

# Risk Management in Upstream Oil and Gas Businesses in Tanzania

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**To cite this article:** Richard, E. M., & Pascal, W. (2022). Risk Management in Upstream Oil and Gas Businesses in Tanzania. *Business Management Review*, 25(1), 111–131.

## **Abstract**

*This study gives an account of major risks faced by Tanzania's upstream oil and gas businesses and how they are managed. The study employs the agency and risk management theories coupled with a triangulation data collection. The data was collected from eight businesses using questionnaires, complemented by interviews and was analyzed using descriptive and content analyses. The study observed regulatory changes, fluctuation in global oil prices, government bureaucracy, corruption and government interference as high risks facing upstream oil and gas businesses. Expert consultation, experience, workshops, stakeholder analysis and brainstorming are the most used risk identification techniques. To manage these risks, businesses familiarise themselves with government guidelines, invest to understand government bureaucracy and cut down some operations. For efficient risk management, the study recommends that oil and gas businesses use techniques that are more relevant to the local environment. The results support the agency and risk management theories.*

**Keywords:** Risk Management, Oil and Gas Businesses, Upstream, Tanzania

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## **Introduction**

The oil and gas businesses represent the largest share of the world's energy generation. In 2019, they contributed around 57.4% of the world energy supply (Ritchie & Roser, 2020). They also create jobs and incomes (Peach & Starbuck, 2011; Cai, Maguire, & Winters, 2019) and build essential infrastructures such as roads, schools, health centres, ports and harbours (Kirat, 2015). In Tanzania, the oil and gas industry is still at an infancy stage and the upstream operations are relatively new in the country. The oil and gas exploration activities commenced in the country in 1952 but it was until 1974 when the first natural gas reserve was discovered Songo Songo area, Lindi region. Later in 1982 another reserve was discovered in Mnazi bay, Mtwara region. In Songo Songo and Mnazi bay, gas production began in 2004 and 2006, respectively (Komba, Rutta, & Nyalusi, 2015). The recent discoveries in other areas such as Kiliwani, Ntorya, Mkuranga and deep-sea (Bishoge, Zhang, Mushi, & Suntu, 2018) indicates the country's potential to become a gas economy. The total reserves discovered as at 2016 are estimated to be 57.25 Tcf (EWURA, 2017). The total production from 2011-2015 was 138,389 million standard cubic feet (MMsft<sup>3</sup>) valued at U.S. \$519.8 million, of which the foremost consumers were local industries, households, hotels, power generators and compressed natural gas producers (TPDC, 2015). The natural gas has contributed 43% of electricity generation in the country. This is about 625.5 megawatts of the installed power capacity (1,450 MW) in 2017 (Bishoge et al., 2018).

Tanzania anticipates building a mega LNG plant, targeting to export energy particularly to Asian markets (Bariyo, 2015). Further, the country anticipates to use natural gas as hydrogen source for ammonia production, a feedstock for fertilizers such as urea which is currently imported (Amanam, 2017). This product is critical for boosting the country's agricultural sector. Despite the prospects, the oil and gas business is highly capital intensive but also a high risk sector to invest in (Chalu, Richard, & Ngohelo, 2019). In the oil and gas value chain, the risks are more centred in the upstream<sup>2</sup> due to its large capital investment, involvement of many stakeholders and complex technology (Suda, Rani, Rahman, & Wang, 2015; Arora, 2012). The upstream undertakings expose investors to, among other risks; legal, investment timing and geological uncertainties, production interruption and environmental damage (Suda *et al.*, 2015). These risks represent the potential adverse events that can affect the future business prosperity (Liu, Hu, & Xiao, 2017). The recent Russia-Ukraine crisis for instance, is crushing the export markets of the Russian oil and gas companies (Astrov, Grieveson, Kochnev, Landesmann, & Pindyuk, 2022). Also, Covid-19 lockdowns led to sharp oil price declines that resulted into losses to the oil and gas businesses (Blas & Pismennaya, 2020). The severe environmental damages of oil spills in Nigeria costed Shell PLC £55m in 2015 to avoid the case embarrassment at the London high court (Vidal, 2015).

Amidst the unforeseen perils, risk management increases organization's chances to achieve its objectives (Karami, Samimi, & Ja'fari, 2020). Thus, managing the risks in the oil and gas businesses is crucial. Risk management involves the process of setting business objectives,

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<sup>2</sup>The industry is classified in upstream, midstream and downstream businesses. The upstream companies deal with exploration and production of oil and gas (Battacharyya, 2011). The midstream, deals with processing, storage and transportation of oil and gas while the downstream companies deal with oil and gas marketing and distribution (Deutsche Bank, 2013)

identifying risks and deciding means of responding to them accordingly and safely to achieve organizational goals (Berg, 2010).

The agency theory stipulates that management works on behalf of business owners. The managers in principle manage the risks to ensure that shareholders get the required returns and their investments are safeguarded. In practice however, managers' goals are not in congruency with shareholders'. The risk management theory explains the process needed to reduce this agency conflict and its associated costs to a business (Wanjohi & Ombui, 2013). The process involves risk identification, assessment, control, monitoring and communication. Risk identification is critical as consequent stages cannot have value if risks have not been identified properly (Akintoye & MacLeod, 1997; Machado & Pereira, 2012; Makui, Mojtahedi, & Mousavi, 2010; Walewski, Gibson, & Vines, 2006). Literature reflects that risk identification practices differ across countries (Gajewska & Ropel, 2011; Kansal & Sharma, 2012; Lyons & Skitmore, 2004; Martins, Morano, Ferreira, & Haddad, 2011). When identified, risks are being analyzed and ranked in importance based on their possible frequency of occurrence and severity when they occur. This process is critical for all kinds of businesses as risks spectrum differ across businesses depending on nature, location and investment size (Sharma & Gupta, 2019). It has been observed further that, risks that are significantly high in one country may not be ranked the same in another country (Ibid). Identification and handling techniques are also not standard across firms, sectors and countries.

Thus, understanding risk identification techniques, significant risks facing oil and gas businesses in Tanzania, and their responses is critical and timely given the fact that the upstream oil and gas businesses are highly risky and relatively new. Further, to appropriately allocate scarce resources for risk management. It has been observed that political, operational, regulatory, financial, weather, and security risks are the top 6 risks facing oil and gas companies in the developed world (Rogers & Ethridge, 2013). These companies use their financial strength, diversified portfolios, hedging techniques and high technology detective devices to manage the risks (Osabutey, Adibo & Agbodohu, 2013). Risk handling techniques used also differ across levels of economic development. Kassem, Khoiry, & Hamzah (2020) stipulated that risk management practices are specific to different countries. Nyoni, Sukamani, & Mavengwa (2019) stress that the significant risks and risk management practices are affected by economic, technological, political, social, legal and regulatory environments. The critical questions this paper is answering are; what are the major risks facing oil and gas businesses in Tanzania, and how oil and gas businesses respond to them?

The remaining parts of the paper proceeds as follows. Section two provides the theories that guided the study and review of the relevant empirical literature. The study methods are explained in section three and section four presents and interpret the results. Section five discusses the results; and section six concludes the study and gives recommendations.

## **Literature Review**

### ***Theoretical Framework***

This study is grounded on two theories; the agency theory and the risk management theory. The agency theory explains the relationship that exists between principals (shareholders) and

agents (managers) within organizations (Jensen and Meckling, 1976). Principals delegate the activity of safeguarding their investments to managers. The said activities involve risk management. Managers however, mostly act in their own interests which in some cases conflict with those of shareholders and create the agency problems (Pratt & Zeckhauser, 1985). The theory suggests for monitoring and control strategies that ensure risks are managed to enable the achievement of shareholders' interests.

Risk management theory on the other hand complements the agency theory by providing a well-defined process of managing the risks. The process systematically involves identifying the risks, assessing, controlling and monitoring and communicating accordingly (Berg, 2010). The value of the entire risk management process lies in the initial stage. Improper risk identification may lead to massive resources losses (Wenk, 2005). Wanjohi & Ombui (2013) confirm that effective risk management involves a transparent accounting of resources and methods to implement the same and eventually, creates shareholders' value.

Agency theory on one hand, suggests that organizations need to have in place monitoring and controlling strategies that ensure risks are managed to enable agents' reduce the agency costs and thus meeting the shareholders' interests. Risk management theory on the other hand provides a well-defined process to be followed by organizations in reducing the agency costs.

### ***Risk Identification in Oil and Gas Businesses***

Risk identification coupled with risk analysis enable companies to recognize the risks with potential significant impact on their businesses. This is very crucial to enable organizations allocate their scarce resources efficiently especially in managing the risks (Kansal and Sharma, 2012). Risk identification involves finding, knowing and describing the possible risks that may happen. Literature provides several techniques that can be employed in identifying risks. These are *workshops* which are group meetings involving discussions, sharing skills and experience in identifying the possible risks (Gajewska and Ropel, 2011); *brainstorming* which is an idea generation technique involving participants' thinking and viewpoints (Tworek, 2010); *interviews* which provide explanations of the risks in details as they are individually or collectively conducted with a set of experienced project members, specialist or project stakeholder (Morano, Martins, & Ferreira, 2006); *questionnaire* that consists of questions for investigation of existence of risks in a business area; *benchmarking* which is-the process of identifying the risks by comparing the risks of industry leaders/ competitors; *expert consultation* that identify the risks by the help of experts in a particular field or area; *past experience* which study the occurred risk events in the past projects in a particular context; *Delphi technique* that assembles experts' opinions from different geographical locations in a systematic way; *risk breakdown structure* which classifies the risks into categories and checks omission (Tworek, 2010); *hazard identification* that identify potential hazards that may arise before the project starts (Lyons & Skitmore, 2004); *database* which uses the stored information of risks related to past projects; *Templates* that are formatted documents that provide structure of organizing, collecting and presenting information or data (PMI, 2017); *checklists* which consist of a list of risks that were previously identified but may not contain the risks which were not identified before (Tworek, 2010). *Project documentation reviews* which use documents related to the project, including policies, assumptions, contracts, and others to identify the risks; *Specialist Literature* which uses written documents of different professionals in a particular field of

interest; *Stakeholder Analysis* that examines potential threats and opportunities from individuals or organization that can influence or be affected by respective business operations; *Research which* identifies risks through conducting research investigation or reviewing research reports.

There is scant empirical literature on risk identification techniques that is specific to oil and gas businesses. Studies in the construction industry indicates that the preferable techniques differ with economic development level of the context. In the UK for instance, documentary reviews, interviews, checklists are used by SMEs (Rostami, 2016); in Poland's experience, documentary review, brainstorming, and Delphi techniques are used by SMEs (Gorzeń-Mitka, 2013). In Lithuania, firms frequently used project documentation review and brainstorming, while interviews and databases are rarely used (Banaitiene and Banaitis, 2012). In Nigeria, companies use past experiences, brainstorming, project documentation, expert consultation and location visitation (Awodele, 2016). In Ghana, checklist, brainstorming and benchmarking are mainly employed (Hayford & Ahmed, 2013). In South Africa, firms mainly use checklists, brainstorming and interviews (Renault, Agumba and Ansary, 2016).

In the banking sector, checklists, SWOT analysis, interviews, simulation, and stress testing are employed to identify credit risks (Kattel, 2015). This implies that risk identification techniques also differ by sector. When risks are identified, they are analyzed according to their magnitude levels in affecting the organizations objectives. This is due to the fact that there are scarce resources to deal with the same. This motivated researchers to establish how oil and gas businesses identify risks and what are the major risks affecting the said businesses accordingly. Risk identification is the first and critical step in risk management. When identified risk is analyzed, it enables businesses to develop plans to minimize harmful events before they arise and hinder realization of objectives.

### ***Responding to Risks by Oil and Gas Businesses***

Literature also indicates that response to risks differ in different economies depending on the level of development as well as strength of supporting structures among others. In his study of risks and their respective mitigating strategies in the United States, Khambati (2012) identified environmental risks, operational risks, natural disasters and credit risks as those facing the oil and gas businesses. It was observed that, the U.S. government teamed up with international oil companies to mitigate these risks through a green business continuity plan, critical environmental audits, simulation and capital risk guarantee. In China, operational risks, financial risks, weather events and geological risks affect the said businesses. Public awareness, advanced technology, hiring competent personnel and quality control systems are used to handle them accordingly (Yanting & Liyunb, 2011). In Russia, oil and gas companies face risks of government interference in their operations, tax policy changes, shortage of qualified specialists, compliance, technological and environmental risks (Lenkova 2018). R&D programs, the use of advanced technology, equipping staff with skills from the most qualified employees, and diversifying their operations are techniques used in handling the above said risks (Lenkova, 2018). In Lithuania, the companies suffer from inadequate fiscal regime and extreme weather events. Insurance, partnerships, and performance bonds are employed to manage the risks (Banaitiene and Banaitis, 2012).

In Iran, a developing country, oil and gas companies face corruption and operational risks (Nikoo, 2015). In Ghana, companies are suffering mostly from environmental, health, and safety risks (Osabutey, Obro-Adibo, Agbodohu, & Kumi, 2013). Thuyet, Ogunlana, & Dey (2007) observed the bureaucratic government system, incompetent workforce, regulatory and natural events to be the main risks in oil and gas businesses in Vietnam. Building good relationships with government agencies, investing in training employees, understanding local laws and regulations, forming partnerships, outsourcing experts to cope with the risks are the most strategies used to handle the risks. In Nigeria, oil and gas businesses face bureaucratic government systems, regulatory risk, poor infrastructural design, and risk management illiteracy (Zuofa & Ochieng, 2014). Companies transfer most of the insurable risks to insurance companies and those that are non-insurable are retained and managed by a specialized risk management units (Nwaeke, (2008).

Literature reviewed suggests that despite the few commonalities in some countries, major risks facing oil and gas businesses differ across countries and so are their responses. Some reasons behind these variations include differences in legal and regulatory set ups as well as their respective levels of law enforcement; advancement in economic, political and technological arena; and availability of resource in host countries (Nyoni *et al.*, 2019). Compared to the developing countries, oil and gas businesses in developed countries use more advanced technologies to manage the risks (Lenkova, 2018; Zuofa & Ochieng, 2014; Khambati, 2012; Yantinga & Liyunb, 2011; Thuyet *et al.*, 2007). Understanding major risks that are faced by the upstream oil and gas businesses in Tanzania and how the said businesses are handling them is thus timely and crucial to enable strategizing appropriately and enabled our economy to become a medium-size industrialized economy.

## **Methodology**

This study used a mixed research methods approach in data collection and analysis for complementarity, confirmation and development of the targeted phenomenon (Greene, Caracelli, & Graham, 1989). The mixed methods research approach was opted for its triangulation benefits. Questionnaire survey was used to collected information about managers' perceived risk identification techniques. In parallel, the interviews of managers was also conducted.

The questionnaire was designed to collected information on the profiles of companies and respondents. As informed by the literature, a list of risk identification techniques using a 5-point Likert scale (from 1=not applicable to 5=highly applicable) and risks (from 1=very low to 5=very high) were constructed (Awodele, 2016; Banaitiene and Banaitis, 2012). Researchers consulted the TPDC's management and identified 9 active upstream oil and gas companies in Tanzania<sup>3</sup>. All these were approached and 7 companies (78%) accepted to participate in the study. These companies existed in Tanzania for more than 10 years. Out of seven (7) companies, two (2) were gas producers, four (4) were gas exploration companies, and one (1) was the state owned oil company (the partner company to all oil and gas companies operating in the country). Consultation with the oil and gas field experts and top management established seven (7) positions/staff who qualified to participate in this study.

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<sup>3</sup> Research was conducted in 2017 and so as data collection

These were the risk managers, general managers, financial controllers, health, safety and environmental (HSE) managers, project managers, legal officers and petroleum geologists. These were therefore the targeted respondents in this study. However, during the distribution of the questionnaires, some target respondents could not be reached out to fill the questionnaires due to their busy schedule. Therefore, only 42 questionnaires were accepted and 36 valid questionnaires (response rate of 85.7%) were returned.

Researchers also conducted eight (8) interviews in parallel with the questionnaire survey. Interviews were conducted mostly with risk managers. Researchers used interview guiding questions throughout these interviews which were conducted in English. The essence was to collect in-depth details of the risks and risk management practices. Each interview took an average of 40 minutes and researchers stopped from approaching another risk manager when we observed that no new insights emerged from additional interviews.

Questionnaires were grouped in each company as the unit of analysis was the company. Descriptive analysis of quantitative data produced the mean ratings to identify the major risks and risk management practices (Renault *et al.*, 2016). Content analysis of qualitative data complemented and strengthened the findings obtained through the questionnaires (Saunders, Lewis and Thornhill, 2016). Researchers were not only keen on listening, thinking through the responses and asking additional questions during interviews, but also recorded the interviews to ensure that they captured all information necessary to answer the research questions. The recording was done after receiving a consent from interviewees. Researchers further re-read the notes taken during the interviews, listened to the recorded audios several times and arranged all the responses in a manner appropriate to respond to respective research questions. Directed content analysis was appropriate in this study as it uses the theory and relevant research findings to guide the codes (Hsieh & Shannon, 2005). The researchers re-read the notes taken during interview listened to the recorded audio and compared the notes to avoid repetitions. The texts that answered the same question were highlighted compared and summarized to provide the results. Research findings and discussion have combined both quantitative and qualitative results to provide a comprehensive understanding of the results hence the study at hand.

## **Findings**

### ***Respondents' Profiles***

All companies used in the study have been in business for at least ten years. Respondents had satisfactory educational qualifications and relatively good experience in the oil and gas industry, which is an assurance that the information was gathered from relevant respondents hence satisfactory to answer the research questions. McNamara (2014) claimed that risk perception depends on gender, education and experience. Of all the respondents, 25 were males and 11 were females. This is expected given the context that the number of women in management is still low. All respondents possess at least a degree with 50% having a second degree qualification. This suggests further the high quality level of the data. Most staff however, had working experience of less than ten years. This was expected given the fact that the upstream oil and gas business is yet at an infancy stage.

### **Table I: Profile of companies and respondents**

Description	Questionnaire		Interviews	
	Frequency	Percent	Frequency	Percent
<i>Companies (in operation <math>\geq</math> 10 years)</i>				
Exploration	13	52.8	4	50
Gas producing	17	30.6	3	37.5
National Oil and Gas	6	16.7	1	12.5
	<b>36</b>	<b>100.0</b>	<b>8</b>	<b>100.0</b>
<i>Gender of respondents</i>				
Males	25	69.4	6	75
Female	11	30.6	2	25
	<b>36</b>	<b>100.0</b>	<b>8</b>	<b>100</b>
<i>Level of Education of Respondents</i>				
Master's degree	18	50	5	62.5
Bachelor's degree	18	50	3	37.5
	<b>36</b>	<b>100</b>	<b>8</b>	<b>100</b>
<i>Experience in the Oil and Gas Industry</i>				
$\leq$ 10 years	32	88.9	4	50
$\geq$ 10 years	4	11.1	4	50
	<b>36</b>	<b>100</b>	<b>8</b>	<b>100</b>
<i>Experience in current organisation</i>				
$\leq$ 10 years	33	91.7	5	62.5
$\geq$ 10 years	3	8.3	3	37.5
	<b>36</b>	<b>100</b>	<b>8</b>	<b>100</b>
<i>Job Position</i>				
Management	18	50	8	100
Subordinate	16	44.4	0	0
Co-ordinator	2	5.6	0	0
	<b>36</b>	<b>100</b>	<b>8</b>	<b>100</b>

### ***How do Upstream Oil and Gas Companies in Tanzania Identify Major Risks?***

Respondents were asked about how they identify major risks facing their businesses by indicating the degree with which they apply the provided different risk identification techniques in their companies. A Likert scale from 1= Not applicable to 5= Highly applicable was used. Table II presents the average responses for each company, separately for only exploration companies (EC) and for only gas producers (G.P). The overall average results are also presented.

Overall, consulting experts, past events experience, workshops stakeholder analysis, brainstorming, database, and hazard identification are mostly used techniques in identifying risks in upstream oil and gas businesses in Tanzania. The project documents and specialist literature review techniques were moderately applicable. There is no significant difference overall, in applying risk identification techniques among the businesses in the exploration and production stages except for the risk breakdown structure technique which is mostly used by exploration companies but moderately used by gas producers. Consulting experts was highly rated risk identification technique. One interviewee explained that,



"We always consult experts in a particular area to help identify the possible risks that may occur in that particular area".

**Table II: Risk Identification Techniques Used by Upstream Oil and Gas Companies in Tanzania**

Risk Identification Methods	Companies									Overall
	A	B	C	D	E	F	G	E. C	G.P	
Consulting experts	4.33	4.50	4.67	4.40	4.00	4.50	3.00	4.39	4.41	4.20
Past experience	4.33	4.67	4.33	3.40	4.00	4.33	3.57	4.33	4.02	4.09
Workshops	3.33	3.83	4.17	3.08	5.00	4.33	3.86	4.33	3.82	4.05
Stakeholder Analysis	4.50	4.33	4.33	3.00	3.00	4.50	3.57	3.89	4.00	3.89
Brainstorming	4.00	2.83	4.17	3.20	5.00	4.17	3.57	4.00	3.79	3.85
Database	3.83	4.83	4.00	4.00	3.00	3.83	2.86	3.94	3.89	3.77
Hazard Identification (Hazid)	4.00	4.33	3.67	3.80	3.00	3.67	3.86	3.67	3.82	3.76
Project documentation review	3.17	3.50	4.50	3.00	2.00	5.00	3.14	3.33	3.72	3.47
Specialist literature	3.17	3.67	3.67	3.80	3.00	4.67	2.29	3.44	3.88	3.46
Risk breakdown structure(RBS)	3.67	3.50	3.50	3.60	4.00	2.00	3.57	3.67	3.09	3.41
Benchmarking	3.50	3.17	4.00	3.60	2.00	3.33	3.29	3.06	3.48	3.27
Checklists	3.17	3.33	3.83	3.00	3.00	1.83	2.71	3.39	2.67	2.98
Templates	3.33	3.67	2.67	3.00	3.00	2.67	2.14	3.11	3.00	2.93
Research	2.83	2.33	2.83	3.00	4.00	1.83	2.14	3.06	2.56	2.71
Interviews	1.17	3.17	2.00	3.00	4.00	2.00	2.00	3.06	2.06	2.48
Delphi techniques	2.33	3.50	2.67	3.00	1.00	3.17	1.57	2.39	2.83	2.46
Questionnaires	2.17	2.33	2.33	3.40	1.00	2.17	2.29	1.83	2.47	2.24
No. of respondents (N)	6	6	6	5	1	6	6	19	11	36

*Note: Companies A and D are gas producers, while B, C, E and F are gas exploration companies. G is a state oil company that is a partner of all private oil and gas companies.*

Tanzania's oil and gas businesses also learn from experience from past risk events to recognize the associated risks. One of the managers described the event that happened on explosives as follows;

*"one day, the driver did not recognize that some explosives were missing from the car. After investigation, we recognized that the villagers took them thinking that they obtained precious items. Then we recognized that attacks or theft of explosives might happen any time. Thus, nowadays security guards have to escort the trucks with explosives".*

Regarding the workshops, members use the forum to not only identify possible risks but also transfer knowledge and skills among the staff themselves. One of the interviewees said;

*"We insist our staff to attend workshops so that they can also gain firsthand knowledge of the risks in different business areas".*

Stakeholder meetings and analysis are conducted at different stages of the project. One of the managers said;

*"We conduct stakeholders' meetings before projects start and during the implementation so that we discuss the possible drawbacks and recognize the threats and opportunities from them".*

Brainstorming is initiated from the functional units as one of the interviewees said;

*"The line managers provide the task to department members to think of possible risks that may happen in their operations. Every member provide a list of risks that come to their minds for discussion in departmental sessions. At the end of the session, each department submits a risk report to the risk management department".*

Tanzania's oil and gas businesses also use historical data that is kept in a database. One of the interviewees said;

*"...since we have a wide range of projects in different countries and a long history in the mining sector in Tanzania, we use the available historical information in our database to identify the risks that may happen in our projects".*

As regards to the application of hazards identification (Hazid), one interviewee explained that:

*"any potential hazard that may arise is investigated well before the project starts. Examples of such potential hazards are security status of an area, the level of pressure that may lead to blowouts or explosions and the like".*

Documentary review techniques such as project documentation and specialist literature review are among the moderately applicable techniques. One of the managers (a Senior Accountant) said;

*"We review the documents for different projects when needed. They contain different risk stories of our previous projects. This helps us know what can possibly happen to our current and ongoing project(s)".*

In risk breakdown structure, Tanzania's oil and gas firms think through the subcategorized risks based on small pieces of works. Gas producer businesses moderately applied benchmarking technique whereby different operations and related risks of the organization are compared with those of other companies in the same industry. One of the respondents explained that;

*"We have the Oil and Gas Association of Tanzania, where we share experiences and knowledge."*

It was observed that, techniques such as research, interviews, Delphi technique and questionnaires were rarely used due to the financial and time cost needed to implement.

**Major Risks Facing the Upstream Oil and Gas Businesses in Tanzania**

Table III presents the means of the responses concerning the major risks facing upstream oil and gas businesses. The risks identified have been listed and discussed in descending order of their intensity (overall):

**Table III: Major Risks Facing Upstream Oil and Gas Businesses in Tanzania**

Risk Identification Methods	Private Individual Companies							E.C	GP	Overall Mean
	A	B	C	D	E	F	G			
Regulatory changes	3.67	4.33	4.83	3.60	5.00	4.83	3.71	4.72	4.03	4.28
Fluctuation in global oil prices	4.17	4.17	4.83	3.60	2.00	4.83	4.57	3.67	4.20	4.02
Bureaucratic government system	4.17	4.17	4.17	3.20	4.00	4.00	3.86	4.11	3.79	3.94
Corruption and bribery	4.00	3.67	4.50	3.20	4.00	4.17	2.86	4.06	3.79	3.77
Government interference	4.17	3.83	4.00	4.20	2.00	4.00	4.00	3.28	4.12	3.74
Resource availability risk	4.50	3.80	3.20	3.50	4.00	3.00	2.57	3.67	3.67	3.51
Credit risk	4.67	1.33	3.50	4.20	1.00	4.50	3.86	1.94	4.46	3.29
Poor infrastructural design	3.83	3.33	4.50	2.20	3.00	3.67	1.86	3.61	3.23	3.20
Risk Management illiteracy	3.50	2.83	3.83	2.20	2.00	4.17	3.43	2.89	3.29	3.14
Reputational risks	3.83	2.00	4.00	2.40	3.00	3.83	2.86	3.00	3.36	3.13
Risk of attack on organization's facilities	2.83	2.83	4.00	2.40	2.00	3.83	3.43	2.94	3.02	3.05
Health and safety risks	3.00	3.00	3.00	2.80	4.00	2.67	2.86	3.33	2.82	3.05
Operational risks	3.33	2.00	3.17	3.00	3.00	2.67	3.71	2.72	3.00	2.98
Environmental risks	3.00	2.33	3.33	2.80	3.00	2.67	3.14	2.89	2.82	2.90
Weathers events, earthquakes, floods	3.17	2.67	2.33	2.40	1.00	1.80	2.71	2.00	2.46	2.30
No. of respondents	6	6	6	5	1	6	6	19	11	36

*Note: Companies A and D are gas producers, while B, C, E and F are gas exploration companies. G is a state oil company that is a partner of all private oil and gas companies.*

Results show that regulatory changes, oil price fluctuations, government bureaucracy, corruption, government interference and oil and gas resource availability risks were perceived to be high as they were rated around 4. One interviewee, while emphasizing regulatory changes risk, said:

*“The enactment of a new bill is not suitable for us since we had already concluded our PSA. The government's current actions introduced a threat to us as they require contract amendments if there is a*

*doubt that government interests won't be achieved. Eventually, we might end up incurring arbitration costs even if we are on the winning side."*

Respondents explained that reducing operations and temporal cessation of some of the projects are responses to unexpected regulatory changes. They also indicated that the fluctuation of global oil prices continued to be a considerable risk. In this regard, one of the respondents said:

*"... Exploration and drilling costs do not decrease with the oil price. When oil prices fall, our share prices in the market drop too much that possibility of using our shares as collateral to acquire additional loans is decreasing".*

Another respondent said:

*"During the periods of low prices, we fall short of funds to run these big projects. Our balance sheets become unhealthy, and the lenders lose confidence in us; thus, they deny us funds. Sometimes, we are forced to shut down some of the operations because of illiquidity challenges. As a result, some employees lose their jobs due to redundancy, which makes more of our staff suffer".*

One of the financial managers, when asked about how they cope with the instability of global oil prices, said,

*"We wait for directions from headquarters on how to respond. More often they always direct us to cut down expenditures by either reducing the number of staff or shut down some of our operations".*

Furthermore, regarding the government bureaucracy, one of the interviewees explained that:  
*"...sometimes when we are almost approaching the end of the negotiations with the government, different directives are received from top government officials directing the government negotiation team members to start the negotiations afresh."*

Regarding the corruption risk, one of the respondents said:

*"...there are corruption temptations in this business, but we are serious about maintaining our ethical principles and our public image. We do not tolerate corrupted activities. We are ready to leave the country to protect ourselves from corrupt scandals".*

Another respondent said:

*"We met large-scale farmers who requested us to overestimate the compensation for their land so that we could share the compensated amount. Our management and the government were not aware of these deals..."*

The existence of many regulatory institutions with no clear line of responsibilities poses a risk of government interference to Tanzania's upstream oil and gas businesses as they are uncertain about whom they should obey. One of the interviewees said:

*"There are many regulators with mixing responsibilities which are not clearly defined. For example, we can negotiate with the local government, National Environment Management Council (NEMC) and the*

Tanzania National Roads Agency (TANROAD) to start operations in an area. Then, the Forest Agency comes and places a stop order. Furthermore, we may get consent to sell our rights, and the Energy and Water Utilities Regulatory Authority (EWURA) says no."

The oil and gas businesses invest a lot to understand the local laws, regulations, procedures, and practices by engaging local and foreign lawyers to strategize how to tackle the government interference risk. The resource availability risk hints at the possibility of finding dry wells hence the loss of money. One of the project managers testified that:

*"In Mtwara, we drilled two wells, and one of the wells was dry. In Mafia, we drilled one well, and it was dry. In Mkuranga, we drilled three wells, and two of them were dry. You can now see how much in terms of billions of shillings were lost".*

Lack of quality data was one of the main reasons behind resource availability risk. One of the geologists explained, *"We are struggling to achieve more sophisticated geological solutions to increase the quality of data related to reserves"*.

Credit risks, poor infrastructure, risk management illiteracy, reputational risks, attack on facilities, health and safety risks, operational risks, and environmental risks were moderate as they have a mean of around three (3). There are no significant differences in the major risks facing exploration and production businesses except for credit risks which is high for gas producers and low for exploration businesses. Furthermore, poor infrastructure risks which is high for exploration businesses while moderate for gas producing businesses. One of the managers when elaborating about credit risk said;

*"Credit risk is affecting our businesses since we are limited to sell to TANESCO and SONGAS only who cannot pay their dues on the agreed time. We are forced to look for other sources to finance our operations as we cannot rely on internally generated funds. It is an enormous challenge to get the funds timely. The only available alternative to get needed funds is to borrow at high-interest rates".*

When explaining about risks associated with poor infrastructure design, one of the managers said:

*"We find that most bridges' capacities are eight tonnes while rigs weigh more than 30 tonnes. Most roads also have low carrying capacity, while most rig trucks weigh 30-40 tonnes, this makes our working environment more challenging".*

Another respondent said,

*"The Mtwara port was not up to the standards, and we had to spend over US\$ 40 million that was initially planned for exploration to upgrade the port".*

Regarding risk management illiteracy, one of the manager pointed out that,

*"Lack of skills in risk management is a major risk by itself. We do have a risk management policy, and we spend enough time conducting trainings, but people just do not understand the magnitude of the impact of different risks to our operations".*

Companies reported however, that they continue investing and giving emphasis on training to equip and update their human resources' knowledge on risk management.

Regarding reputation risk, one of the respondents explained that,

*"The public expecting more than what we can deliver is also a threat to our image as it leads to unfair critics and complaints."*

The risk of attacking organizational facilities is associated with not only physical attacks by robbers and terrorists but also cyber security related attacks. Health and safety risks include risks associated with accidents on people and properties, while operation risks are associated with business interruptions and assets damage. The environmental risks is related to the nature of oil and gas business activities that affect the environment including the climate. Oil and gas firms try to have strong security, safety and detective control systems to handle the risks of attack, health and safety risks as well as operational risks.

## **Discussion**

Findings indicate that the major risks that are facing oil and gas businesses in Tanzania are regulatory changes, fluctuation in global prices, bureaucratic government system, corruption, government interference and resource availability. Credit risk was observed to be major as far as gas producers are concerned while poor infrastructure design was found to be major in exploration companies.

Regulatory change is at the top of the list of high risks facing oil and gas companies in Tanzania. These are mostly due to unexpected reforms which pose threats to the oil and gas businesses' plans. In 2017 for instance, the government decided to review most of the contracts on natural resources, including minerals and oil and gas, to fulfil its interests as it felt that the prior negotiations were not proper (Kjær, Therkildsen, Buur, & Hansen, 2021). This implied insufficient competencies among government negotiators which is among the main cause of this risk.

Fluctuation in oil and gas prices is also among the largest risks mentioned. This however, is a global risk since the exploration and production costs do not decline in tandem with the oil price. Khambati (2012) claims that unstable oil prices is a result of the demand shocks which are associated with the global economic crises and unrest in the Middle East and North Africa. Tanzania being part of the global economy cannot be excluded. The fall in respective prices creates a snag in Tanzania's upstream oil and gas businesses which most of them are the subsidiaries of MNCs. Parent companies usually decide and give orders to their subsidiaries on how to handle the price risk.

Bureaucratic government systems resulted from among others, several directives from different officials, unclear responsibilities and power is among the big risks mentioned also. Al Subaih (2015) and Thuyet et. al. (2007) observe that incompetent officials, weak enforcement of laws, complex approval procedures are among the causes of bureaucratic government systems in emerging economies.

Although Tanzania's oil and gas businesses continue struggling to adhere to global ethical principles as far as corrupt practices are concerned, some of the companies are tempted to fall into a bribery trap. This thrust imply selfishness among a few government officials and some citizens who implicate illegal ways of accumulating wealth. Nikoo (2015) claims that corruption is still catastrophic in emergent economies.

The evaluation of existing hydro-carbons using geological data is judgemental. Companies are not guaranteed that they will find commercially viable oil and gas. Managers accepting the fields based on insufficient/less clear geological data expose the shareholders' investments to high resource availability risk, thus, enlarging the agency problem and chances of project failure. Suda et al., (2015) observed that, this risk affects more upstream than downstream engagements.

Credit risk emanates from poor liquidity among businesses resulted from long-term hangover behaviour of customers delaying paying their bills when falling due. In Tanzania, regulations require gas producers to only sell gas to the national electricity supply company which unfortunately, it has not been a good customer in terms of making timely payments. This situation forces producers to incur expensive debt finances to support their businesses. Khambati (2012) observed that a lack of financial strengths of the partners, customers, and suppliers contributes highly to credit risk.

Our findings established that Tanzania's bridges, roads and ports are not capable enough to support heavy-duty operations such as carrying heavyweights of rig trucks. The newness of the upstream operations in the country may be one of the possible reasons for this big challenge of weak supportive infrastructures.

When it comes to how these risks were identified, our findings observed that techniques used highly by most companies are expert consultation followed by the use of past experience, workshops, stakeholders analysis, brainstorming, database and hazard identification. The use of expert consultation was highly ranked among all the techniques portraying a shortage of experts in risk management functions (Awodele, 2016; Tworek, 2010). The oil and gas businesses in Tanzania are relatively new and hence most of its developments, investments and managerial competence are at the earlier stages. Past experience techniques has also been used mostly. Despite the relatively newline of the oil and gas businesses in Tanzania, keeping the respective records concerning risks and use them accordingly was experienced in this study. This could be due to the fact that it is a cheap method of identifying the risks for companies with limited resources as relative to other techniques. This is consistent with what has been argued by Awodele (2016); Gajewska and Ropel (2011) and Gorzeń-Mitka (2013). Our study found also that oil and gas businesses insist their staff to attend organized workshops in which participants share their experiences and knowledge on how to identify the possible risks. Klemetti (2006) affirms that discussions with many participants are appropriate to identify and manage risks as ideas touch every angle of the business operations. The application of stakeholder analysis is done at almost all stages of the project. The technique assists businesses to identify and discuss all possible risks at different project stages and set strategies to manage them accordingly. Lyons and Skitmore (2004) observed that project planning and executions are the phases where risk management is critical. Gajewska and Ropel (2011) observed also that stakeholders are normally involved in the risk

management plans. Our findings indicate further that the brainstorming technique could be applied mostly because of the complexity and relative newness of the oil and gas businesses in the country. The technique makes it possible to avail several available brains together and use a relatively shorter time in identifying risks. Awodele (2016); Banaitiene and Banaitis (2012); Hayford & Ahmed (2013); Renault et. al., (2016) and Rostami (2016) observed also that brainstorming allows creative ideas. The findings indicate also that companies use the advantage of having projects in other countries and use their historical information kept in the database to assist identifying possible risks.

During the project planning phase, Tanzania's upstream oil and gas businesses also identify potential hazards, which is more of a "what-if analysis". Contrary to Tanzania, where there is a long history of mining projects, oil and gas businesses in other countries rarely use the historical data of related projects to identify risks. Previous studies (Awodele, 2016; Banaitiene and Banaitis, 2012; Hayford & Ahmed, 2013; Rostami, 2016) supports using documentary reviews in identifying risks. The lower mean of project documentation and specialist literature may suggest that Tanzania's oil and gas industry staff has a relatively minor preference for reading several documents related to the field and apply the same in risk identification.

Risk breakdown structure helps to identify all possible risks based on small pieces of works. Consistent with previous studies the use of checklists speed up risk identification by using the list of previously identified risks to check the omissions (Renault et. al., 2016; Rostami, 2016). Tanzania's upstream oil and gas businesses add the previously omitted risks to the list and use them for future control purposes. The costly and time-consuming techniques such as questionnaires, interviews, Delphi techniques and research were the least applicable techniques in Tanzania's upstream oil and gas businesses. Rostami (2016) adds that the lower application of interviews and Delphi techniques may be linked with the shortage of professional project members and skills to use them. This is contrary to Renault et. al., (2016) who observed that the South African construction firms often use questionnaires and Delphi techniques to identify the risks.

Our study found out that reducing operations and temporarily cessation of some of the projects are techniques being used by most oil and gas businesses in Tanzania to respond to unexpected regulatory changes and price fluctuation risks. Furthermore, consistent with the Vietnamese (Thuyet et. al., 2007) and Nigerian (Zuofa & Ochieng, 2014) firms, Tanzanian upstream oil and gas firms hire local lawyers to familiarize themselves with local laws and procedures to cope with government interference in their corporate activities and government bureaucracies. This is however, contrary to practices of firms operating in the developed Russian economy which diversify their operations to handle the interference in their activities (Lenkova, 2018). Continuing efforts are done to get more sophisticated geological solutions to increase the quality of data related to oil and gas reserves. Further, the fact that these companies are compelled to sell to the public company (TANESCO) which do not make timely payments, forces them to look for other expensive sources of finance to finance their operations. Participating directly into assisting the government to improve respective infrastructures was observed to be among the strategies to cater for infrastructure risk. This was also argued by Lynn (2014) in the US who explained that in certain cases when existing infrastructure is not viable, oil and gas producers must invest in roads, pipes or rail



infrastructure. Continual investment and emphasis on training their staff has been used as a key strategy to equip and update their human resources' knowledge on risk management. Mohammed, Naji, Isha, Isha, Alzoraiki, Sharafaddin and Al-Mekhlafi (2020) established that training has an obvious positive effect on employee performance in Yemen's oil and gas companies.

## **Conclusion**

The findings of this study confirm that major risks and respective risk management practices are not standard across countries. Significant risks identified in this study that affect the oil and gas upstream businesses in Tanzania are regulatory changes, fluctuation in global oil prices, bureaucratic government, corruption and government interference. These are identified mostly through the use of experts consultation, experience from past events, workshops, stakeholder analysis and brainstorming. The costly and time-consuming techniques, such as questionnaires, Delphi techniques, interviews, and other research techniques, are less applicable. Risk management in the said businesses safeguard shareholders' wealth from the identified major risks by implementing the risk responses that fit their local environments. The most used techniques are familiarisation with government laws and practices, maintaining ethical principles and cutting down some of their operations; training their staff, participating in developing the required infrastructures, putting more efforts in getting sophisticated geological solutions to increase the quality of data related to oil and gas reserves, and looking for alternative external finance to cater for long payment delays from their clients. The upstream oil and gas businesses in Tanzania strive to use techniques that save cost, consume less time, and enhance risk identification to strengthen efficient and effective risk management. The results suggest further that prioritization of risks and their responses are not standard across countries.

The study contributes to the agency theory that the management safeguards the shareholders' wealth from risks through implementing the risk responses that fit in their local environments. This study contributes to the literature by analysing the risk identification practices, significant and major risks facing Tanzania's upstream oil and gas businesses and respective responses to the risks. The study suggests that Tanzania's upstream oil and gas businesses should continue to instil the culture of providing professional training to employees to reduce risk management illiteracy and have a wider choice of risk identification techniques. The oil and gas businesses should invest in strengthening their relationship with the government to be able to handle its bureaucracy and interferences. They can also be proactive and request relevant reforms made by respective ministries and government agencies. Thuyet et. al. (2007) and Zuofa and Ochieng (2014) advocate building cordial relationships with government decision-makers at all levels to reduce incessant delays in project approvals and government interferences in companies activities. These businesses should also consider using derivatives to manage financial risks to avoid stopping operations and laying off some staff, which denies the public benefits.

The government should offer customized changes of laws and regulations with mutual benefits to investors and the government in the oil and gas industry to avoid unnecessary uncertainties. Policymakers may also consider the risks manifested in this study and create collaborative risks management practices between the government and the oil and gas

businesses. The oil and gas businesses can collectively discuss with the central government and influence them to make their dues timely to cater for the credit risk and avoid using expensive external finances. The private sector in the U.S. joined hands with the government to manage the risks in the oil and gas sector that ensured its success (Khambati, 2012).

This study has identified the risk identification techniques mainly employed by upstream oil & gas businesses in Tanzania and how they are handled. Further studies can look at other steps of risk management; analysis, monitoring and communication. Also, studies to evaluate the relative importance of the identified risk identification techniques are needed. This study also identified the significant risks based on Likert scale measurements. Further studies using other measurements such as the probability and consequences assigned to the risks are needed.

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