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ABSTRACT

This study sought to find out the relationship between risk planning and performance of water projects in Murang'a County, Kenya. The target population of the study was project managers, contractors, and project users of borehole water in Murang'a County, Kenya. A representative sample of 182 respondents was randomly being selected. The study used a descriptive research design to measure the relationship between the risk management practices and performance of borehole water projects in Murang'a County. The study used a questionnaire to collect data. The questionnaire was both structured and semi structured. The Statistical Package for Social Sciences (SPSS) version 22 was used to analyze data, where both qualitative and quantitative approaches were used. A pilot test was done before the actual data collection. The study employed both qualitative and quantitative data analysis methods. ANOVA was used to test the significance of the fitted model. Correlation and regression analysis were done to establish the relationship that exists between the independent variable and the dependent variable. Data once analyzed, was presented in form of tables, figures, and charts. The study found out that there is a positive significant relationship between risk planning and project performance. The study concluded that that there is need to improve the instruments of risk planning to improve project performance. The study therefore recommended that the borehole water projects management in Murang'a County should stipulate policies that will improve the risk planning practice to improve project performance.

Key Words: *Risk Planning, Performance of Borehole Water Projects*

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INTRODUCTION

In many developing countries and emerging markets, providing a sufficient supply of clean drinking water or ensuring working water systems is a daunting challenge that requires due attention (WWF Report 2011). Not only are financial means often missing, but also trained staff, the political goodwill, and effective organizations. In some cases, private enterprise can close this gap. But private enterprises are also forced to react to the water scarcity in several of these countries, employing innovative water saving technology or reusing wastewater (WWF Report 2011). Some are even engaging in working with their peers and authorities to improve the situation in their watersheds. These companies must be assisted.

Water is vital for the ecosystems, for our shared priorities around energy, food, and water security, as well as for the health and sanitation needs of the world's citizens (Stuart Orr, Rafael Sánchez-Navarro, Guido Schmidt, Rafael Seiz-Puyuelo, Kevin Smith & Jochem Verberne, 2011). For business, almost every product and most services require water somewhere along the value chain process or supply chain. This dependence often poses serious financial and economic risks to companies. As such, companies are beginning to deal with the manifold issues surrounding water, its sustainable use, and its associated risks or threats.

Today, there is a significant physical risk for adequate and clean human water supply in Central-South America, the Middle East region, Eastern Europe, Sub-Saharan Africa and areas of Central-South Asia including China. In most of these areas, declining quality water availability is posing a serious threat to river biodiversity and ecological processes. In other parts of the world (including North America, Western Europe and some parts of Australia), water security for humans has (temporarily) been ensured, but often with the burden of significant economic (infrastructure) investments and a deterioration of river ecosystems as well as in other freshwater bodies.

The development and sustenance of a quality water supply system require a high investment cost, including financial, environmental, and institutional aspects that need to be considered. Just like major projects with several stakeholders, drinking water supply projects are vulnerable to risks. Elkington and Smallman (2015) have argued that projects in the utilities sector, including water, power, and telecommunication, are not quite predictable and are perceived to be more risky than common business activities. This then leads to the need for risk management approach in water industries, including water treatment plant design, operations, and better integration within the core business, to provide safe and decent drinking water for consumers (Hrudey *et al*., 2006).

Risk analysis and risk mitigation have become an important approach in engineering economics to suggest the existence of risk and uncertainty in engineering decisions and to quantify that risk (Smith, 1999). The Project Risk Management Handbook (2003) defined risk management as a systematic process of planning for, identifying, assessing, analysing, responding to, and monitoring project risks. Risk management has been widely applied in different types of projects, particularly in large construction projects to reduce uncertainties and achieve project success taking cognizant of time, budget, and quality (Wyk *et al*., 2008).

This study describes the process of risk management planning for a drinking water supply system in a construction project in South Bali. The construction of a water supply system in South Bali will be carried out as an effort to develop new water sources to meet future needs. This has become a concern because, as a center of tourism in Bali, Bali's southern region, which roughly consists of Denpasar, Tabanan, Gianyar, Tabanan, and Klungkung, continues to grow, both in terms of population- and tourism-supporting facilities, it has resulted in an increasing need for drinking water every year. In practice, drinking water supply system development requires very high investment costs, which leads to problems around financing the

project, as water utilities (PDAM) have a limited investment capacity to develop new water sources.

In South Africa, project management and by extension project risk management has a greater footprint than in Nigeria. South Africa is a country classified as an emerging economy, with one foot in the first world and the other foot in the third world. The political changes begun in the early 1990s have led to enormous change including new government legislation and structures, social change and infrastructure improvements such as health clinics, low cost housing, water delivery and increased telecommunication facilities. The South African Government was spending Kshs840 billion on infrastructure projects, including transport, energy, and communications, in 2013-2014.

By 2017, it was expected to increase that investment by 7.9 percent a year to Kshs1050 billion. To manage this large investment in infrastructure 3 including social and health there is need to engage stakeholders and manage their expectations, improved the quality and quantity of project managers to manage programs and projects and the attendant risks, (Guarino & Dirie, 2014).Major project risks identified in the case of South Africa were lack of adequately trained project management practitioners who would apply project and risk management skills, stakeholder management and communication, low maturity level in project management, need for program and portfolio approach to the management of the cluster of projects in order to obtain maximum synergy and lack of adequate funding.

The Kenya Vision 2030 National Development Plan seeks to make water and basic sanitation available to all by 2030. The estimated total cost of investment needed in water sector is Kshs 1.7 trillion according to (NWMP, 2030). Kenya Water Master Plan 2030, states that the available government budget is Kshs 592.4 billion leaving a shortfall of Kshs1.2 trillion. To reduce the gap the sector should increase efficiency, maximizing consumer contributions through tariffs, and encouraging private sector funding.

In Kenya, risk management and especially enterprise risk management (ERM) is still weak and risk to most of organizations is increasing while the traditional risks are constantly evolving. Most of the investment institutions have developed ERM framework but they still face challenges due to weak ERM systems because complexity, unpredictability, evolving risks and globalization of trading activities (Gisemba, 2010). The weak ERM has affected the performance of Kenya as a country in terms of competitiveness making it rank poorly in terms of GDP as well as attractiveness as a business destination compared to other states like Singapore, Taiwan and Malaysia (Odoyo *et al*., 2014).

Statement of the Problem

The Kenya Vision 2030 National Development Plan seeks to make water and basic sanitation available and accessible to all by 2030. The estimated total cost of investment needed in the water sector is Kshs 1.7 trillion according to (NWMP 2030).Kenya Water Master Plan 2030, states that the available government budget is Kshs 592.4 billion leaving a shortfall of Kshs1.2 trillion. To reduce the gap the sector should increase efficiency, maximizing consumer contributions through tariffs, and encouraging private sector funding.

The performance of WSPs falls short of expectation due to several reasons that need an inquiry. The real potential problems for water sector lie; in reducing wastages, improving service quality, maximizing on customer contribution and improving cash flows. This is a problem because wastages affect water quantities, reduces revenue for the service providers, hence degrading quality of service to the customers. Eventually the cost of production becomes high translating to high tariffs of water. The Constitution of Kenya 2010, states that every person has the right to clean and safe water in adequate quantities. To help meet this right, it is necessary that risk management is clearly addressed.

The shortcomings in the quality water supply systems are commonly characterized by low

operational efficiency, the amount of water losses or non-revenue water, the excess charge of human resources, poor water quality, low service coverage, etc (Baietti & Raymond, 2012). The low quality of management, accompanied by the high costs incurred, leads to the emergence of privatization in the drinking water supply sectors, which was previously dominated by the public sector.

WASREB (2018) assessment of utilities showed marginal improvements in their performance, from 36% in the last reporting period (2014/2015) to 38% in the year 2016/17. It was estimated that out of the 21 million people living in service areas of the 88 regulated utilities, more than 8 million people are living in more than 2,000 urban low income areas and a majority of these still depend on informal services that do not comply with the normative content of the human rights to clean water. It is against this background that this study seeks to establish the relationship between the risk management practices and performance of borehole water projects.

Objective of the Study

The study determined the relationship between risk planning and the performance of borehole water projects in Murang'a County Kenya.

LITERATURE REVIEW

Theoretical Review

The Modern Portfolio Theory

The Modern Portfolio Theory (MPT) is a theory of investment and it tries to maximize returns and minimize risks by carefully choosing different assets (Markowitz, 1952). He noted that one should be interested in risks as well as returns and therefore develop the analytics of mean variance trade-off .It is a mathematical formulation that deals with the concept of investment diversification . It aims at selecting a collection of investment assets that has collectively lower risk than any individual asset. This is not possible, in theory, because different types of assets often change in value in opposite ways.

For instance, a fall in prices in the stock market often implies that the prices in the bond market increase and vice versa. Mandelbrot and Hudson (2004) found that a collection of both types of assets can therefore have lower overall risk than individually. The primary principle upon which MPT is the random walk hypothesis which states that the movement of asset prices follows an unpredictable path: the path as a trend that is based on the long-run nominal growth of corporate earnings per share, but fluctuations around the trend are random (Perminova *et al*., 2014).

The MPT has important implications in terms of risk minimization by investing in portfolios that have lower overall risks. Barton *et al.* (2010) found that MPT enables firms' ERM, using a holistic approach, to identify and manage its risk so as to create, protect and enhance shareholder value. Olsson (2014) adds that MPT recognizes that risk management has evolved into a major industry and is still evolving with the evolution of the financial community and the development of new complex financial instruments. Supports the variable risk planning since it articulates how risks should be minimized through diversification.

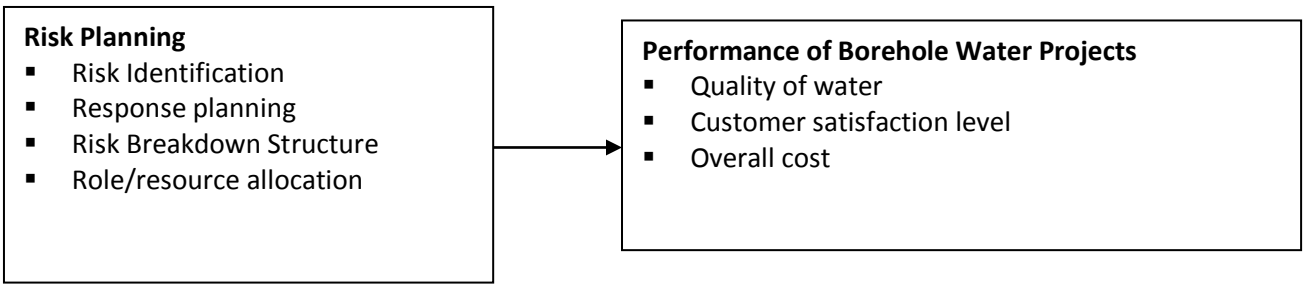

Figure 1: Conceptual Framework

Empirical Review

The quality control of risk analyses is intended to enhance their credibility through addressing inherent uncertainties, both epistemic, due to lack of knowledge, and operational, derived from the use of knowledge (*e.g.* analyst bias, judgments, human error; see Faber and Stewart, 2003; Amendola, 2001). This aspect was perhaps a core weakness of the sub-sample. For example, peer reviews of risk analysis were executed in a largely informal and unsystematic manner, whilst the use of facilitators was restricted to project risk analysis and HAZOP studies. That said, the role of the latter should not be underplayed, as our interviews emphasized that they did *not* drive particular outcomes or provide specific technical input, but sought to guide analysts in the application of methods and focus on the quality of process execution (*e.g.* challenging outliers during consequence evaluation, ensuring all relevant risk categories were considered during hazard identification).

In this view, the importance of understanding the concepts of uncertainty and risk as evidenced in the studies of De Meyer *et al*. (2010) and Perminova *et al*. (2014) make a contribution to the development of risk management as a discipline. Considering that care with project risks is a strategic concern from the management point of view due to generating better results, and thus project managers can thus invest better in management practices. In this line of reasoning, the work of De Meyer *et al.* (2010) provides important elements in decisions about the type of uncertainty to be administered – foreseeable uncertainties and the variability can be the initial target depending on the type of project. More sophisticated processes and practices can be adopted in projects that are under the incidence of risks/unforeseeable uncertainties.

In projects that deal with drinking water supply, the risks that have been identified are essentially concerned with the quality of drinking water produced. Hrudey *et al*. (2006) revealed that the potential danger which is of premium value in the water sector is the failure to provide safe drinking water for communities. It is a fact that there have been several cases of microbial and chemical contamination in drinking water that have resulted in diseases and many deaths. The Wate Companies have been motivated by this to continually monitor water quality by minimizing the risk of contamination in drinking water supplies (Hamilton *et al*., 2006). Additionally, risk management is needed not only in the context of ensuring safe drinking water, but also in maximizing the availability, serviceability and life of their assets and minimizing expenditures on energy, chemicals, and processes (Hrudey *et al*., 2006). Therefore, risk management should be applied to the entire drinking water supply process, starting from the catchment, treatment, distribution, and ending at the customer plumbing system.

However, Boehm (2007) suggested that the low levels of efficiency of water utilities, persistent patterns of corruption, and limited water access for the most vulnerable population show that these approaches have failed. In its turn, management practices seem to have an important role in understanding why the performance of water service delivery (WSD) remains low despite the sector reform and the PSP. Auriol and Blanc (2009) analyzed the issue of corruption and the capture of public water utilities in Sub- Saharan Africa. In their seminal paper, Auriol, and Blanc (2009) point out that "water utilities run by private-public partnerships are not optimally managed either because private ma managers and government are incompetent or not benevolent."

METHODOLOGY

The study employed a descriptive survey research design. The target population of this study comprised 182 project managers, contractors, and the users /beneficiaries of borehole water projects in Murang'a County. The study used a simple random sampling technique to select the study

respondents. The sample was arrived at by using the Slovins formula when since the population was less than 1000 (146 projects). From 125 projects there was a total of 182 project managers, contractors and key users who were all involved in the research. Hence a census was done at 95% confidence level and 5% level of significance.

Questionnaires were used to collect Primary data. Secondary data was collected from documents, previous research, textbooks, journals, records, publications, magazines, and reports of others. A pilot study was conducted to test the validity and reliability of the study instruments. The study employed both qualitative and quantitative data analysis methods. Correlation and regression analysis were done to establish the relationship that exists between the independent variable and the dependent variable.

FINDINGS

Descriptive Statistics

The objective of the study was to determine the relationship between risk planning and project performance in Murang'a County, Kenya. The study found that the majority of the respondents agreed that a standardized document is used for risk identification (*M* = 3.84; *SD* = 0.934). The respondents strongly agreed that they had resources are allocated to manage risks (*M* = 4.00; *SD* = 0.868); the majority agreed that they have a clear risk response plan in the event of any risk (*M* = 3.96; *SD* = 0.763) and that their water projects use a Risk Break Down structure to categorize risks (*M* = 3.89; *SD* = 0.830). The findings indicate that the respondents have adequate training on risk management (M=3.70; SD 0.829).

Respondents agreed that the risk planning process is participatory (M=3.76; SD=0.812). The respondents also agreed that the project design is made in such a way to identify risks on time (M=4.00; SD+ 0.818). The respondents agreed that risk planning influences project performance (M=3.00; SD+ 0.801). The standard deviations were small showing small variations from the individual means. These findings agree with those by other scholars. Van der Waal, (2010) asserts that project performance is dependent on the initial planning incorporated into the project risk management apparatus.

Table 1: Descriptive Statistics on Risk Planning

	N	Mean	Std. Deviation
We use a standardised document for risk identification	160	3.84	.934
Resources are allocated to manage risks	158	4.00	.868
We have a clear risk response plan in the event of any risk	159	3.96	.763
My company uses a Risk Break Down structure to categorize risks	160	3.89	.830
I have adequate training on Risk management	157	3.70	.829
The risk planning process is highly participatory	158	3.76	.812
The project design is made in such a way as to identify risks on time	159	4.00	.818
Risk planning influences performance in my company	160	3.00	.801

Project Performance

The study sought to find out the borehole water project performance in Murang'a County as attributed to risk planning. The findings revealed that there was an improvement in performance over the 5-year period. The findings further revealed that since the year 2014, the cost has been reducing significantly. Also, the value (overall contribution) of the project to the community has shown a great improvement since 2014 to 2018. Findings also show that the quality of the final projects have also shown marked improvement for the period of this study running 2014 to 2018 as indicated in figure 4.8. Findings agree with those by Bellaubi and Visscher (2014) who observed that overall cost and project impact are associated with the level of project success.

Inferential Statistics

Correlation Analysis

This study carried out the Pearson's Product-Moment Correlation Coefficient to determine the relationship that existed between risk planning and project performance as well as to check whether the associations were significant. The study found that risk planning had a strong positive significant relationship with project p, r = .829, p = .000.

Table 2: Correlation Analysis Matrix

	Project Performance	
Risk Planning	Pearson Correlation	.548**
	Sig. (2-tailed)	.000
	N	160

**. Correlation is significant at the 0.01 level (2-tailed).

Regression Analysis

This study ran a regression model to determine the strength of the relationship that existed between risk planning and performance. The independent variable (risk planning) was found to be a satisfactory variable in determining and predicting project performance. This was supported by the coefficient of determination also known as the R^2 of 0.572. This means that risk planning explains 57.2% of the variations in the dependent variable project performance. These results further meant that the model applied to link the relationship of the variables was satisfactory.

Table 3: Model Fitness

R	R Square	Adjusted R Square	Std. Error of the Estimate
0.756	0.572	0.554	0.515249

Analysis of Variance (ANOVA)

The results indicated that the F calculated 73.393 which was greater than f critical (3.90) implying that the model was statistically significant and there was the goodness of fit of the model. Further, the results imply that the independent variable risk planning was a good predictor of project performance. This was also supported by the reported p=0.00 which was less than the conventional probability of 0.05 significance level.

Table 4: Analysis of Variance (ANOVA)

	Sum of Squares	df	Mean Square	F	Sig.
Regression	46.34	1	46.34	73.393	0.000
Residual	99.76	158	0.631		
Total	**158.425**	**159**			

Beta Coefficients Results

The results showed that risk planning had coefficients, β = .413, t = 9.604, p < .000 showing a significant relationship between risk planning and project performance. This implied that a unit improvement in risk planning will lead to a 0.413 increase in project performance.

Table 5: Beta Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	.622	.169		11.212	.000
Risk Planning	.413	.043	.114	9.604	.000

CONCLUSIONS AND RECOMMENDATIONS

The first variable of this study was to find out the relationship that exists between risk planning and project performance. The study found there exist a relationship between risk planning and project performance of borehole water projects in Murang'a County, Kenya. The statistical analysis results of coefficients showed that risk planning had a strong positive relationship with project performance. From the foregoing, it can be concluded that an improvement in the instruments of risk planning will lead to an improvement in the performance of borehole water projects in Murang'a County Kenya.

The study findings indicated that there exist positive relationships between the independent variable risk planning and the dependent variable project performance. The study, therefore, recommends that the borehole water projects management in Murang'a County, should stipulate policies that will improve the instruments of risk planning practice to improve project performance.

The risk response plan needs review and standardization after which training to the staff is recommended. The findings indicated that risk planning is not fully aligned to the overall business strategy and hence operational mismatch. This study, therefore, recommends that the risk planning process should be aligned and institutionalized in the overall business strategy of borehole water projects to enhance performance in the sector.

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