué.

Management at the Operations Stage at the Camps

The operational stage is ongoing, and commenced in 2003/4. The interviews referenced and reviewed here, took place in 2004. At the commencement of the operations stage, the participants all identified a lack of pre-planning and organisation of resources, whether labour or materials or infrastructure/systems/processes.
This created barriers to achieving any meaningful outcomes initially.
"There was a complete lack of transportation, telecommunications, office equipment (phones, fax machines, email systems, photocopiers, paper et al.) Medivac plan, technicians and laboratories when we arrived into Darfur" (Participants15,16 and 10).
This project and the roles that the participants' played were very different to previous aid projects, "*Darfur was unique*" (Participants 15,16).

> *Cannot control IDP movements eg 40,000 staying here for say 6 months, and put some infrastructure in place. Does not happen like that, as the numbers and needs from week to week are always unknown. 20,000 could leave or arrive in any one week, so you try to systemise the information received from people in the field using simple report sheets that can be quickly upgraded so that you can monitor the changes in order to respond* (Participant 8).

The remoteness impacted seriously on the project and the participants' jobs.
According to Participant 2,

> *You can shout basically, and no-one will hear you !!, and you will not always know what the truth is , for example when the supply plane may be arriving, or even leaving", …."remoteness was the enemy of the programme*.

The operations stage had several, evolving parts. Once temporary basic shelter had been created for the IDPs during the Emergency Phase and Recovery Phases, temporary classrooms were built, and continue to be built, to enable the displaced

children a chance to continue or commence their education, and to bring some 'normality' to their daily lives.

> *Some IDPS, in fact, though they are away from their village, may well achieve more by being displaced for example, more girls are going to school, and there are social exchanges occurring between people who would not normally mix, that is, across fertilisation of ideas and skills is happening and has distinct benefits* (Participant 8).

Management of Communications in and around the Camps

Communications to Khartoum relied on a mail system, referred to as a Pulse system by one interviewee. There was a need for more coordination of communications according to participants 10, 15, 8 and 16, who suggested running information and planning workshops in the future. The lack of telecommunications, phones et al, made the job impossible at times according to all 4 of these particular (management) participants. West Darfur is considered to be the most remote area of the three Darfur states (North, South and West), which contributed significantly to the communications challenges noted by these particular participants.

Management of Human Resources associated with the Camps

Human Resources and the employment of staff was conducted by the various UN and NGO agencies and co-ordinated via the sector groups.

There was, and continues to be, a lack of people resources, a lack of trained people, a lack of institutional knowledge, and an inability to draft up monitoring reports. There is no time to train people at HQ (IRW) according to the participants, hence on-the-job training occurred instead,*"HR and HR training of aid personnel is fundamental for overall improvements in the project/programme, and in terms of impacting positively on the programme"* (Participant 16).

Suggestions for managing future projects in terms of management of the camps

- More efficiencies could be realised if the Camps were already in place, even partially, before the specialist technical, field operations and relief personnel are brought in for the Emergency and Recovery Phases. Suggestions from the participants were that a good local field assistant, a couple of local drivers and

a local administration person go ahead and do the ground work, including setting up camp (Participants 2, 10, 15 and 16).

- A lack of transportation, telecommunications, Medivac plan, technicians and laboratories, were barriers to achieving any meaningful outcomes initially.
- There should at least be a clear plan of the area and an initial plan of action and priorities.
- There is a need for efficient people and enough people, so that access into all of the target areas and the necessary aid can be delivered.
- Camp management training should be compulsory for everyone involved on the project, and that includes the local camp conditions and local contextual information.
- Training for the 'longterm' is needed, and that includes strategic, and personnel development, together with future planning initiatives for aid personnel and client support mechanisms/processes/systems.
- There is a need in future, for decentralised decision-making, where delegated authority is given to the personnel on-site, as the time-lag associated with waiting for decisions from Khartoum is too long and impractical in many instances. The current UNHQ situation is too bureaucratic (Participant 15).
- The developed and the planned future activities need to be recorded and available to the subsequent managers and groups of aid personnel, as *" there is a lack of institutional memory, people move on, and then the next group tend to reinvent the wheel, time after time"* (Participant 8).

7.5.4 Managing the Logistics

Five logistics-specific participants were interviewed (Participants 1,3,5,6 and 4)
The key logistical aspects to be coordinated and managed, in their view were:

- Transportation- (Air freight, trucks),
- Resources- People, Food , Materials (for reconstruction/ temporary shelter),
- Equipment- Pipelines, mainly for pumping water,
- Creating temporary bridges,
- Providing logistical information for all of the agencies involved in the project.

Management of the Pre-planning and Detailed Planning Stage(s)

There is no expectation of being pre-briefed in any real detail, according to one participant. However, all four participants (3,4,5 and 6) noted that the briefings they did receive were very basic, and of little relevance to the reality of the situation. The briefings only occurred a few days before they headed for Darfur (Participants 3,4,5 and 6). Most of the useful information was gleaned from the news on television, reading media and UNICEF articles, and from the internet rather than from the agencies.

"Knew little of relevance before getting here. Would have been good to know more of the background, context and key constraints before getting here" (Participant 6).

"Knew about the sensitivity of the situation, but did not give much thought to the dangers of coming here, took safety for granted really , as I am with the UN who will protect me (Participant 3).

Management Framework and Approaches at the Operations Stage

The remoteness of the site had a significant influence on the level and scope of the challenges, for example the climatic conditions, the difficult access(basic tracks at best, there are no roads), coordinating the logistics across such a large area, that is also fraught with looters (Participants 11,8,3,4,5 and 6).

"Would there have been this crisis, if it were not so remote?" (Participant 5).

Coordination issues were mentioned by four participants (Participants 1,4,5 and 6), in terms of what some agencies can and cannot do and when and where. The distance between Khartoum and Darfur added to the problems in terms of getting supplies through intact, if at all.

> *Materials not locally available for example, takes 5 weeks by road , but there are no roads as such, then the materials are looted, or there are floods or heavy rains that wash out the roads/tracks, and/or damage the goods, so you may lose the lot en route and have to start all over again* (Participant 8).

> *The coordination of the various groups is a lot about personality, and how these organisations operate or react in situations, I have a certain amount of credibility which helps enormously. You have to engage everyone (with the ideas or plans), without losing sight of the priorities and your time management* (Participant 5).

The remoteness of the site was expected, but the centralisation of decision-making and administration, was not expected nor helpful when trying to run an operation that was and is changing daily, on the ground, 'in the field' (Participant 4).

There was another major challenge regarding getting access for the NGO international aiders ,*"the Sudanese government had signed an agreement at the preplanning stage, agreeing to give us free access, but then they required 48 hours notice once at the operations stage"* (Participant 12). Dealing with the Sudanese government is/was a delicate situation according to all of the participants.

Management of Communications associated with the Logistics

One of the participants believed there had been given a significant level of autonomy, and that with the authority decentralised from Khartoum to Darfur their role was made easier (Participant 6). This view was not shared by the majority of the seventeen participants, and for example,

"Communications and feedback from the IDPs was difficult at times in terms of the language barrier" (Participant 5).

"Hard to understand what is happening 'on the ground' as stuck in the office, as many of the staff are from Khartoum and they are not local staff" (Participant 5).

"With everything changing on a daily basis you need to have a flexible attitude, and I have that" (Participant 6).

All of the participants commented on the difficulty of getting any information, in or out of Darfur, on a regular basis, *"You cannot pick up the phone at any time, or send an email. This is frustrating as cannot get work reports back to Khartoum or make contact with family members"* (Participant 8).

Management of Human Resources associated with Logistics

The rapid deployment unit apparently did conduct reasonably thorough pre-training sessions. One participant believed that training was best conducted 'on-the-job', with the more important aspect being to first appoint a team of people, who could work together (Participant 4).

There were also several participants who believed that there was a lack of suitably experienced and available personnel on a timely basis.

"There were, and are, huge gaps in the experience of the personnel as the agencies cannot get experienced personnel on the ground when they are needed, and that means that mistakes are sometimes repeated" (Participant 5).
"HR could send us out with the right tools and more information in terms of statistics and backgrounding, before arriving here" (Participant 6).

Suggestions for managing future projects in terms of logistics' management

- Future project coordination and planning beforehand would mean that supplies would already be there, or on their way.
- Available upfront funding would permit this forward coordination in most cases.
- *"Classrooms built out of local materials is overtaxing the ability of the local area to supply local materials, and semi-permanent materials deteriorated over time, so instead, we designed the tent structures which are mobile, or could be, as needed"* (Participant 8).
- "*Make the international community aware of the crisis/emergency so that it does not reach the dire level that existed in Darfur when aid finally arrived "* (Participant 1).
- *"Being flexible and adaptable on the ground, and maybe a better briefing kit and better supplies. Simple operating systems for say computers, to respond more effectively to the primitive nature of the area"* (Participant 5).
- *"More thought and planning needs to go into things like the worst-case scenario situations, before they happen"* (Participant 4).
- *"Decentralise operational stage decision-making and decentralise the associated administration"* (Participant 4).

7.5.5 Managing the Communications and Suggestions for Future Projects

According to participant 9 located in Khartoum and responsible for enabling communications with Darfur *et al.*
"*The logistics were not planned beforehand, hence the systems were not easy to set up quickly, if at all"*.

"Darfur is a unique place and project, the culture of the people are very different, being from so many different tribes and backgrounds".
"The camps are inaccessible by vehicles, only planes come in, and they are not always available, and there's no proper airport".
Asked the question of whether it (communications) was a problem of Darfur or an IT problem , the answer was that it is an IT problem.
"Without communications nothing can happen".
"There is a big plan to deploy high capacity broadband internet access, but the country is not currently linked by fibre –optic cables or satellite, can only use phones basically, hence the primitive communications modes".
"What we need is mobile offices for example a caravan or converted container, which are self-contained modules, with UHS radios and email systems all set up in it, to speed the communications systems and accessibilities up".

7.5.6 The 'Managed on Being Managed' - Suggestions for Managing Future Projects

There was concern expressed by 3 of the 5 participants that they had been working constantly without a break for weeks and even months, which meant they were not particularly rested due to a lack of sleep, and had less patience than at the start of the project and felt really stressed. They suggested that wherever possible in the future, additional /alternate people be appointed in a staggered fashion to give longstanding aid workers on projects, a break every few weeks,
"Our clients deserve excellence, so we have to ensure that we get good people, and look after them in the field. We need to pre-train international staff and the local staff before they go out in the field" (Participant 8).

7.5.7 Analysis of the Key Findings for Research Question Part A (i), ii) and iii) as related to the UN SHA Project in West Darfur.

7.5.7.1 The Key Findings relative to Parts (i) and (ii) of the Question:

The findings were reviewed and analysed under the headings of **:**

- The Management Framework and Approaches
- Funding/Budgets

- Pre-planning Stage(s)
- The Operations Stage
- Communications
- Human Resources
- Suggestions for managing future projects

The Management Framework and Approaches

As discussed in 7.3.1, the UNHCR Handbook (2000) sets out desired outcomes and then leaves it to the particular manager to select the management processes required to achieve the particular outcomes. The management approaches, according to the participants, varied according to the particular agency that the participant represented, and the goals they needed to achieve set against tight timelines. The unanimous view of the participants was that the management approaches were modified to fit with the particular disaster project and therefore followed the UNHCR Handbook (2000) approach and concurred with Fitz-Gerald *et al.* (2002) view that,

> *The humanitarian aid community is a 'slow follower' in the adoption of management tools and techniques. In some ways this can be explained or defended on the basis that humanitarian aid is delivered in an environment where no two situations are the same. Consequently there is no single model that can be applied and the absence of effective lessons-learned mechanisms that ensure positive and negative experiences are addressed throughout all levels of the organisation encourages reinvention with each deployment.*

The lack of one particular coordinating agency dedicated to the needs of the IDPs, and a lack of delegated authority (by the agencies in Khartoum) to make decisions 'in-the-field' was identified by several of the participants as a significant barrier to getting the necessary work done 'in-the-field' in a timely manner.

The remoteness of the site had a significant influence on the challenges faced by the participants in terms of trying to manage the logistics in particular.

Funding and Budgets

Eight of the seventeen participants were actively associated with budgeting and were responsible for reporting and monitoring their activities relative to their budgets. These participants were management personnel, within their particular agencies, which in turn were a mix of UN agencies and NGOs.

The remaining participants were working within teams, or were supporting other (non UN) agencies and had no direct responsibility for specific budgets.
The participants referred to a range of working arrangements, from having an ‘annual budget’ allocated by their agency, to requesting funds on an ongoing basis, to forecasting a year in advance. In almost all cases however, the money was not available at the start of the West Darfur emergency. The funds came initially from the CERF and Humanitarian Aid Fund. The participants spoke of relying heavily on donations, and that those donations continued to come in as a result of performing well and publicising their achievements. The participants also referred to the fact that for some of the agencies, Khartoum budgetted for all of the Darfur states’ needs.
In a few cases, the participants were required to be a part of a reporting and monitoring system, that was linked directly to a monthly Action Plan.

The Pre-planning Stages

The unanimous view of the participants was that whilst they knew of the emergency situation in West Darfur in the general sense, that there were IDPs needing care and protection, they knew very few specifics on the scope or magnitude of the emergency before going there. They were basically advised to ‘assess and fix it ’.
The participants all noted that there was no real expectation of being briefed, but that the briefings they did receive were of little relevance to the actual situation. Statistical information on IDP numbers, available resources and amenities varied and were therefore unreliable. The situation in Darfur basically evolved and personnel were in catch-up mode rather than being able to pre-plan months in advance. Curiously, the participants noted that the most useful information was gained from watching the news on television and from reading media articles, before going to Darfur, rather than from the agencies.
The logistical pre-planning was apparently almost impossible to organise given a complete lack of systems being in place, or easy to set up. In addition there was the issue of the inaccessibility of the site from political and geographical perspectives. Air transport was the only feasible mode of transportation.

The Operations Stage

The pre-planning stages and the operational stages on the UNSHA West Darfur project tended to become blurred, given the short lead-time, and the unreliability of

statistical data. The lack of pre-planning and organisation of resources, whether labour or materials or infrastructure/systems/processes, created barriers to achieving any meaningful outcomes initially, *"There was a complete lack of transportation, telecommunications, office equipment (phones, fax machines, email systems, photocopiers, paper et al) Medivac plan, technicians and laboratories when we arrived into Darfur"* (Participants 15,16 and 10).

There was unanimous agreement amongst the participants that the remoteness of the site seriously impacted on the project and their roles. There was a view that "remoteness was the enemy of the programme". The distance between Khartoum and Darfur added to the problems in terms of getting supplies through intact, if at all. The only realistic and relatively reliable form of transportation involved planes, given there were no properly formed roads, only marginally formed airstrips and no formal airport facilities. However, according to the participants there was never any real certainty as to when the planes may arrive or leave, nor what resources would be on board, and materials not locally available would have taken five weeks by road , but there were no roads as such. The materials were frequently looted, or there were floods, or heavy rains that washed out the roads/tracks damaging or completely destroying the resources.

Communications

West Darfur is considered to be the most remote area of the three Darfur states (North, South and West) and this contributed significantly to the communications challenges noted by all the participants.

There was consensus amongst the participants that the management of communications' systems and processes were either non-existent initially, or were unreliable at best. As already noted air transport was the only feasible means of providing resources to the West Darfur site. The camps were inaccessible by vehicles, Darfur was not serviced by fibre-optic cable nor satellite technology, so phones were the only form of telecommunication, in association with a Pulse mailing system. Reporting systems to HQ in Khartoum relied on a mailing system, and given the ever-changing nature of the emergency, reported information was quickly outdated,*"20,000 IDPs could leave or arrive in any one week, so you try to systemise the information received from people in the field using simple report sheets that can*

be quickly upgraded so that you can monitor the changes in order to respond" (Participant 8).

Human Resources

There are government agencies (UN) and there are Non-Government agencies (NGOs) such as CARE International, the International Red Cross, MSF (Holland, Belgium et al), and Red-R. Each agency appoints, and trains their own staff. In addition the UN generally has a different management and training approach to that of the NGOs, as the UN staff are usually professional career people who are following a particular career path and basically have to "play it by the rules" and be politically correct essentially. All of the Emergency Phase 'needs analysis' people were highly trained specialists in their field, from around the world, or from the local agencies, with high levels of previous humanitarian emergency experience.

There was consensus amongst the participants that there was a lack of trained and experienced people resources with institutional knowledge and an ability to draft up monitoring reports. On-the job training was regarded by a few of the participants, as appropriate, important and unavoidable. The appointment of compatible work personnel was actually considered more important than pre-training.

Summary of the Key Suggestions for Managing Future Projects

- Need to be able to get experienced personnel on the ground when they are needed, to avoid mistakes being repeated,
  "HR could send us out with the right tools and more information in terms of statistics and backgrounding, before arriving here" (Participant 6).
- A plan to install and utilise high capacity broadband internet access needs to be developed, and will require that fibre-optic or satellite links are set up, ahead of deployments of emergency aid personnel.
- Mobile offices are needed, such as converted containers or caravans that are self-contained modules with UHS radios and email systems that are already operational.
- More efficiencies could be realised if the camps were already in place, even partially, before the specialist technical, field operations and relief personnel are brought in for the 'Emergency' and 'Recovery Phases'.

- There should be a clear plan of the area and an initial plan of action and priorities. There is also a need for efficient people, and enough people, so that access into all of the target areas and the necessary aid can be delivered.
- Camp management training is needed for everyone involved on the project, and that includes the local camp conditions and local contextual information.
- Training for the 'longterm' needed, that includes strategic, and personnel development, together with future planning initiatives for aid personnel and client support mechanisms/processes/systems.
- There is a need, in future, for decentralised decision-making, where delegated authority is given to the personnel on-site, as the time-lag associated with waiting for decisions from Khartoum is too long and impractical in many instances. The current UNHQ situation is too bureaucratic (Participant 15).
- The developed and the planned future activities need to be recorded and available to the subsequent managers and groups of aid personnel, as there is a lack of institutional memory. The resultant is that with people moving on the next group tend to re-invent the wheel each time. Future project coordination and planning beforehand would mean that supplies would already be there, or on their way.
- Available upfront funding is needed to allow for forward coordination .
- There is a need to look more closely at the materials needed and where to source them from ahead of time as on the UNSHA West Darfur Project classrooms built out of local materials tended to overtax the ability of the local area to supply local materials, and semi-permanent materials deteriorated over time. Tent structures which are mobile could be implemented as needed.
- The international community needs to be made aware of the crisis/emergency as early as possible, so that it does not reach the dire level that existed in Darfur when aid finally arrived.
- There is a need in future for a better briefing-kit and supplies.
- Simple operating systems for say computers are needed to respond more effectively to the primitive nature of the area.
- More thought and planning needs to go into things like the worst-case scenario situations, before they happen.
- There is a need to decentralise operational stage decision-making and decentralise the associated administration.

7.5.7.2 The Key Findings Relative to Part (iii) of the Question

The findings from the participants' perspectives were compared with those in the 'Lessons Learned document' (Minear, 2005), under the headings of :

- Mobilising humanitarian action,
- Supporting IDPs and refugees,
- Managing the tensions between humanitarian aid activities and the political context,
- Situating humanitarian action in relation to the conflict,
- Improving coordination,
- Crafting an appropriate and accountable international presence.

Mobilising Humanitarian Action

In section 7.4.1 Minear (2005), the summation of the evaluation reports was that international assistance was slow in responding and gearing up for action. In addition, the humanitarian response was unable to effectively respond to the challenges faced, and did not realise how best to respond to the challenges for example, siting the camps too close to the border where military and political tensions were rife, and never quite catching up, or taking control of the crisis, as a direct result of the twelve month delay to mobilisation. In addition, the agencies did not want to alienate Khartoum and the governmental personnel who exercised military and political control over all access for personnel and materials. This summation was unequivocally supported by all of the 'management' participants.

Supporting IDPs and Refugees

As noted earlier in section 7.4.2, Sudan has the largest number of internally displaced persons (IDPs), of any country in the world, reported as being six million in 2004, and there is still no lead agency for the IDP camp management, nor identifiable institutional patron of the IDPs. The evaluations (Minear, 2005), urged that the UN agencies not repeat mistakes made relative to the IDPs' policies of the 1990's.

There was consensus amongst the participants that:

- they were always reflecting on and reviewing how sustainable their intervention systems were, in terms of a population in 'emergency mode',

- education would equip the IDPs with a basic set of skills for their future, thereby giving them the ability to be self-sustaining.

According to participant 12,

> *The whole thing is based on sustainability and durability. You have to ensure the protection of the IDPs and refugees, and that their return (to their township and land) is sustainable and not just a survival package. Have to give them the means to be self-sustaining"*.

Managing the Tensions between Humanitarian Aid Activities and the Political Context

There was unanimous agreement amongst the participants that advocacy was critical in regard to the West Darfur situation. There was a widely shared concern amongst the participants, that speaking out about the conflict or any related political issues could have materially affected their operational presence. Participant 14 for example, stated that *"you cannot be directly confrontational in talking with or dealing with the governmental agencies, and any dealings with the Sudanese government had to be handled very delicately"*.

The participants' views directly supported the agency evaluations (Minear, 2005), and the fact that the Sudanese government threatened to expel Save the Children-UK and Oxfam-GB in 2004, following their challenging statements to the UN Security Council.

Situating Humanitarian Action in Relation to Conflict

There was significant concern amongst the participants regarding the issue of "forced return" that is, forcing the return of the IDPs to their homes, whilst the conflict was still actively creating more IDPs in Darfur. The participants considered this to be a violation of human rights, and a politically motivated strategy by the Sudanese government, to try to reduce the international presence. This directly supported the evaluations in section 7.4.4 of Minear (2005), which referred to the presence of international humanitarian personnel creating embarrassment to a country trying to become self determining, and that the conflict provided the government with the rationale required to limit the scope, access and location of aid activities, to mainly government-controlled areas where they could control what the public witnessed. This view was further supported by Participant 14 who stated that, *"the government of*

Sudan signed an agreement saying that they would give us (NGO) access, but instead required 48 hours notice" and *" were the communications systems allowed to remain poor once aid arrived, in order to keep the world out ??"*. In addition, participant 5 held the view that as foreigners, the international aid personnel acted as 'witnesses' and 'buffers', and hence offered the IDPs safety from violation of human rights, whilst they were there in West Darfur.

Another effect of the conflict, according to the evaluations, (Minear, 2005) was the reported raids on aid supplies, often conducted by the guards. This view was upheld by the participants, in as much that they frequently received only a fraction of the expected supplies, once they finally arrived. However, the participants did not specifically name the guards as the prime suspects, as it could have been the result of 'bandits', or weather, or road or airstrip conditions, as well as looters.

Improving Coordination

As already referred in section 7.4.5 Minear (2005), noted that the weaker the government in a crisis, the greater the need for an outside coordination role and stated that,*" even in a non-conflict situation, such a weakness and lack of authority at the centre would create confusion"*. A strong international connection was not evident in the Darfur crisis. The picture painted by the evaluations in Minear (2005), that after a decade of reviews of UN agencies, there are still issues around governance structures, funding sources and institutional cultures, sectoral and geographical gaps. All of which reduce effective coordination (cited in Minear, 2005, p.107).The fact that the individual participants reported back to their specific agencies and sectoral agencies, meant that they supported the view that there was a lack of international coordination, and often referred to "not knowing what the overall coordination or governance plan was". Yet there were a few participants (all NGOs) who were party to a tiered decision-making system and team, where they were specifically consulted given that they were working 'in the field', or 'on the spot', and their contributions were sought-out and valued. Conversely, other participants saw their roles as "putting plasters on the cuts", and "putting out fires", mainly because communications with Khartoum were considered quite daunting, and nothing could happen without their approval. The participants were in agreement that the main issue one to three months into the West Darfur Project, was a lack of coordination and *"seeing what some agencies can do and what others cannot"* (Participant 5), as well as the physical distance between

Khartoum and Darfur, the basic remoteness of the area and the lack of capacity to deliver goods and poor or no logistical support. All of which led to poor coordination and outcomes for the clients (IDPs).

Crafting an Appropriate and Accountable International Presence

The six Darfur evaluations identified the most useful levels and scope of involvement by an international presence in terms of humanitarian intervention, (Minear, 2005), in section 7.4.6, and suggested that the Darfur response *" suffered from a shortage of field staff with the necessary knowledge and experience of starting- up a large scale acute emergency response"* (cited in Minear, 2005, p.111), and that one of the major weaknesses associated with high levels of expatriate personnel involvement in humanitarian interventions, was the poor understanding of local contexts. There was consensus amongst the participants that these views were a true reflection of their own experiences on the West Darfur project. In terms of suggestions for managing future projects, the lack of pre-training, reference to, or availability of, local expertise, and experienced field staff on the West Darfur project were recurringly strong criticisms of the start-up, pre-planning and operations stages amongst the participants.

7.5.8 Concluding Thoughts on the Findings for Part A of the Interview Questions in this Chapter

From a management perspective the findings suggest a fragmented and highly uncertain set of overall outcomes, for the stakeholders and the clients (IDPs). The overall management framework would appear to not be working optimally, or even adequately according to the findings.

All the participants, whilst being given some basic terms of reference, on appointment, from their particular agency for the SHA project in West Darfur appeared to be working in parallel rather than in an integrated manner. There was also a mix of personnel amongst the cross-sectional selection of participants, whether volunteers and paid personnel from NGOs, and career humanitarian aiders from UN government agencies. All have to comply with the overall UN (and hence the USA's) current foreign policies and Handbooks of Management Policies and Procedures. At the same time there are policies and procedures for each of the agencies whether NGOs or governmental, and each emergency is different to the previous one.

Not only are the foreign policies and priorities in terms of who and where aid will be focussed, politically driven, so too are the individual government's policies and procedures and desired outcomes. In the case of the Sudanese government, the findings and the UN agency evaluations, suggest that there appeared to be an unwillingness on the part of the government to acknowledge the numbers and actual plight of the IDPs, in that they tried to downplay the problem in part, by making the access process difficult for humanitarian aid personnel.

The 'Lessons Learned at Darfur review' commissioned by ALNAP 2004 (Minear, 2005) and subsequently read by their staff, identified the need for a thorough analysis to be conducted of the Darfur situation, as the review in their words *"relies on a fairly narrow set of data set of six evaluations of work in Darfur"*. The lack of an overall and thorough review has to date resulted in ongoing weaknesses in strategic planning initiatives for UN Humanitarian Aid Projects (Minear, 2005).

This view was strongly supported by the findings from the collected data for the Interview Questions of Part A.

7.6 The UN Sudanese Humanitarian Aid Project in West Darfur – the fit of the conceptual management model with the realities of managing the pre-planning and operational stages of the project

7.6.1 Interview Questions Part B

Part B of the interview questioning was aimed at testing the fit of the conceptual model's four key factors and potential drivers with the management realities of the UN Sudanese Humanitarian Aid Project in West Darfur. The question actually posed to the eight senior and middle operational managers (from NGOs and UN Agencies) was,

"How well does the conceptual design management model for remote sites represent the realities of your management experiences on UN Humanitarian Aid Projects and in particular, the West Darfur Humanitarian Aid Project in Sudan?".

7.6.2 Data Collection

The interviews that were conducted, explored the project in its entirety with the seventeen selected key personnel, in terms of their official roles. However, the

selection of only eight of the seventeen interviewees' transcripts, for this part of the research question, was made on the basis that these people were the managers from each of the agencies, and therefore knew the big picture objectives, the strategies being applied, and the desired outcomes.

The remaining data collected related to the participants' particular roles on the project and the impacts on their roles of the main issues, during the course of the project, and is written up in sections 7.5.1 to 7.5.9.

A refereed and published paper by Kestle and Potangaroa, (2006), focussed specifically on a selection of the collected data gathered from the eight interviewees, when testing the conceptual design management model for remote site projects against the UNSHA Project in West Darfur.Testing was directly related to the four key factors of the conceptual design management model for remote sites.

These factors were:

1. Value Generation;

2. Knowledge Integration;

3. Process Integration;

4. Timely Decision-Making,

The aim was to establish how well the gathered data supported or added to the four key factors of the conceptual design management model. The data were transcribed, collated and analysed in terms of the interview questions and the overall research question.

7.6.3 Analysis and Discussion of the 'Key Factor' Findings

As already described in section 7.1 and 7.2, the selection of the case study at West Darfur in Sudan, was made on its ability to represent the phenomenon of remote site design and project management. The UNSHA Project in West Darfur, being an international collaborative, involved aid representatives from several international countries (such as the UN HQs in Geneva and Khartoum, the USA, UK, European Union, New Zealand, and Australia). Each country contributed to the management and/or operational aspects of the project. This collaborative approach created a complex regime of project personnel and tasks that needed to be sensitively integrated, coordinated and managed. The overall aim of the UNSHA Project in West Darfur, (and therefore the various agencies), as previously noted, was 'to make a difference' to the lives of the beneficiaries of the aid, the Internally Displaced Persons

(IDPs). Provision of basic shelter and the necessaries of life, were at the core of the project's aims. Measuring the 'differences' made was problematic, as it involved levels of quantitative assessment, clinical monitoring, and also a range of qualitative, cultural, and psycho-social observations and measurements, by the operational personnel.

The complexity of the UNSHA Project in West Darfur, and the associated management of this internationally collaborative project, was strongly evident to the planning committee, subsequent management personnel, and the field personnel from the commencement of their engagement on the project, according to virtually all of the participants. This stemmed in part from the fact that there were several agencies and several countries' representatives involved, with all of their associated stakeholders and their expectations, and a non-negotiable timeline to achieve the desired outcomes.

Testing the collected data against the conceptual model under the four factors and potential drivers of value generation; knowledge integration; process integration and timely decision making, involved reviewing the responses specific to the West Darfur Humanitarian Project in Sudan. The results were generally consistent across all of the selected interviewees, though some of the respondents appeared to have more autonomy than others in terms of playing a real part in the decision-making processes. The personnel interviewed supported the four key factors of the design management model, as being valid for humanitarian aid project sites generally, and as being representative of their experiences, or those that were needed, on projects such as the West Darfur Humanitarian Aid Project in Sudan.

The key points shown in Table 5 were drawn from the collected data under the 'factor' headings.

Table 5 Key points from the UNSHA West Darfur data in reference to the 4 key Conceptual Design Management factors

The Four CDM Key Factors for Remote Sites	**Value generation as perceived or needing to be realized on the West Darfur Humanitarian Aid Project in Sudan and as per the collected data was:**
Value Generation	The effectiveness, and therefore the value was measured on the project, by what was achieved, how many people (IDP's) have been saved and fed; what the mortality rate was. Value was measured quantitatively. About keeping a reliable, continuous supply line of food to the displaced people, from a distant donor to the NGO's in the field. About making a difference to the living conditions, in terms of emergency water and sanitary assessments in the 'Field', acting

	on the recommendations, and their timely implementation. Measured in how many built outputs will be achieved, and then seeing the re-collection of people; putting the 'village' back together again.
Knowledge Integration	That there are definite gaps in the knowledge integration process. No-one wants to trespass on others' areas, and therefore perceived as a possible hindrance to finding the best solution(s). That there's a problem with the planning and the reality. Very specialised personnel who come in, cannot do what they are best at, as have to follow a particular plan, and therefore not necessarily seeing the desired/potential 'results on the ground'. That there are consultants, who are not in the UN system, who need to be advised of the potential pitfalls, when involved on these types of projects. That there are basically, informal and formal systems of knowledge integration. The gaps in specialist knowledge, in terms of the experiences of the people in the field, versus those in the office - they were not always in-line at times. That sometimes there is too much specialised knowledge on a project, and what is needed is a more holistic approach. A good knowledge of the IDPs cultural and value systems is needed, before commencing the on-site work. The high turnover rate of people in these roles, so things were not recorded as much as they could have been. Important though, to understand the context of the project.
Process Integration	To try and understand how the IDPs think, and will act/respond, and then to try and set up the best processes and systems. In trying to achieve co-ordination at the camp level, and engage in meaningful and useful relationship-building with the International, and IDP Communities. Knowing the other agencies' plans, means better facilitation. That little could have been achieved without the Sudanese people and their expertise. They had valuable connections and networks within the community. About co-ordination of the various groups, on this project, and helping working groups focus on the task in hand. To make sure that assessments are correct. That a thorough, logical and sensible solution to the assessment findings is made. Then prepare a plan to address the challenges within the timeframe and the budget.
Timely Decision-making	That decision-making on this project was quite reactive and prescriptive. The detailed, and bigger picture decisions were fed from the 'Field' back to central, where the tailoring occurred, and the decisions, and plans, were fine tuned. A tiered system of decision-making. Consultative decisions were made. The people with the on-the-ground, or with the bigger picture knowledge, worked together to work out the best answers, and decide what was feasible. That decision-making involved a group of managers, one manager for each of the programmes, and it was essentially de-centralised. That at the organisational level, the decision-making was de-

	centralised. There were considerable levels of co-ordination between West Darfur, Khartoum and the agency's head office. The staff were given almost total autonomy in the 'Field', and dedicated organisational finance personnel to work with.

The main challenge for all of the aid agencies was establishing a means of quantifying acceptable 'differences' in their clients' lives, and whether the 'plan' had been achieved once implemented, and that the expected 'value' had been generated. Measuring the 'differences' achieved was problematic, as it involved both a level of quantitative, clinical monitoring, and also a range of qualitative, cultural, and psycho-social observations and measurements.

One of the notable outcomes, from the collected data, was the diversity of views held by the respondents as to who they considered to be the stakeholders of the project, and what contributed to value generation on this project. A range of views also emerged in terms of the preferred and actual process integration in practice on the project, and whether the respondents had to slavishly follow the plan from 'central' or that local decision-making opportunities existed on the project.

There was recurring criticism of the centralised decision-making process of some of the agencies, and how this hindered progress, timely communications, and the potential for on-the-ground, and informed and improved/relevant local decisions being able to be made. Others believed, that they had some autonomy in terms of the decision-making, having had the authority delegated to them by their agency(ies). This lack of consistency of decision-making and delegated authority, across the range of agencies, and the ever-changing personnel in-the-field and offices, was challenging, frustrating and disorientating for a number of the respondents.

The respondents, almost unanimously (7/8), noted that there were significant gaps in terms of specialist knowledge and knowledge integration on the West Darfur Humanitarian Aid project.

This resulted from a range of contributing factors, in their view, being:

1. Mismatches between the knowledge and experience of personnel in the agency offices, and that of the personnel specifically brought in for the on-the-ground work associated with the project.
2. No-one wanted to trespass on (or offend) other agencies' areas of responsibility, which in reality probably puts limits on achieving the much needed knowledge integration, on these projects.

3. Too little time being spent on the pre-planning stage(s). Realistic strategies and implementation plans and processes are regarded as essential, even though these are emergency projects.
4. Continually changing staff, in all areas, means that record keeping, as well as status and improvement report writing (by the specialist consultants in particular), should be an essential part of the central and local portfolio resource pool and the pre-briefing/training of affected personnel.

A commonly, and strongly held view was that there was insufficient pre-briefing and associated training, before going into the field. There was consensus amongst the respondents, that there was a significant lack of effective and timely communication equipment, and systems available for project staff, in the Field and in the offices at the start of the 'in-the-field' project work.

Reliable and timely communications are considered to be critical on these remote sites, yet miscommunications do occur at times, between the various stakeholders, on and off site, caused perhaps by different interpretations of the issues, or decisions being made remotely from the site itself, and from each other (Kestle & Storey, 2005).

Concluding Statements

The overall research question was aimed at investigating whether a project framework based on relatively conventional issues of remoteness and sustainability could be applied to a humanitarian aid context, where the human costs involved are often significant. However, if such research could be used and extended into what must be considered an 'extreme' context, then there would be the potential to provide aid workers with guidance in a situation of apparent 'chaos'.

The in-depth detail of how well the conceptual management model represents the realities (or needs) of managing humanitarian aid projects, such as the one in West Darfur is found in the analysis and discussion of the findings in this chapter and in Chapter 8. The eight selected interviewees were very clear though that the model works, and unequivocally supported the four key factors of the design management model, as accurately representing their experiences, or those that were in fact needed on projects such as the UN SHA West Darfur Project. The analysis of the semi-structured interviews, suggested that the conceptual design management model for remote sites (Kestle & London, 2002), is relevant in a non-profit and/or humanitarian

aid context. In addition, the model allows for a blending of traditional and modern management methods.

This support by the participants of the conceptual design management model for remote sites, lends significant support to the model and to the associated typology for remote sites, and is especially pertinent given that Humanitarian Aid projects are probably one of the worst situations that one could select to test, also being very different in many ways to the Antarctic Science project(s). Yet the model works for both contexts. This then gave weight to the notion/idea of ‘model portability’ which is discussed elsewhere in the thesis and specifically in Chapter 8.

CHAPTER 8. DISCUSSION AND ANALYSIS

8.1 Introduction

The detailed findings and analysis for each of the two main case-studies in Antarctica and Sudan can be found in Chapter 6 and Chapter 7 respectively. The discussion and analysis within this chapter is in relation to the comparative similarities and differences between the findings of the Antarctic and Sudanese case-studies, and how that provided the potential to influence, modify and /or validate the conceptual management model. The two main case studies referred in Chapter 8.2 and 8.3 are the Cape Roberts Drilling Project (CRP) in Antarctica, and the United Nations Sudanese Humanitarian Aid Project (UNSHA) in West Darfur. The Antarctic science project was a retrospective historical case-study conducted with a representative cross-section of the personnel previously involved, whereas the UN Aid project was an 'as it was happening' live and current case-study, conducted with a range of aid agency managers and other in-the-field personnel.

8.2 The similarities and differences between the findings and analyses of the two main case-studies.

8.2.1. The Similarities between the Findings

- There was a consistent call from both groups of participants for better pre-planning and operational plans that reflect the actual realities of in-the-field staff needs and experiences. (UNSHA and CRP office and field staff had very different experiences and ideas respectively, on how to identify, manage and conduct the necessary tasks).
- That relevant and timely delegated authority was needed to better respond to the 'in-the-field' situations, resulting in better outcomes for everyone involved.
- There is a need for project managers to be brought in before the start of a project to better manage, inform and motivate staff to do the best job.
- That funding of these international collaborative projects is an issue at the pre-planning and operational stages, mainly because there are multiple stakeholders and sponsors and each have their own timelines for expenditure

and reporting. These expectations are rarely in sync with each other. In addition the international stakeholders either put up money or 'in kind' payments/contributions. The in-kind contributions are hard to quantify or compare across different countries as they usually involve logistical support, equipment, across laboratory access, labour or research resources, for example.

- That both groups of participants called for improved coordination of efforts at the pre-planning and operational stages by the various agencies in the future, whether Antarctic science or humanitarian aid projects, citing problematic communications and gaps in or duplication of effort on occasion.
- That the management of communications and information on these international collaborative projects conducted on remote sites, challenged even the best of the experienced staff's efforts and intentions. This was mainly because these sites were not well serviced with phones, fax, email or internet even before the expert personnel arrived, therefore hindering progress for some days and weeks, creating significant frustration and lost opportunities. In addition to the geographical remoteness, there were often local weather conditions that prevented optimal, and at times even fundamental, communication systems being installed.
- That issues around the fragmented location of site and/or office personnel created real and potential misinterpretations and miscommunications of issues, reporting of results or needs, and therefore affected outcomes and critical progress on the projects.
- That politicization of these international projects, whether resulting from cultural or local political conflicts, or governmental strategising by the various stakeholder countries, became quite a hindrance on the projects. This impacted to varying degrees on the two projects, in terms of planning, meeting operational objectives, funding, timely decision-making and trying to achieve integration of effort(s) whilst trying to work with tight timelines.
- That there were, and never are, enough personnel with the necessary specific remote site project experience, particularly on the Humanitarian Aid projects, to provide continuity between projects or provide for a satisfactory and plausible successional planning.

8.2.2 The Differences between the Findings

- The Cape Roberts Drilling Project, and Antarctic projects generally, are pre-planned well in advance in terms of funding, environmental impact reports, logistical needs and special area access requirements, often up to twelve, twenty four months or more, before the projects commence on site. This is because the scientists can only conduct their Antarctic research during the months of late September to February in any one year, as the first sunrise is around 20 September each year, and the last sunset is on or around late March. Therefore the logistical support crew prepare for the scientific research requirements during the winter months of total darkness, in readiness for the New Zealand scientists' projects. However, on the collaborative projects such as CRP there was the additional complexity of trying to coordinate management and logistical issues across seven different countries, and the changing needs and expected outcomes of their project specific personnel. In addition, what also sets the Antarctic project apart from the UNSHA project is what is referred to by the participants as the 'Antarctic Factor', meaning that the Antarctic weather and the environment control everything, and can destroy the best made plans. Flying resources and personnel into Antarctic sites can be delayed by weather conditions up to a week or more at times, meaning that worst case scenario is that the scientists cannot conduct their research in the specifically funded year. On the CRP project there was also a problem with the sea ice and the sea currents beneath it moving at speeds faster and more erratically than expected, thereby compromising the drilling equipment and the project for that first season of the 5 year project.
- That conversely, on the UNSHA project in West Darfur, the work on-site started as an International Emergency Response, meaning that fully trained and experienced Aid personnel were contacted only 24-48 hours before they were required thousands of kilometres away in the middle of a desert, with no formed roads, or communications systems in place, and with only minimal information or pre-planning available. Experienced personnel would however have been familiar with the UN Humanitarian Aid Handbook (2000), and have worked on previous, though not similar projects necessarily. Several of the participants interviewed commented that they learned more about the disaster

and where they were going from international news desk reports. The actual scope and scale of the humanitarian aid issue in West Darfur was largely unknown prior to the aid personnel arriving, as their objective at the Emergency Response stage was to in fact conduct the needs assessment and analysis in-the-field, from which the resourcing and implementation plan for the 'Recovery Stage' could be drawn up.

- That logistically, the CRP Antarctic Science projects needs were prepared during the winter months in micro detail before most of the scientists arrived in Antarctica, because of the limited access times, the limited supplies of specialist support equipment. Replacements that might be required through damage or loss, were also sourced beforehand. However, being a collaborative comprising personnel from seven countries, the coordination of actual on-site needs and objectives were often unable to be addressed fully until personnel arrived in Antarctica. The UNSHA project in West Darfur was a major challenge to the aid agency representatives and the international experts brought in, given there were no formed roads, airstrips and the area was prone to the extremes of drought or flooding, and looters. Up to 60% of donated aid and critically needed basic resources were prevented from arriving to the project camp sites, by looters or extortionists, or damaged by flooding.

8.2.3 How the Findings Compared Overall

Despite the fact that the two key case study projects were operating within quite different disciplines and with very different goals, there were significant similarities between the findings, even though they were very different projects, with uniquely specific objectives, stakeholder expectations and management approaches. This was not really expected at the outset, but added weight to the value, usefulness and portability of the management model across disciplines, and was very encouraging in terms of how well the model stood up to the in-field testing with the selected participants.

8.3 Why the Model was Specifically Supported by Participants on the two main Case Study Projects

When writing up the data analysis from the findings for both of the main case-studies, all of the participants agreed that the four key factors of the management model

represented their experiences on the project that they had been involved on, and had been interviewed about for this research. The model was supported by the two main case-study projects' findings. Evidence of this was found by looking in more detail at situations identified by the participants, which were linked to statements where they refer to 'the factors in the model being representative of the project's management, and their own experiences'. Specific examples are drawn from each of the Antarctic and Sudanese case studies, and written up under the four key factors of the model, to show how they were severally and collectively supported.

8.3.1. Antarctica - Cape Roberts Drilling Retrospective Case-study Findings Pertinent to the Support of the Model's Four Key Factors for this Particular Project

Value generation was acknowledged as a key factor particularly as it related to the key aims and the value sought in terms of the Antarctic rock core drilling projects. The main aim had been to recover high quality sedimentary strata core to provide internationally significant scientific outcomes related to determining the core's composition (geologically and climatologically). In addition, the analysed data from the case-study supported the notion that strategic decisions made at the design and pre-planning stages significantly impacted the value generated for the client and stakeholders in terms of the outcomes.

Knowledge integration was acknowledged as a key factor too, being realized in the lack of, and need for successional planning on these specialised projects. However, intellectual property (patch protection) issues were identified as an inhibiting factor for knowledge integration to occur as intended under the Antarctic Treaty. There was strong support for clear, effective and regular communications, on these remote Antarctic sites in future. In addition there was a call for centralized storage and management of operational and archival data on future projects, in order to enable reliable and efficient processes, innovative responses, and accurate, timely outputs. The creation of a common website accessible to all of the international collaborators and involved personnel, whether logistic, design, scientific or administrative was another recommendation from the participants.

Process integration was acknowledged as a key factor by the project participants. They noted that there had been a lack of certainty and/or clarity around process integration, as it involved the various stakeholders, offsite and on-site personnel. The

associated planning, logistics and procurement strategies had resulted in dissatisfied staff, staff burn out, budget blowouts and incompleted projects.

Timely decision-making was acknowledged as a key factor given the potential of time delays associated with decision-making about design or financial issues causing flow-on effects across all disciplines and tasks.

Misinterpretations of issues and a lack of delegated authority were cited as having occurred between stakeholders on and off-site, due mainly to their working remotely from each other, and in several instances, remotely from the site itself, causing delays of up to twelve months on the project until the site became accessible again. However, it is also well known in the Antarctic fraternity that personnel/stakeholders have no real control, as the weather and the environment control everything, often being referred to as the 'Antarctic Factor'.

8.3.2 West Darfur Sudanese HA Case-Study Findings Pertinent to the Support of the Model's Four Key Factors

Value generation was acknowledged as a key factor on this Humanitarian Aid (HA) project, and was measured quantitatively in terms of how many lives were saved and fed, and the number of built outputs achieved in rebuilding the villages, and establishing a reliable and continual supply line of food and water.

Knowledge Integration was strongly acknowledged as a key factor on Humanitarian Aid projects. The participants identified a number of gaps in knowledge integration. Examples included situations where very specialised personnel were brought in to the sites, but they could not do what they were best at due to a lack of a reality check at the preplanning stage between the plan set by office staff remote from the site, and the actual in-the-field needs. In addition no-one wanted to trespass on another's area of perceived expertise, so the best solutions were potentially missed, and sometimes there was too much specialised knowledge on a project. What was needed was a more holistic approach.

Process Integration was acknowledged as a key factor too, being realized for example, when trying to achieve coordination amongst the various aid agencies and their specifically targeted plans. Also when trying to build workable relationships between the IDPs and international aid communities at the 'camp' level, whilst keeping to a tight budget and timeframe.

Timely decision-making was strongly acknowledged as a key factor on this and other HA projects, and that the timing and reality of decisions made were pivotal to the success or potential failure of this and other humanitarian aid projects. Examples being the recurring criticism (by interviewed participants) of how the centralised decision-making process of some aid agencies, and a lack of delegated authority to field personnel often hindered progress and communications at the critical emergency response and recovery stages.

8.4 The Usefulness of the Model and the Changes over Time

The analysis of the data findings from the interviews conducted on **the Sudanese Humanitarian Aid project,** suggest that the conceptual design management model for remote sites by Kestle and London, (2002), is relevant in a non-profit and/ or humanitarian aid context, because the conceptual model essentially allows for a blending of traditional and modern management methods which apply on these projects. The analysis of the data findings from the interviews conducted on **the Cape Roberts Drilling project,** suggest that the conceptual design management model for remote sites by Kestle and London, (2002), is relevant for these commercial scientific projects as it recognises the realities and the politicization that occurs on international collaborative projects such as the Cape Roberts Antarctic Drilling project.

The issue and impacts of politicization on these international projects added to the management challenges across all aspects, and all stages of the projects, and included the impacts on the stakeholders, clients, logistics, finances, site and office personnel, the processes, and the final outcomes for these international collaborative projects. Differing languages, differing cultural, work and organisational structures at the planning and operational stages, have to be acknowledged and addressed on future projects in the process documents when delegating effective decision-making authority, and when planning to manage personnel in-the-field', or 'on-site'.

On reviewing the findings and analyses from Chapters 6 and 7, the usefulness and an unexpected portability of the conceptual model has emerged, as a result of testing it across the very different disciplines of Antarctic Science and Humanitarian Aid post-disaster projects on remote and frequently environmentally sensitive sites.

The initial intent and objective around the development of the conceptual management model for remote sites have evolved over time, and the model has started to take on a few new dimensions and uses. One use for the model was as a

‘management tool’ where it was found to be effective in understanding the issues related to the provision of Humanitarian Aid, and for modelling and analyzing situations, as attested on the Humanitarian Aid Project in West Darfur (Kestle & Potangaroa, 2006). Another use for the model, on both of the main case-study projects was as a management framework for comparing what was seen and experienced in-the-field with what was originally planned by in-the-office management personnel often distantly located from the sites and with little or no in-the-field experience. The extent and potential for the management framework’s portability, could be developed further by documenting applications of the model by future practitioners in the Antarctic science, humanitarian aid and post-disaster reconstruction fields.

CHAPTER 9. CONCLUSIONS

The objective of this research was to develop and validate a conceptual design management model for remote sites, in order to answer the research question: "What are the key factors and drivers that constitute a plausible theoretical conceptual design management model for remote sites?"

The approach taken involved several stages of research investigation, commencing with a review of lean and design management literature and investigating, in part, three previously completed world heritage site projects across a range of geographically remote locations, in order to develop a typology and an exploratory conceptual design management model for remote sites. The model emerged from a synthesis of production and sociologically-oriented world views associated with the reviewed lean design and design management theoretical and applied research literature, in the Architecture, Engineering, Construction, Conservation and International Science disciplines. The conceptual model identified the perceived importance of an integrated approach to the management of these remote site international collaborative projects.

The next stage involved testing the newly developed model by conducting a retrospective case-study of the Cape Roberts Antarctic Drilling Project (1995-2001), in 2003-2005, and a case-study of the UN Humanitarian Aid Project in West Darfur, Sudan in 2004, using face-to-face interviews with selected participants. The Antarctic community were keen to have an 'outsider' actively review the project from a management perspective, as were the Humanitarian Aid community.

The findings (refer Chapter 8) lent significant support to the model and to the associated typology for remote sites. This was especially pertinent given that Humanitarian Aid projects are probably amongst the worst situations that one could select to test, given the random nature of emergencies needing to be managed, the lack of forewarning for the specialist personnel, the wide range of agencies and their expectations, and management approaches. They are also different in many ways to the Antarctic Science project(s), in terms of there being an opportunity to pre-plan the Antarctic Projects, but the challenge there is always the Antarctic Factor.

The comparative findings were discussed in some detail in Chapters, 6, 7 and 8, and the key points are summarised as follows:

1. The conceptual design management model can be applied to:
    - international science projects
    - humanitarian aid projects
    - eco-resort projects with an environmental education focus
    - national park conservation site projects.
2. The conceptual design management model:
    - is relevant in non-profit and/or humanitarian aid contexts
    - allows for a blend of traditional and modern management methods on humanitarian aid projects in particular
    - recognises the realities of politicization and differing organisations on international collaborative remote site projects.

As discussed in Chapter 8, there were a significant number of similarities between the findings on the Antarctic and Sudanese Humanitarian Aid projects, regarding the validity of the remote site management model, despite their very different disciplines, stakeholder goals/expectations, and approaches to managing the projects. The findings regarding the usefulness and fit of the conceptual design management model with the realities of managing the two main case-study projects selected were very encouraging, and at times surprising, in terms of how well the model stood up to the in-field testing with the selected participants. The model works for both contexts. This was certainly not expected at the outset of the research, but added weight to the value, usefulness and portability of the model across a range of very different disciplines. This gave weight to the notion/idea of ‘model portability’ as discussed in Chapter 8, and leads to the discussion on the potential directions that future research may take, in Chapter 10.

CHAPTER 10. FUTURE RESEARCH

Subsequent research work has already commenced. Further testing of the conceptual model by in-the-field practitioners and researchers has been undertaken from 2004-2008 on the post-disaster reconstruction tsunami relief project in Banda Aceh, Indonesia (Potangaroa & Kestle, 2008). The objective of the research on this project was to establish where perceived and actual value was added to the beneficiaries, by the Jesuit Refugee Services (JRS) as a part of their Tsunami Relief Programme. Following further with the Humanitarian Aid theme and the notion of 'model portability', given the findings as discussed in Chapters 6,7 and 8 in particular, there is the prospect for:

- The development of a project planning framework specifically for Humanitarian Aid projects built from the conceptual design management model for remote sites, which ensures that the significant 'gaps', identified by the respondents and interpreted from the data collected from the West Darfur Humanitarian Aid Project in Sudan, are addressed.
- The documentation of further applications of the conceptual design management model by future practitioners in the Antarctic Science, Humanitarian Aid and post-disaster reconstruction fields.

In addition, there are several other potential research developments and investigations that could be undertaken that build from and align with this doctoral research, particularly when reflecting on the work by Winter *et al.* (2006). Those research findings supported 'theoretical models for practice', (such as the conceptual design management model for remote sites in this thesis). In their research work Winter *et al.*,(2006) called for "new models and theories which recognise and illuminate the complexity of projects and their management at all levels", "concepts that focus on the interaction amongst people and the framing of projects within an array of social agendas, practices, stakeholder relations, politics and power," and "concepts and frameworks which focus on *value creation* as the prime focus of projects." They asserted that *"theories about practice can also be used as theories for practice."* The *network* project data analysis also established that future research needs to specifically focus on creating theories and concepts which are closely aligned with in-the-field

realities, and which provide project practitioners with realistic and contemporary management frameworks.

The data collected from the practitioners by the *research network* referred to the complexity of projects, created in the main by ‘the multiplicity of stakeholders and their differing agendas’, and ‘theories, practices and communications operating within the different interest groups’. They suggested that concepts and frameworks which would help them deal with the project complexity issues ‘in the midst of practice’ would be useful. Such concepts and frameworks need to recognise interdisciplinary approaches, social processes, project conceptualisation, value creation and value management. This presents one of the key challenges for future research that leads directly from this work.

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APPENDIX A

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APPENDIX B

University of Canterbury Human Ethics Committee (HEC) ref HEC 2008/1.

1. Letter of Approval from the HEC University of Canterbury, for the research proposal “Thesis: Remote Site Design Management - Project A and Project B”.
2. Project Case Study A- Cape Roberts Drilling Project Antarctica, Information Sheet, and Participant Consent Form templates.
3. Project Case Study A- Cape Roberts Drilling Project Antarctica, Interview Questions.
4. Project Case Study B- UNSHA (Humanitarian Aid) Red R project Sudan (West Darfur), Participant Information Sheet and Consent Form templates.
5. Project Case Study B- UNSHA (Humanitarian Aid) Red R project Sudan (West Darfur), Interview Questions.