A study of the elements that lead to reach the ineffectiveness of risk management implementation in Independent Water and Power Plant projects in Saudi Arabia

Yousef Alsulaiman, Dr. Graeme Bowles and Prof. Stephen Ogunlana

Ya48@hw.ac.uk , g.bowles@hw.ac.uk, and S.O.Ogunlana@hw.ac.uk

+ (44)7760131166, + (966)504224378.

School of the Built Environment, Heriot-Watt University, Edinburgh, EH14 4AS, UK

Abstract

Many countries worldwide are facing a significantly high demand for water and power. Saudi Arabia has one of the highest water consumption rates per capita in the world. Water and power plant projects following the Independent Water and Power Plant (IWPP) approach have typically involved a plethora of risks. Since about 75% of IWPP projects in Saudi Arabia (SA) have failed to meet specified objectives, effective risk management (RM) implementation is key to the success of any public and private project. Practitioners have related their experience about RM in IWPP projects in SA through semi-structured interviews, and analysed these through the grounded theory approach. The paper concludes with an emergent diagram that illustrates three major phenomena, eight categories, and eighteen subcategories affecting the implementation of RM in water and power plant projects in SA.

Keywords: IWPP project, risk, Saudi Arabia, water and power.

1. INTRODUCTION

With the growing demand for water and power service provision and the tight budgeting by governments, the IWPP approach is a promising option to resolve the twin issues of water and power provision. However, no construction project can be undertaken without an attendant element of risk; thus, RM is an essential consideration in project management when seeking to improve performance and project efficiency (Kelly 1993). To insure success in an IWPP project, the risks associated with the project first need to be clearly identified, evaluated and managed (Hsiao 2000).

This paper aims to support a novel theory, by illuminating a particular phenomenon in the area under study, which aims to identify the elements leading to ineffectiveness when implementing RM in IWPP projects in SA. Three main subjects, namely, RM (RM), water and power plant (WPP) projects and public private partnerships (PPP) in the global context, and SA in particular, are linked together to reflect the contributions of each in fully enhancing performance in regard to time, cost and quality in independent water and power plant (IWPP) projects.

2. LITERATURE REVIEW

2.1 RISK MANAGEMENT

It is widely accepted that risk attends all construction projects; whilst this can be managed, minimised, shared, transferred or accepted, it cannot be ignored (Dallas 2006). Due to the significant changes witnessed within the construction industry, particularly in terms of procurement methods, as clients allocate greater risks to the private sector, RM has become a necessity, requiring organisations to examine the entire lifecycle of a project. Furthermore, one of the main barriers to the success of such projects is the lack of a formalised approach to RM (Tah and Carr 2000; Ke *et al*. 2010).

It is crucially important for both public and private sector organisations to understand the various risks associated with projects if they are to guarantee long-term success for projects. Furthermore, for each risk it is essential to address the likelihood of risk and the ability of the organisation to reduce the incidence and impact of the risk (Wang *et al*. 2004). Managing risk has two major objectives: to avoid the downsides of risks and to exploit opportunities.

2.2 Current Risk Management Practice in Saudi Arabia

Based on multiple studies into the implementation of RM within the SA construction context, it was found that RM has not been successfully applied uniformly throughout the diverse stages of previous SA construction projects. Falqi (2004) compared the UK and SA in terms of delay to construction project performance, and reported extensive delays affected SA construction projects; typically reported delays which were considerably longer than those in the UK. Poor implementation of RM was found to be one of the most significant reasons for delays. However, the current literature has illustrated that there are an insufficient number of feasibility studies to assess the practice of RM in water and power projects in SA adequately; despite the general research on inadequate observance of RM practices. Combined with this lack, there are also no previous studies regarding the practice of RM in IWPP projects in the SA context. This may be attributable to the short history of IWPP projects in SA. Hence, this research is important when trying to uncover RM practice in IWPP projects in SA.

2.3 WATER AND POWER PLANT PROJECTS

The majority of the current water and power plant projects in the global context, and in SA in particular have been conducted by the public sector, which finances and operates projects and contracts with the private sector for design and construction. In the USA (the 2nd largest producer of desalinated water), less than 20% of the population is served by the private sector. SA (the world's largest producer of desalinated water), is home to only 3 private projects, whereas there are 33 public projects. The reason for this is that the water sector was one of the most recent sectors to be opened up for privatisation. According to Davis (as cited in Prasad 2007), private sector participation (PSP) in the water sector has been "late and light" compared to the privatisation of other sectors such as telecommunications and transport.

The involvement of the private sector has required a partnership between the public sector and the private sector, to support the financing, design, development, construction and operation of water and power projects. In the Middle East, this is called an Independent Water and Power Plant (IWPP), which is one of the various forms of PPP (VTU 2009). Figure 1 displays the relationships between WPP, PPP and IWPP, which is the focus of this study.

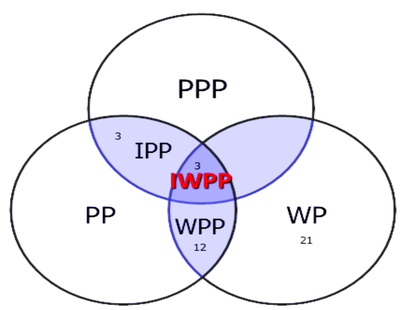

Fig 1: The research concentration areas

In SA, there are 15 water and power plants in operation, only three of which were constructed under the IWPP scheme; the remainder are run under the auspices of public finance and operation

(SWCC 2011). However, the World Resources Institute (WRI 2011) stated that in March 2004, SA had announced a plan to launch ten IWPPs by 2016, requiring a total investment of $16 billion.

2.4 RISKS IN INDEPENDENT WATER AND POWER PLANTS

A feature of IWPP projects is that they encounter a plethora of risks during the project lifecycle; some of these risks are unique and specific to the IWPP. This is because it has unique characteristics, which require many organisations to work together over a long period; each with its own policy and culture, and overseeing complex processes. Furthermore, there are a large number of parties from the public and private sectors involved in a typical project, leading to a need for the generation of many documents and agreements to support an IWPP project.

Although some IWPP projects have performed well, many have failed. Completing projects on time and within budget is seen as an indicator of good performance; however, the project lifecycle of the IWPP approach is subject to many variables and volatility, which derives from many sources. These sources include: the short history of IWPP, a lack of experience of IWPP arrangements between involved parties, complexity in terms of the involvement of various stakeholders, limited competition, a long negotiation and concession period, long term financing, environmental conditions, technology issues, complex interface between water and power, and unpredictable events, which can be classified as risky (Wibowo and Mohamed 2008; Cheung and Chan 2011).

Furthermore, previous studies have proven that IWPP projects are problematic and result in poor performance in SA and internationally. Studies have shown the failures of these projects could be attributed to improper risk identification, analysis and mitigation.

Therefore, paying additional attention to risks should assist industry practitioners to minimise the probability of poor performance (Falqi 2004).

3. RESEARCH METHODOLOGY

The primary task of this research is to uncover data pertaining to RM in the context of water and power projects in SA, to address the dearth of studies in this area. Fellows and Liu (2008) suggested that questionnaires, as a means of data collection are inadequate tools for acquiring the type of in-depth knowledge required. Therefore, the researchers selected the semi-structured interview method, based on and adapted form of grounded theory, for this study.

Grounded theory derives its name from the fact that the theory is developed from the data, rather than the other way round. Understanding of how complex phenomena occur, and the resulting concepts that emerge from it are grounded in the reality of those phenomena. The data determines the final shape of the theory and this approach is most likely to provide a good fit for the situation detailed in this research. Researchers should also aim to gather field data and discover theory based on a hierarchical structure of categories (Corbin & Strauss 1990).

Rubin and Rubin (1995) suggested that qualitative interviewers need not try to simplify, but should instead aim to capture some of the richness and complexity of their subject matter, and then explain it in a comprehensible way. During the interviews, the participants are to be encouraged to speak using their own terminology as related to the research topic, and are asked to clarify and extend their comments (Fontana and Frey 1994).

3.1 DESIGN OF THE INTERVIEWS

This research was designed to discover which elements lead to the ineffectiveness of implementing RM in IWPP projects in SA. A grounded theory methodology does not provide detailed information regarding interview techniques or styles. Therefore, the informal interviews conducted for this research were based on qualitative interviewing techniques, which promoted a flexible outline of topics and questions (Patton 2002). The factors, taken into consideration for the interview, included strategies for guiding answers from generalised to more specific cases.

3.2 SAMPLE AND DATA COLLECTION

Grounded theory is often used to investigate complex phenomenon where little understanding exists; hence, the selection of participants is particularly important.

Variations in samplings are often suggested leading to a broad diversity of information-rich participants in the research setting (Patton 2002). Purposeful, variation sampling, by contrast, is used to ensure that there is diversity in the information gathered. For the purpose of this research, the interviewees were chosen on the basis of their experience and knowledge of the phenomenon under study. The essence of the sampling method was to collect data from those interviewees who were best able to answer the questions, rather than sampling a predetermined group of participants or settings (Glaser 1978). The interviewees selected provided a rich source of information on RM in water and power projects in SA.

Seven interviews were conducted in the first round, followed by another seven interviews in the second round; these were with key informants from the organisations who were thoroughly familiar with RM. The focus was on WPP and IWPP approaches; the WPP approach was investigated due to the long experience of this in the public sector has earned. For reasons of confidentiality, the respondents' names are not disclosed. (See table 1&2).

Round	Interview NO.	Organization Role	Organization Name	Participant Position	Experience	Interview duration
1	Int.1	Government Official	SWCC	PM	10 Years	49 Min
	Int.2			Follow up and Planning Engineer	11 Years	55.4 Min
	Int.3	Consultant	Fichtiner company	Site Engineer	9 Years	39.3 Min
	Int.4	Project Promoters (SPV)	SWEC	PM	14 Years	65.5 Min
	Int.5		SqWEC	Executive Engineer	9 Years	53 Min
	Int.6	Contractor	Doosan Heavy Industries	Assistant Manager	16 Years	44 Min
	Int.7	Facilities Provider	Marafiq company	Operational Manager	11 Years	41 Min
	Total					347.2 Min

Table 1: first round interviewees' details

Round	Interview NO.	Organization Role	Organization Name	Participant Position	Experience	Interview duration
2	Int.8	Government Official	SWCC	Engineering Dep. Manager	22 Years	76.8 Min
	Int.9			PM	17 Years	61 Min
	Int.10	Consultant	ILF company	PM	18 Years	47 Min
	Int.11	Project Promoters (SPV)	SWEC	PM	18 Years	50.3 Min
	Int.12		SqWEC	PM	9 Years	59 Min
	Int.13	Contractor	Mitsubishi Heavy Industries	Site Manager	16 Years	45.8 Min
	Int.14	Facilities Provider	SqWEC	Operational Manager	20 Years	71 Min
	Total					410.9 Min

Table 2: second round interviewees' details

The above tables report the data from the first and second rounds of interviews. More rounds of semi-structured interviews will be considered in ongoing research, until saturation of information is reached. The first round aims to deliver a broad overview of the area under study and to establish the emergent theory; the second, and subsequent rounds, are directed toward critical junctures or significant points and events affecting the targeted subject under study. The interviewees in the case of the first round interviews were identified from the researcher's experience and colleague's recommendations. The interviewees for the second round of interviews were identified via the snowballing technique, whereby names are obtained through the recommendations of the first round interviewees. This process led to the interview sessions conducted with Interviewees 8 to 14 (See Table 2).

4. FINDINGS AND DISCUSSION

As a result of the analysis of the data collected from practitioners in the first round of interviews, the researcher has established initial theoretical foundations, and a starting point for this research. The data collected in this round is rich, which allows for a clear understanding of the topic. The researcher began with a general overview, and then used the interviews delved further into the topic to determine the causes of problems, why previous projects failed to meet their objectives and how they might implement ideal risk management implementation processes.

The emergent data is developed in the second round and presented in a diagram summarising the emergent theory. Additionally, the researcher supports all phenomena and categories with supporting data acquired from practitioners. The analysis that was carried out explored some initial phenomena found to have affected RM implementation in the water and power projects in SA. Thus, the following phenomena were explored: unawareness, poor planning and operational and support. The entire phenomena and all the features, which emerged from the grounded data analysis, are illustrated in Figure 2.

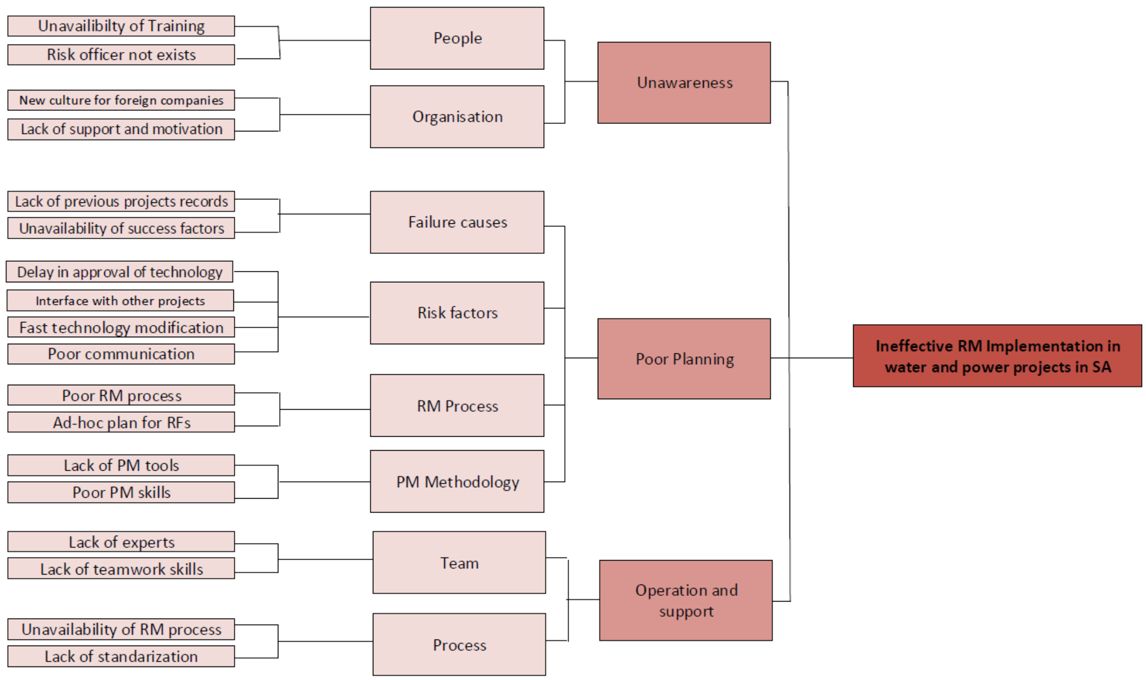

Fig 2: 2nd Round emergent theory

Each of these phenomena, categories and subcategories is described individually in the table below with quotations from practitioners given to illustrate how the data was grounded.

Categories	Subcategories	Clarification & Practitioners' Quotations
People	(a) Training (b) Risk officers	*"A lot of effort in increasing staff awareness with regard to risk management should take place at the level of the individual dealing with it."*
Organisation	(c) Foreign companies (d) Lack of support and motivation	*"I would say that all water and power firms need to set up a strategy to treat the lack of awareness…. If they can't come up with a clear plan for solving the awareness problem, they may continue to suffer negative results during the project."*

Table 3: Phenomenon 1: ***Unawareness***

Categories	Subcategories	Clarification & Practitioners Quotes
Failure Causes	(a) Lack of records (b) Lack of success factors	*"In any project, it is necessary to identify and study the failure causes of the previous projects in order to not repeat the failure".* *"At the beginning of starting new project, we would like to go through a list of recorded success factors in order to strengthen them and study their suitability in each project, but unfortunately we are missing it and we get difficulties in the starting point".*
Risk factors	(c) Approval delay (d) Project interfaces (e) Technology modifications (f) Poor communication	*"I can tell you one or two crucial risk factors specific to IWPP that cannot be found in the literature, such as the complicated interface between the water and power plant project and the pipeline system project, the coordination between these two projects needs a high level of communication".*
RM Process	(g) Poor RM process (h) Plan for RFs	*"Applying RM process adequately will increase the performance and let everyone knows what is happening in the project and what risks might face them".*
PM Methodology	(i) Lack of PM tools (j) Poor PM skills	*"It is important to choose the tools wisely, and ensure the related people in the project are comfortable when they use them"*

Table 4: Phenomenon 2: ***Poor Planning***

Categories	Subcategories	Clarification & Practitioners Quotes
Team	(a) Lack of experts (b) Teamwork skills	*“Experts in water and power plant projects are missing”. & "very difficult to complete tasks effectively when the teamwork skills do not exist".*
Process	(c) Unavailability of RM process (d) Lack of standardisation	*“There is no RM standard applied in IWPP project in SA, if an organisation adopts a standard, it will use what is appropriate for them only. Take into consideration that most water and power organisations do not apply an RM standard”*

Table 5: Phenomenon 3: ***Operation and Support***

5. CONCLUSIONS

The data that emerged from the practitioners has been analysed using the grounded theory method. The researcher developed an initial foundation for the theory and a starting point for PhD research in the first round. Rich data was collected, providing a clear understanding of the topic. The research began with a general overview then delved more deeply into the topic to uncover the causes of problems, also why previous projects failed to meet their objectives and how they can reach ideal RM implementation based on the opinions of the interview respondents. In the second round, the data gathered was developed.

The main results emerging from practitioners in both rounds were:

- An initial conceptual theory that emerged from the grounded data analysis, which showed the entire phenomena, categories, and subcategories leading to the ineffectiveness of RM implementation in WPP projects in SA.
- Crucial practical risk factors specific to water and power projects, which affect project objectives.
- The current implementation of RM in water and power plant projects in SA is considered informal.
- Practitioners agreed that the effective implementation of RM will be able to resolve the existing water and power projects failures, whereas poor implementation of RM affects project objectives.
- SA suffers from a lack of knowledge and experience in dealing with RM in IWPP projects.
- Providing the appropriate RM resources, training and awareness programs to staff is critical for building an effective organisational culture.
- RM awareness is important for everyone in the project – it is important that everyone is aware of their surroundings and the potential risk they face.

6. REFERENCES

Al-Ghafly, M. A. (1995) *Delays in the construction of public utility projects in Saudi Arabia*, Unpublished PhD thesis, CEM Dept., KFUPM, Saudi Arabia.

Alotaibi, S. (2009) *Effective Management: Explaining Project Management in Saudi Arabia.* Unpublished MSc thesis, SBE, Heriot Watt University, UK.

Cheung, E. & Chan, A. (2011) Evaluation Model for Assessing the Suitability of Public-Private Partnership Projects. *Journal of management in engineering*.

Dallas, (2006) *Value and Risk Management: A Guide to Best Practice*.

Glaser, B (1978) *Theoretical Sensitivity*. California: Sociology Press.

Falqi, I. (2004) *Delay in project completion: A comparative study on construction delay factors in SA and the UK*. Unpublished MSc thesis, SBE, Heriot Watt University, UK.

Fellows, R. R. & Liu, A. (2008). *Research Methods for Construction*. (3rd ed.). Wiley-Blackwell Science, London.

Fontana, A., and Frey, 1. H. (1994) 'Interviewing: The Art of Science'. In Denzin,

Ke, Y., Wang, S. & Chan, A.P.C. (2010) Risk Allocation in PPP Infrastructure Project: Comparative Study. *Journal of Infrastructure System*. 16(4), pp.343-351.

Kelly, J. (1993) "Value Management in Design Construction". Published by E&FN Spain.

Patton, M. Q. (2002) *Qualitative Research & Evaluation Methods* (3rd ed.). Thousand Oaks, California: Sage Publications, Inc.

Prasad, N. (2007) *Why is regulation insufficient? Social Policies and Private Sector Participation in Water supply*. UNRISD.

Rubin, H. & Rubin, I. (1995) *Qualitative Interviewing: The Art of Hearing Data*. London: Sage Publications, Inc.

SWCC (2011) Saline Water Conversion Corporation. [Online] Available at: http://www.swcc.gov.sa/ [Accessed 2nd Feb, 2011].

Tah, J. & Carr, V. (2000) Information modelling for a construction project risk management system. *Engineering, Construction and Architectural Management*. 7 (2), pp. 107-119.

VTU Energy (2009) Combined Power and Water Plants- From Concept to Production. VTU Energy supports IWPP projects from Pre-RFQ to Commercial Operation. [Online] Available at: www.vtu.com [Accessed 2nd Feb, 2011].

Wang, S., Dulaimi, M. & Aguria, M. (2004) Risk management framework for construction projects in developing countries. *Construction Management and Economics*. 22, 237–252.

WEC (2011) *Water and Electricity Company*. [Online] Available at: http://www.wec.com.sa/items.aspx?catId=17 [Accessed 2nd Feb, 2011].

WRI (2011) *World Resources Institute*. [Online] Available at: http://projects.wri.org/sd-pams-database/saudi-arabia/integrated-independent-water-and-power-projects-iwpps. [Accessed 2nd Feb, 2011].

Wibowo, A. & Mohamed, S. (2008) Perceived Risk Allocation in Public-Private-Partnered Water Supply Projects in Indonesia. *Advancing and Integrating Construction Education, Research and Practice*.