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## HOW WELL DID A MULTI-STAKEHOLDER MANAGEMENT FRAMEWORK FOR REMOTE SITES MODEL THE REALITIES ON AND OFF-SITE OF A SCOTTISH HIGHLANDS INFRASTRUCTURE MARINE PROJECT - REFLECTIVE CASE STUDY

Linda Kestle<sup>1</sup>,

<sup>1</sup> Unitec Institute of Technology, New Zealand  
lkestle@unitec.ac.nz

**Abstract:** The next 20 years will see inward investment of up to £100 billion in construction (and energy) projects in northern Scotland, particularly in the Highlands and Islands. The majority of these projects will take place in locations which are, to a greater or lesser extent, remote. However the performance of many remotely-sited projects across the world highlight the need for more effective management strategies and models. The multi-stakeholder management framework for remote site projects, developed by Kestle (2009), synthesised production and sociological design and management approaches, and has already been tested and validated on Antarctic, humanitarian aid and post-disaster reconstruction projects globally. Participants for this research were designers, construction, and project managers involved on a commercial scale marine infrastructure project in the Scottish Highlands. Semi-structured interviews were conducted and the findings analysed to establish and reflect on whether the framework modelled the realities on this remote site project, and actually provided the value-added sought by the multi-stakeholders involved. The findings suggested that the stakeholders' value criteria expectations were indeed met, and that the management framework did reflect the realities of designing and managing this particular remote site project.

### 1 INTRODUCTION

Design and construction processes have become more complex and fragmented over the last few years, resulting in an increasing need for a shared and early understanding of the project objectives amongst the stakeholders. What is valued in the project, significantly impacts upon how and when decisions are made on design/construction issues. In the design management field the integration of those who have knowledge that contributes to the design, construction and management, is critical to developing and achieving value on projects. The added dimension of remote site projects, increases the complexity, and makes early decision-making; knowledge integration; logistical implementation planning absolutely critical and central to the potential success, or failure, of the project. The project team has to not only address the traditional management problems, but also those that specifically occur as a result of the remote locations of these often environmentally, and politically sensitive sites (Kestle, 2009).

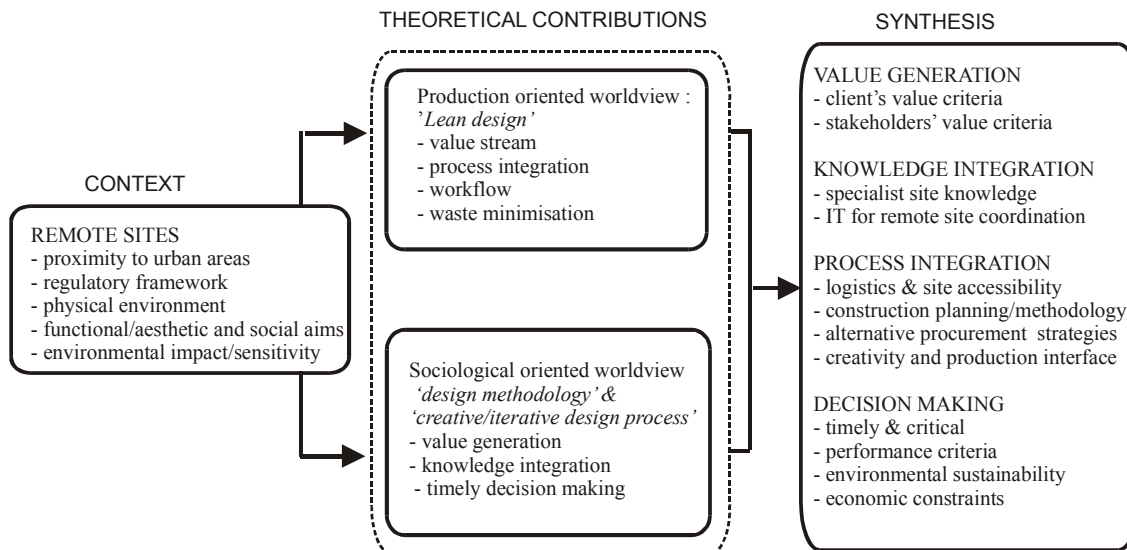
The selected project for the this reflective case-study was the Ullapool pier improvement project, as it met the majority of Kestle (2009) typological criteria for remote sites, and aim was to utilise the Kestle (2009)

management framework to establish and reflect on how well it modelled the realities of designing and managing an innovative infrastructure marine project in the remote Scottish highlands.

## 2 THE BASIS OF THE KESTLE (2009) MANAGEMENT FRAMEWORK

The development of the conceptual design management model (for remote sites), was a in part a response to a call by design management researchers Koskela *et al.* (2002) for example, for research collaborations that improved the discipline of design management, and provided a solid conceptual foundation. Similarly, Winter *et al.* (2006) observed that “theories about practice can also be used as theories for practice”. In particular it was suggested that future research needed to focus on ‘in-the field realities’ and offer practitioners realistic and contemporary management frameworks, that helped deal with the complexity issues of projects in the ‘midst of practice’ and recognised that an interdisciplinary approach was useful.

The conceptual model by Kestle (2009), was originally informed at the exploratory stages, by the key concepts and principles of design management and lean design management literature, and developed in conjunction with a typology for remote site projects (Kestle and London, 2002). The latter involved investigations into three historical project case studies on remote sites in Australia (Kingfisher Bay eco Resort), New Zealand (Tongariro National Park huts and ski lodge sites), and the Ross Sea Region scientific bases in Antarctica. The end result was a theoretical conceptual model which highlighted the factors or drivers that needed to be considered in the development of a conceptual design management model for remote sites (Kestle, 2009). Those factors were *value generation*, *knowledge integration*, *process integration* and *timely decision-making*, and were arrived at by contextualising the typological descriptors for remote sites, identifying the contributions made by the sociological and production oriented worldview literature, and in turn became the synthesis described by the four factors/drivers for the theoretical model.



Conceptual Design Management Model for Remote Sites  
(Kestle, 2009)

'Value Generation' - refers to the value that the client and stakeholders place on the project outcomes, and will vary according to the differing clients' and stakeholders' expectations of the projects, and these can vary not only between stakeholders but also between client groups.

'Knowledge Integration' - is concerned with capturing and integrating the specialist knowledge of all those personnel involved on a particular project, prior to and during the project phases. This suggests that key

personnel be involved with any pre-briefing, pre-planning, and in the regular monitoring and review of the planning and operational stages, as the project progresses. Specialist knowledge is required to ensure the best solutions and results, despite frequently working with non-negotiable timelines.

'Process Integration'- involves the timely and cost-effective co-ordination and planning of a range of processes across the total project, such as planning methodology, logistics, information management, and the management of design/ production interface. Logistical planning and implementation is complex, as well as critical in post-disaster response and recovery coordination.

'Timely Decision Making'- refers in the main to financial and design decisions, which are critical to the successful management of collaborative international projects. These decisions are made within the context of frequently non-negotiable windows of buildability timeframes, fixed or controlled budgetary constraints, and/or health and safety concerns.

The (doctoral) design management model for remote sites by Kestle (2009), has now been used for a few years as a management framework/tool on a range of multi-stakeholder international projects to gather data from in-field personnel and compare the in-field realities with the designers' and managers' pre-construction stage design and management planning for the project, in order to add to learnings from these remote site and often environmentally sensitive projects.

Researchers Salvatierra *et al.*(2010), recently noted that the concept of value varies across time, is context dependent, is relative/comparative, and very subjective, and tends to be restricted to just achieving value for end-users and clients, rather than society as a whole. Salvatierra *et al.* (2010), also referred to research by Ballard (2006) who was working on a model of project definition with a value generation perspective and which gives importance to the stakeholders 'perspective of value'.

The stakeholders involvement is considered a key element in generating value, therefore it is important to underline the contribution of Emmitt *et al.* (2004), where the concept of value was divided into 'external value', which is the client/customer value, the value that the finalised project should have achieved, and the 'internal value' achieved by, and between the delivery team. The Kestle (2009) management framework, and the research work by Kestle published in Emmitt (2012), referred to adding-value, and that the integration of a team with knowledge contributing to planning, design, construction and management, was critical to developing and achieving value on projects for the client and stakeholders.

### **3 METHODOLOGY**

The decision to undertake a reflective case study of the 'Ullapool harbour pier/berthing improvement'-a marine infrastructure project in the Scottish highlands, was made on its perceived ability to resonate with the Kestle (2009) management framework and provide data and insights into how well the framework resonated /fitted with this multi-stakeholder remote site project.

The qualitative data were collected using semi-structured interviews with 5 selected participants and these were later codified, and analysed to identify whether and how the stakeholders' added-value expectations had been met, and if the management framework did in fact reflect the realities of designing and managing this particular remote site marine infrastructure project.

Participant selection for this research was made on the basis of the participants' roles and disciplines, and whether they played a management role, and/or were key players on the Ullapool Harbour Pier Improvement project in the Scottish highlands. The selected participants were stakeholders, designers, construction managers and project managers. The aim of the participant selection, and subsequent qualitative semi-structured interviews with them in September 2014, was to try and establish the participants' perceptions and realities of their first-hand experiences in the design office, and in-the-field, and how the project ran, on reflection, and whether and how value was added for the various stakeholders. The interviews ran for a minimum of an hour and thirty minutes per participant, using the ethically approved open-ended interview questions (refer Appendix A). The interviews were conducted within the context of the participants' official roles on the project. This involved exploring the management approaches, the challenges at the pre-planning and operations stages, the reflections and learnings from

the project in Part A, and seeking detailed participant responses to the relevancy of the four key factors of the Kestle (2009) management framework to this particular project in Part B.

## **4 RESULTS AND REFLECTIONS**

### **4.1 Overview of the case study project**

The project, located in the northwest Scottish highlands was initiated by the clients/stakeholders (Ullapool Harbour Trust, Stornaway Port Authority and CEMAL (Caledonian Maritime Assets Ltd)/CalMAC - Caledonian, Macbrayne ferries), as a result of a decision to increase ferry passenger capacity between Stornaway and Ullapool, and which involved the commissioning of a new 13000 tonne, 115m long ferry for delivery in late 2014. The new ferry weighed 50% more than the existing ferry, and was 15m longer. There was originally only one pier, and one linkspan at Ullapool, whereas there were already two piers at Stornaway, hence the decision by the various Port and Ferry service stakeholders to extend the current Ullapool pier by 35m, and call for interested marine infrastructure designers to compete for the appointment to design and manage the tendering of the project.

### **4.2 Key factors for consideration and resultant design challenges**

The Ullapool pier and berthing improvement project was designed, consented and tendered in the period from 2010 till 2013. Factors for consideration included the fact that winds are often over 25 knots. This fact had previously meant 1/3 to 1/2 of existing ferry sailings being cancelled, so the capacity of the new pier extension thrusters needed to be increased for when winds are over 25 knots to help the ferry when reversing into the extended pier. The berthing velocity needed to be 0.2m/s, as the energy absorption of the current pier of 3500 ton displacement, could not resist the 6054 tonne displacement of the new ferry. Hence new and innovative 8m long fenders, known as 'parallel motion fenders' were designed and installed on the pier extension. According to the interviewed participants, energy absorption is absolutely critical when designing piers. The design of the fenders had to be undertaken first before any of the other considerations were addressed, and the fenders were only to be attached once the caisson was installed at the Ullapool pier. The thickness of the caisson walls was critical as well, too light it would fail under hydrostatic pressures, too heavy and it might sink.

### **4.3 Stakeholder criteria and consequent impacts on the type and installation of the pier extension structure**

Avoiding disruptions to the use of the harbour by ongoing ferry passenger services, cruise ships, fishermen, tourists, and avoiding disruptions to tour bus operations, and local residents' and businesses, was absolutely pivotal to meeting the stakeholders' value criteria/added expectations of the project. Therefore, after several piling options were considered, the decision was taken to increase the budget to facilitate the construction of a 35x14mx15m high caisson off-site, some 140 miles/230 km away at Greenock, Glasgow and float it north along the coast to the Ullapool pier over a 2.5 day period. This called for design, construction and logistical innovations, to ensure that the right design solution, safe delivery and installation at Ullapool. The risks were significant, on reflection, according to the participants, given the fact that this off-site prefabrication and delivery approach was a first, the dramatic off-shore coastline to be navigated, the unpredictable weather, challenging spring tides, and the constant risk of capsizing of the 4000 tonne caisson that consisted of 12 cells filled with water ballasting to weigh it down sufficiently for the trip to the pier site. When the caisson was floated in a fenderless state to the pier, there were on average 5.5m tide changes.

### **4.4 Management Frameworks, Pre-planning, Operations, and Communications**

In summary, neither the designers, nor contractors operated a hierarchical management framework. Instead teamwork, partnership, a no-blame organisational culture, and an open-company approach was the norm. The resultant pier improvement project personnel were a team of informed, included and acknowledged staff, sub-contractors, and clients/stakeholders. Significant pre-planning was a constantly

held view by participants of how and why the project succeeded in meeting stakeholder expectations. Pre-planning by the designers and contractors included extensive, thorough, albeit exhaustive detailing of every element, component, pre-fabrication process, operational logistics, installations, coordination of trades at the pier and foreseeing harbour-use contingencies. Communications were collaborative, inclusive and regular during all of the design and operational stages. All the design and construction staff were expected to be quick problem-solvers and deal with any problems immediately. Daily communication meetings were held between the client, designers and contractors once site work commenced, resulting in positive progress, open frank discussions and collaborative decisions, resulting in a very positive work environment and best end product. Staying on top of the details was suggested as another reason for the success of this (and other) project(s), and was a commonly held view amongst the participants'

#### **4.5 Reflective Analysis of the (Part B) management framework factors' findings**

##### **a) Value Generation**

The clients and stakeholders non-negotiable value criteria were that this project had to be completed by August/September 2014, for the new ferry service to potentially commence late 2014, and that there be minimal disruption to ferry schedules, any and all harbour users, tour operators and local residents. In addition, the Ullapool pier improvement project had to be well project managed, timing and keeping to budget was also absolutely critical for client/stakeholders. All of these criteria were met, and the ongoing feedback from clients/stakeholders as work progressed, and as it completed have been very positive on all counts. The off-site caisson decision was the right one as was the decision to award the contracts to the successful designers and contractors who paid significant attention to pre-planning, detailing, logistics and an inclusive non-hierarchical team approach. The resultant was a project that met all of the stakeholders' and client's value criteria – no disruptions to harbour users, met the strict timelines and was definitely fit for purpose.

##### **b) Process Generation**

This project was all about forward planning and logistics from a process integration perspective - building the 35x14x15m high caisson off-site at a considerable distance (230km) from the pier site, and then also ensuring that the pier was ready to receive the caisson. The work platform was very tight (35x14m), with 4 very different contractors there at any one time, including teams of divers, grit blasters, concrete pumpers, and crane operators. A total team involvement, including the designers, clients, designers, contractors, sub-contractors, caisson prefabricators *et al* from day one, and even before day one, was obviously key to the successes achieved within the very tight 6 month construction timeframe, embracing specialised design and construction innovations, and logistical risks.

##### **c) Specialised Knowledge Integration**

The fact that the designers and contractors' had previous specialist pier experience, even though the caisson approach was a first for them. Apart from the prefabrication of the caisson, the project utilised local people, local knowledge/solutions, and local networks proved invaluable for this project from the stakeholders' perspective. Specialist knowledge was definitely needed though on this site, for example, previous and detailed knowledge of ground conditions under the future caisson position, ballasting specialists were essential, divers experienced in attaching anodes to the steel piles and thence to the caisson, painting and concreting below water, and the need for very specialised marine specific IT knowledge. Early contractor and sub-contractor involvement with local knowledge across all or most of the tasks was invaluable on this project. Achieving demanding 'tolerance controls' under water for caisson work was a significant lesson learned for future projects according to the participants..

##### **d) Timely/Critical Decision Making**

The start time in January 2014 was a difficult time of the year to start such a project, being winter, and northern Scotland. However, according to the participants the extensive pre-planning meant that everything went as planned in terms of the caisson and foundation aspects of the project. Funding

constraints meant that monies had to be spent by the end of March, so working through some of the worst months weatherwise, with limited daylight was a real challenge at times. Deferring end-budget to end-summer might help future projects. However, in future a new challenge for infrastructure projects is that consents have to be in place before any funding is sought. Decisions were always made cooperatively and collectively between on-site and off-site personnel, and were always unambiguous in terms of the tight construction times and tides, creating trust, buy-in and best solutions. Delegated authority was key. Workable tides only ever occurred 3 times/fortnight, which together with strong seasonal winds created pressure points on the project that had to be met, no question. This was particularly important, as it significantly affected decisions around when diving operations could be undertaken, especially painting, anode attachments, and concreting activities best conducted at those lower tide levels.

#### **4.6 Overall reflections, learnings and relevance of the model to the focus project in the Scottish highlands**

The client/stakeholder representative provided feedback at daily meetings with the on-site including the designers, and this at times included off-site staff as well. This in their view resulted in clear and timely communications throughout the project, and avoided potential misunderstandings and programming holdups. In terms of the pre-planning, it was noted by the participants that the designers, client, stakeholders, the potential contractors and sub-contractors were meeting regularly around the table. At these meetings the potential contractors were made aware that they had to provide a method in their tender for the caisson, rather than for piling, and had to demonstrate and explain how they planned to mitigate disruptions to all the harbour users. The caisson approach was a new experience and challenge for those who had been involved with previous pier construction, so it carried a modicum of risk and the chance for innovation as well. The resultant design, logistics and construction methodology worked well according to the stakeholders and the participants interviewed. The caisson was floated into position in June 2014, and the completed project handover was 25<sup>th</sup> September 2014, meaning the project was on-budget and well ahead of the scheduled ferry delivery time in late 2014.

The participants all commented that the four factors did in their view model the key aspects of the design and management on and off-site for this project, and when undertaking a multi-stakeholder remote site projects. Participants were quick to identify ways in which the process integration, value generation, specialist knowledge and timely/critical decision making applied to this and other remote site projects that they had been involved on, and often answered giving some in-depth examples. They found the semi-structured interview research process very useful in terms of offering them a chance to reflect on their experiences and identify the areas of reassurance around their on and off-site practices, and the lessons learned from the Ullapool pier improvement project. One of the commonly held views amongst the participants in terms of best practice management of the project, was how well the collaborative approach involving all the on-site and off-site staff, and stakeholders had worked, both before and during the construction stages.

## **5 CONCLUSIONS**

The objective of this research was to establish and reflect on how well the Kestle (2009), multi-stakeholder management framework for remote site projects modelled the realities/experiences on and off-site, and added value for the stakeholders in terms of their expectations and requirements, on the Ullapool pier improvement project in the Scottish Highlands. The methodology undertaken involved conducting semi-structured interviews with designers, stakeholders, construction and project managers on the pier project, in September 2014 as the project concluded, and was handed over to the client/stakeholder representatives. The findings suggested that the reasons for the project achieving the stakeholders goals and a value-added result resided in the extensive pre-planning, thorough detailing, quick problem-solving, and working collaboratively at all times across all the players, before and during the construction stages, therefore keeping everyone informed on a regular often daily basis. In addition, specialist knowledge of pier design and construction, local labour, local networks, and the local challenges (such as tides and weather, ground conditions), were invaluable to the success of this project

being delivered to budget, to stakeholder criteria, and well ahead of schedule in readiness for the new ferry at this remote site location in the Scottish Highlands.

## Acknowledgements

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## Appendix 1

### INTERVIEW SHEET

#### Part A

The focus of this part of the interview is on the official role that you play(ed), from a management/managed perspective.

Name of Interviewee

Date

Name of the Project

#### Q1

In your role (and your official capacity) as .....on this project, please identify

- a) Your job description, briefly, in terms of your key responsibilities on this project, and how they may have changed during the course of the project.
- b) If there were changes during the course of the project, how did these impact on your role and/or on the project overall

#### Q2

(a) What in your official role, were the main (management) challenges that arose during the project. Please answer this question as concisely as possible, under the bulleted headings below.

- Management framework and approaches,
  - Pre-planning and detailed planning stage(s)
  - Operations stage
  - Communications
  - HR
  - Funding
  - Other challenges
- (b) Recommendations / lessons learned for future projects

#### Part B

The next few questions are related to the exploratory conceptual design management model/framework developed by Kestle (2009) for multi-stakeholder international remote site projects.

Please find a copy of the model/framework attached to this questionnaire, as we would like to test some of those ideas with you relative to this particular project.

#### Q3

In terms of this Project in particular, and your role on that project, please comment on:

- a) Value Generation – (the value that the client/stakeholder places on the particular site and the project, and the value various roles add to the outcomes)
  - what are/were the clients value criteria,
  - what are/were the stakeholders value criteria
  - how do you know or measure the effectiveness of your role on this project
  - are there any rules-of-thumb that you intuitively apply(ied)



- how and what type of feedback do you get/ have you received from clients
  - b) Knowledge Integration- (a combination of relevant specialist knowledge across IT, design briefing, pre-planning/early contractor involvement and at the construction/operational stages)
    - specialist on-site construction knowledge expectations/challenges
    - IT for remote site coordination challenges
    - are there gaps in the specialist knowledge that you are aware of in your area of involvement on the project, and if so what
    - how is what you have learned on this project passed on to others during the course of the project, and for future projects
  - c) Process Integration
    - logistics and site accessibility challenges
    - design and the production interface challenges construction/operational planning/methodology
    - alternative procurement strategies
    - what methods or approaches do you employ to achieve your goals and fulfil your role
    - how have you improved/added value to this approach, or to the system(s) used
    - what role does HR play, or could it play (staff training /upskilling)
  - d) Decision Making
    - how are the decisions made – and are they decentralised or centralised
    - what are the expected performance criteria expectations on staff and their accountability
    - are there limited operational windows, and if so when and why do they occur
    - what are some of the economic constraints (are there tight/impossible budgets?) and how are budgets maintained
    - how are any environmental sustainability sensitivities of the site, and likely impacts addressed and managed
- Q4 Other comments, that you consider may be relevant to this research