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Risk Management and Performance of Health Supply Chain Projects in Uganda. The Case of Uganda Health Supply Chain Project

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Abstract: ***This study aimed at assessing the effect of risk management on performance of Health supply chain projects in Uganda using a case of Uganda Health Supply Chain project. The specific objectives were; to determine the effect of risk identification on the performance of health supply chain projects in Uganda; assess the effect of risk analysis on the performance of health supply chain projects in Uganda; investigate the extent to which planning for risk management affects the performance of health supply chain projects in Uganda and lastly determine the extent to which risk response and control affect performance of health supply chain projects in Uganda. The study was based on the normative decision theory of risk management and the positivism research philosophy. It employed a cross-sectional study design and adopted both quantitative and qualitative approaches. A total sample population of 196 was used. Primary data was collected using self-administered questionnaires for quantitative data and analyzed using STATA while qualitative data was collected using an interview guide and analyzed using the content analysis method. In this study, four hypotheses were tested using the logistic regression technique employing the p-value and odds ratio approach. Findings revealed a good understanding of the risk management concept among a majority of the respondents, but however, there was a low adoption of standard risk management practices. The study further revealed that a majority of the investigated practices had a significant effect on the level of time, cost and quality performance of health supply chain projects in Uganda. The study concluded that performance of health supply chain projects in Uganda has been below average due to low adoption of standard risk management practices. The study recommended prioritizing risk management high on the project's management agenda by all supply chain projects in Uganda***

Keywords: Risk management, Performance, Health supply chain projects, risk identification, risk analysis, planning for risk management, risk response and control, Essential Medicines and Health Supplies (EMHS)

1. Introduction

A functional health supply chain system forms a back bone of an efficient health system (Yadav*et al*, 2015). However, supply chain systems in developing countries are marred with enormous drawbacks, diminishing the capacity of health systems to respond to health care needs of populations (Abdallah *et al*, 2017). Jaberidoost *et al*(2013) highlights out that most supply chain challenges troubling developing countries are as a result of absence of risk management mechanisms. This is again reinforced by Heckmann (2015) who stresses that supply chain performance is directly linked to risk management practices.

A health supply chain (HSC) is a network of all activities starting from production or manufacture, sourcing, planning and selection, forecasting and quantification, procurement, distribution, storage up to consumption and all management support functions of medicines, vaccines, blood products, antibodies, diagnostics, Personal protective equipment and other health products to the end users i.e. health facilities or patients with a core aim of maximizing client value in terms time, cost and quality. (Lenin, 2014). Therefore a functional HSC system is expected to improve quality of medical goods and services, increase patient services and responsiveness, reduce waste and non-value added activities to boost cost reduction, reduce surplus inventory, improve supply chain communication through speed and timelines, information sharing and accuracy of information, decrease cycle time in new product development and supply lead time, and ultimately satisfaction of the final patient.

However, studies conducted by Besner *et al* (2012) show that only 1 in 10 HSC projects in developing countries are using known risk management practices.

This study therefore answered the question as to whether performance of health chain projects in Uganda is affected by their conformance to risk management practices or not.

2. Statement of the Problem

Globally, over 10 million under 5 year children die every year in developing countries directly from lack of medicines and health supplies in health facilities resulting from poor Health Supply Chain Systems (WHO Report 2015, Dye 2013).

Over the last decade more than 27 billion USD has been spent to improve global health supply chain systems by international financing organizations such as World bank, Global fund, USAID, UKAID, Global Alliance on vaccines & immunization (GAVI), Bill & Melinda gates foundation, among others (Yadav*et al*, 2015), yet still, one third of the population in Africa does not have access to essential medicines because of poor Health supply chain systems (Perehudoff *et al*, 2019).

In 2012, a risk management plan was introduced in Uganda, specifically in the Uganda Health Supply Chain (UHSC) Project and its core aim was to enhance the performance of Uganda's Health supply chain system. But however, despite a risk management plan being in place for the past 7 years, 60% of Uganda's population still does not have access to

quality and affordable medicines and health supplies. Health facilities are challenged by frequent stock outs, long procurement and delivery lead-times; mismanagement of donor funds meant for essential medicines, among others (Armstrong*et al*, 2018)

The performance of Health supply chains is still short of what was expected by this time.

If the current cause of these gaps is not investigated and addressed, Uganda could lose collectively over 700 million USD in GDP by 2030 in economic welfare (2.6% of the total current GDP of 28.5 billion USD) for Uganda's economy as a result of increased mortalities resulting from lack of access to medicines and health supplies, withdrawal of financial support from donors (e.g. Global fund) for Uganda's Health supply chain system, among others. (Alkire*et al*, 2018).

This study therefore sought to assess the effect of risk management on performance of health supply chain projects activities in Uganda using UHSC project as a case study.

3. Methods

3.1 Study setting

Uganda Health Supply Chain program is one of the many Health supply chain programs supporting the Ministry of Health (MOH) in Uganda. Its main role is to support the Ugandan government through the MOH to enhance Uganda's supply chain system through improving accessibility, availability, affordability, and appropriate use of good quality EMHS to Uganda's population. UHSC supports Uganda's supply chain and logistics in 129 districts. Its main administration is situated in Bugolobi, Nakawa Division, Kampala.

3.2 Study design

A cross sectional study design was adopted for this study employing both qualitative and quantitative methods. The qualitative approach supported the researcher to get an in-depth analysis of the problem, while the quantitative approach helped the researcher determine the relationships and test hypotheses of the study (Amin, 2005)

3.3 Study population

The composition of the study population was 284 UHSC project staff (officers and Medicine management supervisors) and 100 end users i.e. patients in health facilities in districts supported by UHSC, totaling to 384

3.4 Sample size

The sample size of UHSC staff and end users that participated in this study was determined using the Yamane (1967) formula and was 196

3.5 Data collection methods

3.5.1 Questionnaire survey

The study employed a questionnaire survey method using a semi structured and pretested questionnaire to collect data that is quantitative in nature. The main advantage of self-administered questionnaires is that the researcher can control all the completed data pieces within a short period of time (Amin, 2005).

3.5.2 Focus Group Discussions

This study employed Focus group discussions, where a selected group of UHSC staff and end users were asked a series of questions about their opinions and perceptions about performance of HSC projects and risk management in an interactive group setting where participants were fee to talk with other group members. This was used to determine the reactions that could be expected from a larger group. The study employed at least 3 FDGs, with each constituting of 8-12 respondents. The official language used was English.

3.5.3 Document review

The study reviewed project records in the UHSC data base, these were used to verify information given by staff. They were used as secondary data sources. The researcher also reviewed different documents like text books, journals and internet containing information about risk management and performance of HSC projects. The purpose of this method was to enable the researcher collect independent verifiable data and information and also provide a reasonable procedure to identify, analyze and decode full information obtained from those documents

3.6 Data analysis

Quantitative data analysis

All questionnaires that were filled-in were crosschecked for completeness and comprehensiveness by the researcher. Incomplete information were filled in appropriately, and this was done before leaving the field. All collected questionnaires were numbered and questions coded in preparation for entry into computer. STATA statistical program was the main statistical program used for analysis of the study data.

Descriptive statistics presentation, analysis and interpretation

Descriptive statistics helped in describing the data characteristics (Sekaran 2003). Descriptive data mainly including data univariate in nature such as Age, sex, years of work, level of management and others, it was presented in form of graphs, pie charts, bar chart and frequency distribution tables. It was later analyzed and interpreted using percentages, frequencies, means, and standard deviations.

Inferential statistics presentation, analysis and interpretation

Inferential statistics helped the researcher in going beyond simple data description and characterization. It helped in making conclusions about the data through drawing comparisons of different groups of variables (Sekaran 2003). For data bivariate in nature, Odds rations (OR) were used to

measure and establish associations. Data was presented in contingency tables, then using ORs, tests of significance were done to establish associations between the categorical variables. For data multivariate in nature, logistic regression was used to develop a model for predictor factors related to levels of risk identification, risk analysis, risk planning and risk response and control. Here data was presented in tables containing variables with adjusted ORs and confidence intervals (CI), this help in establishing statistically significant associations.

Qualitative data analysis

This study used content analysis method of data analysis. According to Mugenda & Mugenda (2003), content analysis is a method of systematically analyzing qualitative data through use of themes so that generalizations can be made in relation to the study. Data gathered from open ended questions by the researcher during FGDs inform of notes was grouped into themes. The researcher identified themes that were recurring, recurring beliefs and opinions, then these themes were presented in a cohesive manner. Sub themes that were similar were regrouped under other themes. For responses that were differing, these were noted for quotations. A master sheet was used for analysis.

Data presentation was done inform of summarized text and quotes.

4. Results

Quantitative results

Results as per objective

The study investigated the level of performance using the 3 classical dimensions of project performance i.e. time, cost and quality. Indicators that measure time, cost and quality performance were evaluated using responses from study participants. Responses were grouped on a dichotomous scale of agree and disagree.

Using odds ratios, an association between risk identification, risk analysis, risk planning, risk response and control and performance in terms of time, cost and quality was established, and then using logistic regression the strength of the effect of risk management on the level of performance in terms of time, cost and quality was evaluated.

4.1 Effect of risk identification on the performance of HSC projects

Study results showed a good and agreeable understanding of the concept of risk identification by a majority (97.45%) of the respondents. However, findings identified a low level of application of risk identification practices (35.67%). The study findings further revealed and established a significant relationship between risk identification practices and the level of performance of HSC projects. The study found out that risk identification, has a significant effect on the level of time performance, cost performance and quality performance of HSC projects.

Time performance

Table 2: Effect of Risk identification practices on time performance of UHSC project

Dependent Variable (Time performance)	Y					Number of obs :	157
						F (9, 147):	25.52
						Prob > F:	0.000
						R-squared:	0.6079
						Adj R-squared:	0.5839
						Root MSE:	0.24421
Independent Variables (Risk identification practices)	(x)	Coef.	Std. Error	t	P-value	Odds ratio	95% CI
UHSC is concerned about supply chain risks	X_1	1.14	0.05	3.07	0.861	1.08	0.47 – 2.47
Availability of a formal documented risk identification process	X_2	1.32	0.09	3.76	0.000	0.09	0.04 – 0.25
Integration of risk management into UHSC's supply chain agenda	X_3	2.00	0.19	3.50	0.000	4.98	1.33 – 8.33
UHSC conducts Health Supply Chain risk identification	X_4	2.40	0.21	5.40	0.000	3.79	1.79 – 8.79
Gathering & selecting of information sources during risk identification	X_5	0.84	0.12	6.50	0.038	0.23	0.06 – 0.92
Identification of supply chain risks by frequency of occurrence	X_6	0.07	0.04	1.60	0.017	2.90	1.21 – 6.96
Use of standard tools & techniques to identify risks	X_7	1.52	0.10	5.04	0.000	0.02	0.005 – 0.086
Participation of entire project team in risk identification	X_8	0.28	0.07	3.93	0.000	2.06	1.76 – 7.66
Conducting external and internal cross-checks during risk identification	X_9	1.07	0.17	6.31	0.001	1.76	0.33 – 3.36
Documentation of risks by UHSC	X_{10}	1.11	0.53	2.19	0.000	1.04	0.79 – 1.38
Periodic collection of risk information from critical partners	X_{11}	1.03	1.17	0.08	0.001	3.98	1.79 – 8.84
Constant	C	11.53	0.18	1.53	0.006	0.89	0.65 – 1.08

CI: Confidence Interval; Source: Primary source

Study findings showed that all the investigated risk identification practices were found to be significantly associated with the level of time performance of UHSC project, except for Organization's concern about supply chain risks which was found not to be associated with level of time performance of UHSC project (OR=1.08, 95% CI (0.47 – 2.47), P=0.861). This can be explained by the fact that, an organization's concern about risks can only make meaning if the organization goes ahead to practice the required risk identification procedures. Availability of formal documented risk identification process(OR=0.09, 95% CI (0.04 – 0.25), P=0.000), integration of risk management into UHSC's agenda (OR=4.98, 95% CI (1.33 – 8.33), P=0.000), conducting of HSC risk identification by UHSC (OR=3.79, 95% CI (1.79 – 8.79), P=0.000), existence of gathering and selecting of information sources during risk identification(OR=0.23, 95% CI (0.06 – 0.92), P=0.038), whether SC risks are identified by frequency of occurrence(OR=2.9, 95% CI (1.21 – 6.96), P=0.017), use of standard tools and techniques to identify risks(OR=0.02,

95% CI (0.005 – 0.086), P=0.000), participation of entire project team in risk identification(OR=2.06, 95% CI (1.76 – 7.66), P=0.000), conducting of external and internal cross-checks during risk identification(OR=2.06, 95% CI (1.76 – 7.66), P=0.000), documentation of risks(OR=1.04, 95% CI (0.79 – 1.38), P=0.000), and periodic collecting of risk information from critical partners(OR=3.98, 95% CI (1.79 – 8.84), P=0.001).

Cost performance

Table 3: Effect of Risk identification practices on cost performance of UHSC project

Dependent Variable (Cost performance)	*Y*					Number of obs :	157
						F (9, 147):	11.60
						Prob > F:	**0.0000**
						R-squared:	0.4152
						Adj R-squared:	0.3794
						Root MSE:	0.24558
Independent Variables (Risk identification practices)	(x)	Coef.	Std. Error	t	P-value	Odds ratio	95% CI
UHSC is concerned about supply chain risks	X_1	1.23	0.05	4.89	0.010	1.33	0.30 – 3.70
Availability of a formal documented risk identification process	X_2	1.32	0.09	3.76	0.000	2.73	1.02 – 5.45
Integration of risk management into UHSC's supply chain agenda	X_3	2.42	0.21	1.49	0.000	4.90	1.40 – 10.40
UHSC conducts Health Supply Chain risk identification	X_4	2.10	1.40	2.34	0.000	2.47	1.12 – 8.12
Gathering & selecting of information sources during risk identification	X_5	1.41	0.13	3.12	0.000	1.67	0.95 – 5.95
Identification of supply chain risks by frequency of occurrence	X_6	1.26	0.04	5.40	0.238	0.54	0.19 - 1.50
Use of standard tools & techniques to identify risks	X_7	1.14	0.11	1.29	0.001	0.73	0.23 – 2.30
Participation of entire project team in risk identification	X_8	1.42	0.07	5.86	0.090	0.24	0.08-0.69
Conducting external and internal cross-checks during risk identification	X_9	1.25	0.17	1.51	0.000	2.06	1.76 – 7.66
Documentation of risks by UHSC	X_{10}	1.23	0.05	4.43	0.001	1.76	0.33 – 3.36
Periodic collection of risk information from critical partners	X_{11}	1.18	0.18	1.01	0.000	1.04	0.79 – 1.38
Constant	C	8.43	0.19	2.28	0.024	0.89	0.21 – 3.52

CI: Confidence Interval; Source: Primary source

In addition to the above findings, all the investigated risk identification practices were still found to be significantly associated with cost performance of UHSC project, except for 2 practices, Identification of supply chain risks by frequency of occurrence (OR=0.54, 95% CI (0.19 – 1.50), P=0.238) and participation of entire project team in risk identification (OR=0.24, 95% CI (0.08 – 0.69), P=0.09).

Quality performance

Table 4: Effect of Risk identification practices on Quality performance of UHSC project

Dependent Variable (Quality performance)	*Y*					Number of obs :	157
						F (9, 147):	8.51
						Prob > F:	0.0000
						R-squared:	0.3426
						Adj R-squared:	0.3023
						Root MSE:	0.3763
Independent Variables (Risk identification practices)	(x)	Coef.	Std. Error	t	P-value	Odds ratio	95% CI
UHSC is concerned about supply chain risks	X_1	0.08	0.07	1.16	0.143	1.69	0.84 – 3.43
Availability of a formal documented risk identification process	X_2	0.06	1.13	0.47	0.002	2.10	1.00 – 6.00
Integration of risk management into UHSC's supply chain agenda	X_3	1.20	0.32	0.24	0.010	4.5	1.45 – 10.23
UHSC conducts Health Supply Chain risk identification	X_4	0.49	0.41	1.21	0.000	2.47	1.12 – 8.12
Gathering & selecting of information sources during risk identification	X_5	1.41	0.20	2.06	0.000	1.67	0.95 – 5.95
Identification of supply chain risks by frequency of occurrence	X_6	1.20	0.07	2.76	0.001	3.98	0.95 – 5.95
Use of standard tools & techniques to identify risks	X_7	1.31	0.16	1.95	0.000	2.55	1.40 – 7.40
Participation of entire project team in risk identification	X_8	0.05	0.11	0.45	0.790	1.14	0.44 – 2.91
Conducting external and internal cross-checks during risk identification	X_9	0.20	0.26	0.77	0.003	2.79	1.09 – 7.98
Documentation of risks by UHSC	X_{10}	1.45	0.08	5.46	0.010	1.88	0.38 – 3.38
Periodic collection of risk information from critical partners	X_{11}	0.34	0.27	1.20	0.013	2.25	1.10 – 7.10
Constant	C	4.78	0.29	0.17	0.036	1.20	0.62 – 1.72

CI: Confidence Interval; Source: Primary source

Further still, findings showed that all investigated risk identification practices have a significant effect on Quality performance of UHSC project (p-value $\leq$ 0.05), except for Organization's concern about supply chain risks which was found not to be associated with Quality performance of UHSC project (OR=1.69, 95% CI (0.84 – 3.34), P=0.143) and participation of entire project team in risk identification (OR=1.14, 95% CI (0.44 – 2.91), P=0.790).

4.2 Effect of risk analysis on the performance of HSC projects

Study results revealed good knowledge and understanding of the concept of risk analysis by all the respondents (100%). However, findings showed a low level of adoption of standard risk analysis practices (12.74%).

Study findings further revealed and established a significant relationship between risk analysis practices and the level of performance of HSC projects. The study found out that risk analysis has a significant effect on the level of time performance, cost performance and quality performance of HSC projects.

Time performance

Table 5: Effect of risk analysis practices on time performance of UHSC project

Dependent Variable (Time performance)	*Y*					Number of obs :	157
						F (7, 149):	47.31
						Prob > F:	**0.0000**
						R-squared:	0.6897
						Adj R-squared:	0.6751
						Root MSE:	0.2157
Independent Variables (Risk analysis practices)	(x)	Coef.	Std. Error	t	P-value	Odds ratio	95% CI
Availability of an established risk assessment procedure in place	X_1	1.33	0.09	3.45	0.001	1.24	0.38 – 4.05
Priority ranking of supply chain risks	X_2	1.85	0.13	6.60	0.011	3.02	1.22 – 9.56
Frequent analysis on previous occurrence of supply risks	X_3	1.83	0.05	14.93	0.000	63	17.56 – 225.9
Cost benefit Analysis of potential risks	X_4	0.27	0.09	3.46	0.001	0.73	0.23 – 2.30
UHSC conducts internal quality assessments of suppliers	X_5	0.05	0.05	1.04	0.136	0.52	0.22 – 1.23
Results from risk assessments are used to control risk	X_6	1.48	0.06	7.70	0.033	2.75	1.08 – 6.98
The project complies with the risk assessment procedure	X_7	1.32	0.32	2.49	0.010	1.33	0.30 – 3.70
Availability of a framework for training in risk management	X_8	1.57	0.91	3.39	0.000	2.73	1.02 – 5.45
My supervisor handles the risk assessment process satisfactorily	X_9	0.27	0.10	2.64	0.000	4.90	1.40 – 10.40
Constant	C	4.50	0.02	1.39	0.167	0.50	0.02 – 1.09

CI: Confidence Interval; Source: Primary source

Findings showed that all the assessed risk analysis practices (with p-value ≤ 0.05) have a significant effect on the level of time performance of UHSC project. Conducting internal quality assessments of suppliers was the only practice found not to have a significant effect on the level of time performance of UHSC project (OR=0.52, 95% CI (0.22 – 1.23), P=0.136), other risk analysis practices had a significant effect on performance. Availability of an established risk assessment procedure (OR=1.24, 95% CI (0.38 – 4.05), P=0.001), Ranking of supply chain risks by priority (OR=3.02, 95% CI (1.22 – 9.56), P=0.011), conducting cost benefit analysis of potential risks (OR=0.73, 95% CI (0.23 – 2.30), P=0.001), use of results from risk assessment to control risks(OR=2.75, 95% CI (1.08 – 6.98), P=0.033), availability of a framework for risk management training(OR=2.73, 95% CI (1.02 – 5.45), P=0.000), and supervision of risk assessment (OR=4.90, 95% CI (1.40 – 10.40), P=0.000).

Cost performance

Table 4: Effect of Risk analysis practices on cost performance of UHSC project

Dependent Variable (Time performance)	*Y*					Number of obs :	157
						F (7, 149):	26.28
						Prob > F:	**0.0000**
						R-squared:	0.5525
						Adj R-squared:	0.5314
						Root MSE:	0.2133
Independent Variables (Risk analysis practices)	(x)	Coef.	Std. Error	t	P-value	Odds ratio	95% CI
Availability of an established risk assessment procedure in place	X_1	1.12	0.09	1.35	0.014	1.34	0.90 – 1.99
Priority ranking of supply chain risks	X_2	1.19	0.13	1.53	0.000	1.04	0.79 – 1.38
Frequent analysis on previous occurrence of supply risks	X_3	0.04	0.05	0.71	0.000	4.13	2.28 – 7.49
Cost benefit Analysis of potential risks	X_4	1.33	0.08	4.43	0.015	3.75	1.29 - 10.92
UHSC conducts internal quality assessments of suppliers	X_5	1.31	0.06	6.77	0.000	2.45	1.02 – 8.42
Results from risk assessments are used to control risk	X_6	1.32	0.17	5.18	0.013	2.01	1.00 – 7. 67
The project complies with the risk assessment procedure	X_7	1.27	1.20	2.72	0.000	1.32	1.01 – 7.22
Availability of a framework for training in risk management	X_8	0.13	1.31	3.91	0.001	3.02	1.22 – 9.56
My supervisor handles the risk assessment process satisfactorily	X_9	1.01	0.10	9.82	0.000	1.04	1.44 - 6.92
Constant	C	5.78	0.03	0.07	0.047	0.23	0.01 – 1.01

CI: Confidence Interval; Source: Primary source

The study further found out that all the investigated risk analysis practices were still found to have a significant effect on cost performance of UHSC project. All risk analysis practices had a p-value ≤ 0.05. Availability of an established risk assessment procedure (OR=1.34, 95% CI (0.90 – 1.99), P=0.014), Ranking of supply chain risks by priority (OR=1.04, 95% CI (0.79 – 1.38), P=0.000), conducting cost benefit analysis of potential risks(OR=3.75, 95% CI (1.29 – 10.92), P=0.015), Conducting internal quality assessments(OR=2.45, 95% CI (1.02 – 8.42), P=0.000), using results from risk assessment to control risks (OR=2.01, 95% CI (1.00 – 7.67), P=0.013), availability of a framework for risk management training (OR=3.02, 95% CI (1.22 –

9.56), P=0.001), Supervision of risk assessment (OR=1.04, 95% CI (1.44 – 6.92), P=0.000).

Quality performance

Table 4. 1: Effect of Risk analysis practices on quality performance of UHSC project

Dependent Variable (Quality performance)	*Y*					Number of obs :	157
						F (7, 149):	52.05
						Prob > F:	**0.0000**
						R-squared:	0.7098
						Adj R-squared:	0.6961
						Root MSE:	0.2484
Independent Variables (Risk analysis practices)	(x)	Coef.	Std. Error	t	P-value	Odds ratio	95% CI
Availability of an established risk assessment procedure in place	X_1	1.55	0.11	5.07	0.000	2.06	1.76 – 7.66
Priority ranking of supply chain risks	X_2	1.18	0.15	1.22	0.001	1.76	0.33 – 3.36
Frequent analysis on previous occurrence of supply risks	X_3	1.13	0.06	2.14	0.000	1.04	0.79 – 1.38
Cost benefit Analysis of potential risks	X_4	0.40	0.08	4.56	0.002	3.66	1.58 – 8.45
UHSC conducts internal quality assessments of suppliers	X_5	0.27	0.05	4.92	0.000	4.13	2.28 – 7.49
Results from risk assessments are used to control risk	X_6	0.67	0.07	9.52	0.000	7.83	3.34 – 18.90
The project complies with the risk assessment procedure	X_7	0.39	1.01	1.33	0.000	0.03	0.006 – 0.11
Availability of a framework for training in risk management	X_8	0.24	0.14	3.15	0.000	0.24	0.068 – 0.86
My supervisor handles the risk assessment process satisfactorily	X_9	0.28	0.12	2.40	0.032	0.06	0.03 – 0.12
Constant	C	3.04	0.03	1.26	0.208	0.27	0.01-1.08

CI: Confidence Interval; Source: Primary source

Further still, findings showed that all investigated risk analysis practices have a significant effect on Quality performance of UHSC project (p-value ≤ 0.05). Availability of an established risk assessment procedure (OR=2.06, 95% CI (1.76 – 7.66), P=0.000), Ranking of supply chain risks by priority (OR=1.76, 95% CI (0.33 – 3.36), P=0.001), conducting cost benefit analysis of potential risks(OR=3.66, 95% CI (1.58 – 8.45), P=0.002), Conducting internal quality assessments(OR=4.13, 95% CI (2.28 – 7.49), P=0.000), using results from risk assessment to control risks (OR=7.83, 95% CI (3.34 – 18.90), P=0.000), availability of a framework for risk management training (OR=0.24, 95% CI (0.068 – 0.86), P=0.000), Supervision of risk assessment (OR=0.06, 95% CI (0.03 – 0.12), P=0.032).

4.3 Effect of planning for risk management on the performance of HSC projects

Study results revealed good knowledge and understanding of the concept of risk planning by the majority (92.36%) of the respondents. However, findings showed a low level of adoption of standard risk planning practices (24.2%).
Study findings further revealed and established a significant relationship between risk planning practices and the level of performance of HSC projects. The study found out that risk planning had a significant effect on the level of time performance, cost performance and quality performance of HSC projects.

Time performance

Table 4. 2: Effect of Planning for risk management on time performance of UHSC project

Dependent Variable (Time performance)	*Y*					Number of obs:	157
						F (8, 148):	20.39
						Prob > F:	0.0000
						R-squared:	0.5243
						Adj R-squared:	0.4986
						Root MSE:	0.2681
Independent Variables (Risk planning practices)	(x)	Coef.	Std. Error	t	P-value	Odds ratio	95% CI
UHSC's processes incorporate effective risk management planning	X_1	0.06	0.07	0.91	0.002	1.89	0.39 – 6.89
Senior management support risk management planning	X_2	0.29	0.06	4.29	0.052	0.33	0.11 – 1.00
There is a clear risk planning procedure	X_3	0.29	0.09	2.43	0.013	3.10	1.01 – 7.01
The organization has a developed supply chain risk mitigation strategy	X_4	1.13	0.18	6.31	0.000	2.23	0.90 – 5.90
My supervisor gives me clear instruction when planning for risk	X_5	1.11	0.24	2.33	0.000	1.97	0.85 – 9.00
I have a fair opportunity of influencing risk registers	X_6	0.65	0.07	9.19	0.000	8.92	3.5 – 22.76
I am satisfied with the way am performing in risk planning	X_7	1.55	0.11	5.18	0.010	2.00	1.00 – 6.59
I am consulted during risk planning and my opinion is considered	X_8	1.07	0.13	8.36	0.000	1.13	0.67 – 8.90
There is good communication that makes the planning process clear	X_9	0.16	0.06	1.26	0.387	1.17	0.51 – 5.78
Planning is given enough time, we are never in a rush	X_{10}	1.20	0.04	2.31	0.000	2.12	1.11 – 8.11
Constant	C	5.24	0.03	4.71	0.000	0.23	0.01 – 1.23

CI: Confidence Interval; Source: Primary source

Findings showed that all investigated risk planning practices have a significant effect on time performance of UHSC project (p-value 0.05), except for senior management support which was found not to be associated with time

performance of UHSC project (OR=0.33, 95% CI (0.11 – 1.00), P=0.052) and Communication (OR=1.17, 95% CI (0.51 – 5.78), P=0.387). Other risk planning practices had a significant effect on time performance. Incorporation of effective risk management planning in organizational processes (OR=1.89, 95% CI (0.39 – 6.89), P=0.002), Availability of a clear risk planning procedure (OR=3.10, 95% CI (1.01 – 7.01), P=0.013), Availability of a developed supply chain risk mitigation strategy (OR=2.23, 95% CI (0.90 – 5.90), P=0.000), Clear supervision of risk planning process (OR=1.97, 95% CI (0.85 – 9.00), P=0.000), employee input into risk register (OR=8.92, 95% CI (3.5 – 22.76), P=0.000), employee satisfaction with risk planning performance (OR=2.00, 95% CI (1.00 – 6.59), P=0.010), employee participation in risk planning process (OR=1.13, 95% CI (0.67 – 8.90), P=0.000), and giving enough time to risk planning (OR=2.12, 95% CI (1.11 – 8.11), P=0.000).

Cost performance

Table 4.3: Effect of Planning for risk management on cost performance of UHSC project

Dependent Variable (Cost performance)	*Y*					Number of obs:	157
						F (8, 148):	31.75
						Prob > F:	0.0000
						R-squared:	0.6319
						Adj R-squared:	0.6120
						Root MSE:	0.1942
Independent Variables (Risk planning practices)	(x)	Coef.	Std. Error	t	P-value	Odds ratio	95% CI
UHSC's processes incorporate effective risk management planning	X_1	0.06	0.05	1.25	0.000	4.20	1.02 – 10.02
Senior management support risk management planning	X_2	1.14	0.05	2.86	0.351	1.63	0.58 – 4.58
There is a clear risk planning procedure	X_3	0.09	0.68	0.14	0.000	9.1	2.85 – 29.04
UHSC has a developed supply chain risk mitigation strategy	X_4	1.80	0.13	6.24	0.000	3.11	1.1 – 9.11
My supervisor gives me clear instruction when planning for risk	X_5	1.21	0.22	2.31	0.000	10.10	2.83 – 24.83
I have a fair opportunity of influencing risk registers	X_6	1.03	0.05	0.66	0.000	8.79	1.22 – 20.22
I am satisfied with the way am performing in risk planning	X_7	3.11	0.56	1.02	0.000	13.11	2.01 – 32.01
I am consulted during risk planning and my opinion is considered	X_8	1.23	0.78	3.00	0.000	11.55	3.47 – 38.38
There is good communication that makes the planning process clear	X_9	1.29	0.09	3.23	0.000	10.19	3.13 – 33.11
Planning is given enough time, we are never in a rush	X_{10}	1.48	0.04	11.00	0.013	3.10	1.01 – 7.01
Constant	C	6.12	0.02	1.61			

CI: Confidence Interval; Source: Primary source

The study further found out that all the investigated risk planning practices were still found to have a significant effect on cost performance of UHSC project (p-value 0.05), except for senior management support. Findings revealed that senior management support for risk management planning was not associated with cost performance of UHSC project (OR=1.63, 95% CI (0.58 – 4.58), P=0.351). Other risk planning practices had a significant effect on cost performance. Incorporation of effective risk management planning in organizational processes (OR=4.02, 95% CI (1.02 – 10.02), P=0.000), Availability of a clear risk planning procedure (OR=9.1, 95% CI (2.85 – 29.04), P=0.000), Availability of a developed supply chain risk mitigation strategy (OR=3.11, 95% CI (1.1 – 9.11), P=0.000), Clear supervision of risk planning process (OR=10.10, 95% CI (2.83 – 24.83), P=0.000), employee input into risk register (OR=8.79, 95% CI (1.22 – 20.22, P=0.000), employee satisfaction with risk planning performance (OR=13.11, 95% CI (2.01 – 32.01), P=0.000), employee participation in risk planning process (OR=11.55, 95% CI (3.47– 38.38), P=0.000), Good communication during the planning process (OR=10.19, 95% CI (3.13 – 33.11), P=0.000) and giving enough time to risk planning (OR=2.12, 95% CI (1.11 – 8.11), P=0.000).

Quality performance

Table 4.4: Effect of Planning for risk management on Quality performance of UHSC project

Dependent Variable (Quality performance)	*Y*					Number of obs:	157
						F (8, 148):	11.60
						Prob > F:	0.0000
						R-squared:	0.3855
						Adj R-squared:	0.3523
						Root MSE:	0.3626
Independent Variables (Risk planning practices)	(x)	Coef.	Std. Error	t	P-value	Odds ratio	95% CI
UHSC's processes incorporate effective risk management planning	X_1	1.77	0.09	1.92	0.025	0.61	0.26 – 9.47
Senior management support risk management planning	X_2	1.22	0.09	2.35	0.012	0.32	0.13 – 0.78
There is a clear risk planning procedure	X_3	1.58	0.12	4.56	0.000	28.71	6.21 – 132.70
UHSC has a developed supply chain risk mitigation strategy	X_4	1.42	0.24	1.76	0.001	1.02	0.67 – 8.02
My supervisor gives me clear instruction when planning for risk	X_5	1.26	0.35	1.23	0.000	3.11	1.1 – 9.11
I have a fair opportunity of influencing risk registers	X_6	1.29	0.09	3.05	0.010	2.00	1.00 – 6.59
I am satisfied with the way am performing in risk planning	X_7	2.01	0.17	2.30	0.000	2.12	1.11 – 8.11
I am consulted during risk planning and my opinion is considered	X_8	1.18	0.14	1.29	0.002	2.48	0.84 – 7.32

There is good communication that makes the planning process clear	X_9	0.08	0.16	0.48	0.147	2.19	0.76 – 6.29
Planning is given enough time, we are never in a rush	X_{10}	0.16	0.08	1.97	0.004	3.12	1.43 – 6.81
Constant	C	4.03	0.05	7.69	0.000	1.04	0.2 – 6.03

CI: Confidence Interval; Source: Primary source

Further still, findings showed that all investigated risk planning practices have a significant effect on Quality performance of UHSC project (p-value 0.05), except for communication. Study findings show that communication during the planning process does not have a significant effect on beneficiary satisfaction (OR=2.19, 95% CI (0.76 – 6.29), P=0.147). Other risk planning practices had a significant effect on quality performance. Incorporation of effective risk management planning in organizational processes (OR=0.61, 95% CI (0.26 – 9.47), P=0.025), Senior management support in risk management planning (OR=0.32, 95% CI (0.13 – 0.78), P=0.012), Availability of a clear risk planning procedure (OR=28.71, 95% CI (6.21 – 132.70), P=0.000), Availability of a developed supply chain risk mitigation strategy (OR=1.02, 95% CI (0.67 – 8.02), P=0.001), Clear supervision of risk planning process (OR=3.11, 95% CI (1.1 – 9.11), P=0.000), employee input into risk register (OR=2.00, 95% CI (1.00 – 6.59, P=0.010), employee satisfaction with risk planning performance (OR=2.12, 95% CI (1.11 – 8.11), P=0.000), employee participation in risk planning process (OR=2.48, 95% CI (0.84– 7.32), P=0.002), and giving enough time to risk planning (OR=3.12, 95% CI (1.43 – 6.81), P=0.004).

4.4 Effect of risk response and control on the performance of HSC projects

Study findings showed good knowledge and understanding of the concept of risk response and control by all the respondents (100%). However, findings still showed a low level of application and adoption of standard risk response and control practices (22.93%). Study findings further revealed and established a significant relationship between risk response and control practices and the level of performance of HSC projects. The study found out that risk response and control had a significant effect on the level of time performance, cost performance and quality performance of HSC projects.

Time performance

Table 4. 5: Effect of risk response and control practices on time performance of UHSC project

Dependent Variable (Time performance)	Y					Number of obs :	157
						F (5, 151):	11.63
						Prob > F:	**0.0000**
						R-squared:	0.2781
						Adj R-squared:	0.2542
						Root MSE:	0.3269
Independent Variables (Risk response and control practices)	(x)	Coef.	Std. Error	t	P-value	Odds ratio	95% CI
Incorporation of risk response and control strategies into the project management plan	X_1	0.28	0.07	4.14	0.000	5.29	2.18 – 12.79
Availability of clear Risk responses for negative risks/threats are in UHSC	X_2	1.16	0.07	2.44	0.003	3.75	1.59 – 8.87
Availability of clear Risk responses for positive risks/opportunities in UHSC	X_3	1.20	0.23	1.25	0.003	3.75	1.59 – 8.87
Risk audits are conducted in UHSC	X_4	2.01	0.08	0.42	0.940	0.96	0.29 – 3.06
Risk status meetings are carried out in UHSC frequently	X_5	1.03	0.12	1.58	0.000	2.9	0.9 – 8.9
Technical performance measurement is conducted periodically in UHSC	X_6	1.40	0.06	5.32	0.002	0.17	0.05 – 0.53
Variance and trend analysis is conducted to monitor overall project cost and schedule performance against the baseline from time to time.	X_7	0.09	0.09	4.16	0.012	1.71	0.51 – 10.77
Constant	C	3.45	0.04	3.75	0.000	1.23	0.12 – 4.05

CI: Confidence Interval; Source: Primary source

Findings showed that all the assessed risk response and control practices (with p-value $\leq$ 0.05) have a significant effect on the level of time performance of UHSC project, except the practice of conducting of risk audits (OR=0.96, 95% CI (0.29 – 3.06), P=0.940). The study observed that conducting risk audits was not associated with time performance of UHSC projects. Other risk response and control practices had a significant effect on time performance. Incorporation of risk response strategies in the project management plan (OR=5.29, 95% CI (2.18 – 12.79), P=0.000), Availability of clear risk responses for negative and positive risks (OR=3.75, 95% CI (1.29 – 8.87), P=0.003), Conducting of frequent risk status meetings (OR=2.9, 95% CI (0.9 – 8.9), P=0.000), Periodic conducting of technical performance measurements(OR=0.17, 95% CI (0.05 – 0.53), P=0.002) and time to time conducting of variance and trend analysis to monitor overall project cost and schedule performance against the baseline (OR=1.17, 95% CI (0.51 – 10.77), P=0.012).

Cost performance

Table 4. 6: Effect of risk response and control practices on cost performance of UHSC project

Dependent Variable (Cost performance)	*Y*					Number of obs:	157
						F (5, 151):	32.86
						Prob > F:	0.0000
						R-squared:	0.5211
						Adj R-squared:	0.5052
						Root MSE:	0.2193
Independent Variables (Risk response and control practices)	(x)	Coef.	Std. Error	t	P-value	Odds ratio	95% CI
Incorporation of risk response and control strategies into the project management plan	X_1	1.09	0.04	2.06	0.006	2.68	0.94 – 7.64
Availability of clear Risk responses for negative risks/threats are in UHSC	X_2	1.49	0.04	9.29	0.001	0.97	0.05 – 8.05
Availability of clear Risk responses for positive risks/opportunities in UHSC	X_3	3.21	0.20	4.21	0.003	7.02	1.12 – 25.13
Risk audits are conducted in UHSC	X_4	1.07	0.05	1.43	0.000	4.0	1.45 – 18.45
Risk status meetings are carried out in UHSC frequently	X_5	2.65	0.01	2.35	0.000	1.97	0.85 – 9.00
Technical performance measurement is conducted periodically in UHSC	X_6	0.31	0.03	7.83	0.000	8.79	1.22 – 20.22
Variance and trend analysis is conducted to monitor overall project cost and schedule performance against the baseline from time to time.	X_7	0.21	0.06	3.33	0.000	13.11	2.01 – 32.01
Constant	C	4.09	0.03	3.66	0.000	0.51	0.01 – 4.23

CI: Confidence Interval; Source: Primary source

The research study further observed that all the measured risk response and control practices still had a significant effect on cost performance of UHSC project. All these evaluated practices have a p-value ≤ 0.05. Incorporation of risk response strategies in the project management plan (OR=2.68, 95% CI (0.98 – 7.64), P=0.006), Availability of clear risk responses for negative risks (OR=0.97, 95% CI (0.05 – 8.05), P=0.001) and positive risks (OR=7.02, 95% CI (1.12 – 25.13), P=0.003), Conducting risk audits (OR=4.0, 95% CI (1.45 – 18.45), P=0.000), Conducting of frequent risk status meetings (OR=1.97, 95% CI (0.85 – 9.00), P=0.000), Periodic conducting of technical performance measurements(OR=8.79, 95% CI (1.22 – 20.22), P=0.000) and time to time conducting of variance and trend analysis to monitor overall project cost and schedule performance against the baseline (OR=13.11, 95% CI (2.01 – 32.01), P=0.000).

Quality performance

Table 4.7: Effect of risk response and control practices on quality performance of UHSC project

Dependent Variable (Quality performance)	*Y*					Number of obs :	157
						F (5, 151):	12.73
						Prob > F:	0.0000
						R-squared:	0.2966
						Adj R-squared:	0.2733
						Root MSE:	0.3841
Independent Variables (Risk response and control practices)	(x)	Coef.	Std. Error	t	P-value	Odds ratio	95% CI
Incorporation of risk response and control strategies into the project management plan	X_1	1.23	0.08	2.89	0.004	3.12	1.43 – 6.81
Availability of clear Risk responses for negative risks/threats are in UHSC	X_2	0.03	0.07	0.48	0.050	2.11	0.99 – 4.45
Availability of clear Risk responses for positive risks/opportunities in UHSC	X_3	0.25	0.12	1.23	0.050	2.11	0.99 – 4.45
Risk audits are conducted in UHSC	X_4	1.26	0.08	2.92	0.000	6.22	1.12 – 19.12
Risk status meetings are carried out in UHSC frequently	X_5	2.10	0.07	1.45	0.000	4.01	1.04 – 20.13
Technical performance measurement is conducted periodically in UHSC	X_6	0.34	0.11	5.03	0.000	9.04	3.92 – 20.83
Variance and trend analysis is conducted to monitor overall project cost and schedule performance against the baseline from time to time.	X_7	0.13	0.11	1.13	0.046	2.92	1.02 – 8.34
Constant	C	3.25	0.05	1.82	0.070	2.03	0.45 – 3.45

CI: Confidence Interval; Source: Primary source

Further still, the study looked at quality performance in relation to risk response and control practice. Findings revealed that all the evaluated risk response and control practices still had a significant effect on quality performance of UHSC project (p-value ≤ 0.05). Incorporation of risk response strategies in the project management plan (OR=3.12, 95% CI (1.48 – 6.81), P=0.004), Availability of clear risk responses for negative risks and positive risks (OR=2.11, 95% CI (0.99 – 4.45), P=0.050), Conducting risk audits (OR=6.22, 95% CI (1.12 – 19.12), P=0.000), Conducting of frequent risk status meetings (OR=4.01, 95% CI (1.04 – 20.13), P=0.000), Periodic conducting of technical performance measurements (OR=9.04, 95% CI (3.92 – 20.83), P=0.000) and time to time conducting of variance and trend analysis to monitor overall project cost and schedule performance against the baseline (OR=2.92, 95% CI (1.02 – 8.34), P=0.046).

Qualitative results

A number of open-ended questions were asked during the interactive interview sessions with each of the 8 key respondents about risk management and performance. These included:

How do you manage HSC risks during the implementation of your project?

Respondents expressed a number of ways in which they manage HSC risks in UHSC. These were grouped into themes of Ad hoc risk management strategies, Standard risk management strategies and No strategies as expounded below:

Ad hoc risk management strategies

The theme of ad hoc strategies was further sub categorized into 2 sub-themes. These included; proactive strategies and reactive strategies.

Proactive strategies

"We focus at Increasing visibility and transparency"

A number of respondents reported that the project has focused on increasing visibility and transparency through ensuring that risk information is shared across all the departments, and also putting in place clear communication protocols.

"We focus on collaboration"

Respondents reported that through focusing on collaboration through engaging active participative management, cross sectional or departmental involvement and risk sharing is one of the ways they have managed to mitigate risks

''Agility''

Agility was described by the respondents as changing of operations to suite the current market conditions. Respondents disclosed that they manage risks by directly changing their operations to meet customers' demands. This is done by responding to customer feedback and planning jointly with the beneficiaries.

''Increasing logistics capabilities''

Respondents revealed that one of the ways they have managed to handle risks is by increasing logistics capabilities of the project, this has been done through increasing investment in warehousing to minimize risks due to shortages of storage, increasing transportation equipment capabilities to minimize risks related to transportation issue

''Increasing innovativeness''

Some key respondents reported that one of the ways the project has managed to mitigate risks is through increasing its innovativeness. This has been done through research and development of new strategies to reduce vulnerabilities.

Reactive strategies

This sub-theme included all those strategies suggested by respondents that involve acting in response to a vulnerability after its occurrence.

''Buffer strategy''

Respondents reported that some vulnerabilities like stock outs in health facilities are mitigated through using the buffering stock strategy. Upon reporting of stock outs, NMS, JMS and MAUL use their buffer stocks to replenish health facilities that are critically stocked out.

''Demand management''

Once demand from a health facility is reported then supplies for medicine stocks is done. This is done through putting in place direct telephone lines to NMS, JMS or MAUL, and also direct feedback mechanisms from beneficiaries about stock outs

Standard risk management strategies

This theme included all the known standard risk management strategies. These include risk identification, risk analysis, planning for risk management and risk response and control.

''We use risk management tools & techniques''

Some respondents revealed that some established structures have already been put in their organization to manage risks. For example during the planning for risk management, the brain storming technique is employed by NMS during the planning meetings to help draw mitigation measures for any identified risks. Other tools cited in the interviews included use of the risk register and risk matrix. A number of other techniques were also cited for example SWOT analysis and use of surveys

''We are trying to build a risk management culture''

One of the respondents (Chief of party of UHSC) confessed that the risk management culture is something a bit new in UHSC, and is trying to put in a place a number of measures to institute the culture for the improved performance of the project. Some of the measures included; team work during risk planning, risk governance and senior management support

''The organization has greatly focused on risk knowledge management''

The procurement manager for UHSC cited trainings in risk management as one of the strategies they have focused on lately to improve risk awareness and knowledge of HSC risks that are faced by UHSC and how to devise mitigation strategies to enhance performance of every department.

No strategies

This theme include all confessions from respondents that their organizations did not have risk management strategies in place.

''Risk management is not incorporated in the project management plan''

A project management plan describes every phase of the project, from initiating, planning, executing, monitoring and control and closing. Some of the senior managers interviewed from UHSC confessed that risk management is a concept that was not incorporated in any of the project phases during development of the project management plan.

''We do not have any clear risk strategies and risk policies''

A majority of key respondents confessed that their organizations did not have any clear risk strategies and risk policies. In fact some respondents were suggesting that it is a long – awaited virgin area that could be delightfully accepted in their organization as it could turn around performance.

5. Discussion

This section of the research paper provides a discussion of results from a number of indicators allocated to establishing the effect of risk identification, risk analysis, planning for risk management and risk response and control on the level of performance of HSC projects in Uganda using UHSC as a case. These indicators were categorized into knowledge assessment indicators about risk identification, risk analysis, planning for risk management, risk response and control practices in UHSC.

Knowledge assessment indicators of risk identification included: a description of the understanding of what risk identification is and the importance of risk identification in HSC. Risk identification practice indicators included: UHSC's concern about HSC risk, availability of formal documented risk identification process, integration of risk management into UHSC's agenda, conducting of HSC risk identification by UHSC, existence of gathering and selecting of information sources during risk identification, whether SC risks are identified by frequency of occurrence, use of standard tools and techniques to identify risks, participation of entire project team in risk identification, conducting of external and internal cross-checks during risk identification, documentation of risks, and periodic collecting of risk information from critical partners.

Furthermore, knowledge assessment indicators about risk analysis included: a description of the respondent's understanding of risk analysis and the importance of risk analysis in HSC. Risk analysis practice indicators included: Availability of an established risk assessment procedure, Ranking of supply chain risks by priority, conducting cost benefit analysis of potential risks, conducting internal quality assessments of suppliers, use of results from risk assessment to control risks, availability of a framework for risk management training, and lastly supervision of risk assessment.

5.1 Effect of risk identification on the performance of HSC projects

The findings show that that whereas 97.45% of the respondents showed good knowledge of risk identification and its importance as being a corner stone for good performance of HSC organizations, adoption of standard risk identification practices within HSC projects in Uganda is still very low. Use of a formal documented risk identification process was found to be at only 35.67%. This is consistent with a study conducted by Besner *et al* (2012) in sub-Saharan Africa that reported that only 1 in 10 projects are using known standard risk management practices.

A study also conducted by Zwikael (2007) also found out that whereas risk management is regarded in project management as a vital need, a few countries have actually adopted it. This is still supported by studies conducted by Raz (2002) and Ryan (2013) who observed that the discipline of risk management especially systematic risk identification processes is still in its infancy in sub-Saharan Africa.

Furthermore, findings in this study show that there is a significant association between risk identification practices and performance of UHSC project. Level of performance was investigated using the 3 classical dimensions of project performance i.e. time, cost and quality (Larson 2015). The study investigated the relationship between risk identification practices and time performance, cost performance and quality performance of UHSC project, then using odds ratios and the p-value to verify statistical significance, the effect of risk identification practices on performance of HSCs was established.

These findings still compare positively with findings from a study conducted by Musa (2012) and Talluri (2013) who found out that HSC projects in which risk identification practices are fully functional, there is time efficiency i.e. there are low procurement lead times, low delivery lead times and low order lead times, and also cost efficiency. In his study Talluri observed that HSC projects that conform to standard risk identification practices recorded low inventory holding costs, low warehousing costs, and low transportation costs.

Further still, findings showed that all investigated risk identification practices have a significant effect on Quality performance of UHSC project (p-value $\leq$ 0.05). These findings still compare consistently with findings from a study conducted by Watson (2013) who observed that HSC projects with operational risk identification systems are associated with quality services and improved end user satisfaction and confidence.

5.2 Effect of risk analysis on the performance of HSC projects

Study findings show that 100% of the respondents were knowledgeable about risk analysis and its importance. These agreed that compliance to risk analysis procedures improved performance of HSCs. However, findings discovered that the use of an established risk analysis process within UHSC was only 12.74%. A study conducted by Christopher (2016) highlighted that uptake of risk management is still in its infancy in projects across Africa, however he further observes that adoption of standard risk management systems including efficient risk analysis boosted project performance. This is in line with this study.

Furthermore, results from the study found out that risk analysis practices have a significant effect on the performance of UHSC. This compares favorably with findings from a study by Carvalho (2015) which observed that adoption of standard risk analysis systems had a significant effect on enhancing project performance. This is again supported by Aven (2015) who found out that risk analysis practices had an effect on performance of HSC projects in developing countries.

5.3 Effect of planning for risk management on the performance of HSC projects

Findings of this study show that an overwhelming majority of the respondents (92.36%) were knowledgeable about what planning for risk management entailed and its

importance in enhancing performance HSC projects. However, findings revealed that use of an established risk planning process within UHSC was only 24.2%. In fact none of the respondents (0%) were satisfied with the way risk planning was being performed. A study conducted by Watson et al (2013) on risk management in public health supply chains observed that most sub-Saharan HSC projects are underperforming because of lack of systematic risk planning protocols and procedures incorporated in their project agenda. He further stresses that risk planning goes beyond setting up protocols and procedures, planning must be followed by proactive implementation of established mitigation measures. This is consistent with findings of this study.

Study findings further discovered that risk planning practices have a significant effect on the performance of UHSC. This compares positively with findings from a study by Musonda (2018) which noted that adoption of planning for risk management had a significant effect on boosting project performance. This was again supported by Musa (2012) who discovered that planning for risk management had a significant effect on performance of HSC projects in developing countries.

5.4 Effect of risk response and control on the performance of HSC projects

Results from the study show that all respondents (100%) were knowledgeable about what risk response and risk control entailed and its importance in reducing the probability and impact of threats to improve efficiency of the risk management throughout the project life cycle. However, findings still discovered that use of a standard risk response and control process within UHSC was only 22.93%. This low usage rate correlates with findings from a study conducted by Yadav (2015) who found out that most HSC projects in Africa do not have standard health supply chain risk mitigation strategies. This is still in line with findings from a study by Rausand (2013).

Study findings further revealed that risk response and control practices have a significant effect on the performance of UHSC. This relates satisfactorily with results from a research conducted by Ho et al (2015) on supply chain risk management in HSC projects who confirm that risk response and control processes notably affect performance of supply chain projects.

6. Conclusions

In conclusion, the study revealed that risk management practices i.e. risk identification, risk analysis, planning for risk management, and risk response and control affected the performance of HSC projects in Uganda. The study further unearthed that HSC projects in Uganda lack a comprehensive framework for risk management. Findings have shown that there is a low adoption of standard risk management practices due limited attention being given to HSC risk management practices by senior management teams. Most of the risk management practices employed are adhoc in nature with no formal documented processes and protocols and are not included in the organization's agenda and project management plan from the beginning of project conception or initiation phase. Therefore this study provides an insight of how HSC projects in Uganda can improve risk management to consequently result into improved performance.

7. Recommendations

While this research successfully examined the effect of risk management practices on performance of HSC projects in Uganda, using a case of UHSC, it has also improved understanding of the specific risks affecting health supply chains in Uganda and the core issues involved in risk management and performance of HSC projects in Uganda, and how this can be improved.

Although study findings showed that the majority of the respondents had a clear understanding of risk identification, risk analysis, risk planning and risk response and control, and their importance in improving performance, adoption of these risk management practices was alarmingly low. The following recommendations have been suggested:

- There is a need to Integrate risk management in the organization's agenda. The study found out that risk management as a component was not incorporated in UHSC's project management plan. This is evidence that during the project initiation phase, risk management frameworks were not a priority.
- Development of an institutional framework for training in risk management in order to build capacity and confidence of every project staff in risk management. This would improve project staff contribution in the risk management process since it is a requirement for the entire project team to participate in the risk management process.
- Ensure participation of the entire project team in risk identification, risk analysis, risk planning and risk response and control processes. Findings show that a majority of project staff were dissatisfied about their non-inclusiveness in the risk management process by the senior management team.
- Need for senior management support of the risk management process. Study findings revealed that there was limited attention allocated to HSC risk management processes in UHSC by the senior management team. This was significantly associated to the low performance of the project.
- There is a need for close supervision of the risk management process by line supervisors with clear instructions in accordance to developed standard risk management frameworks.
- Ensure effective risk communication during the entire risk management process. This entails conducting frequent meetings during the processes of risk identification, analysis, planning and risk response and control. These could include: Frequent risk status meetings, risk identification meetings, periodic technical performance measurement meetings, variance and trend analysis meetings to monitor overall project cost and schedule performance against baseline from time to time etc.

- Instituting a formal documented risk identification process, risk analysis process, risk planning process and risk response and control process backed up by protocols and policies. Study findings discovered that these were not formally in place.
- Compliance with the risk identification procedure, risk analysis procedure, risk planning procedure and risk response and control procedure. Findings showed that even the few procedures put in place were not being complied to.
- Routine conducting of risk audits. Risk audits entail documenting and examining how effective risk responses are in dealing with the HSC risks identified and their root causes as well as the entire risk management process. Study findings revealed that conducting of risk audits was at only 15.29% in UHSC.
- There is a need to allocate more time to the risk planning and identification processes. Study findings observed that a majority of project staff (77.07%) were dissatisfied with the time apportioned to risk planning and identification exercises yet they are very core

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