IDENTIFICATION OF RISK FACTORS IN THE DEVELOPMENT OF UPSTREAM OIL & GAS PROJECTS IN SOUTH AFRICA

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by

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Dedication

This dissertation is dedicated to my parents, Mrs Tshililo Annah Sadiki and my Late Father, Mr Ramunenyiwa Aplheus “Maanda” Sadiki. Despite his disability and lack of formal education, my father and my mother believed in education and always encouraged us to be dedicated to knowledge-building and contribution. This paper results from the seed you instilled in us, your children. Continue to rest in peace, *Muloi wa Ngombe*, and may the Lord grant my mother a long, healthy, happy life.

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I sincerely thank everyone who directly and indirectly supported me and or participated in this study.

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I owe my special thanks to all the participants and respective organisations. This research was only possible to complete with your participation. Thank you for sharing your valuable time, experience and insights.

I extend my heartfelt thanks to my supervisor, Dr Nien-Tsu Tuan, for agreeing to supervise me and for your unwavering confidence in my abilities. Your guidance and patience have been invaluable throughout my research journey, and I am truly grateful for your mentorship.

Declaration

Plagiarism Declaration

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ABSTRACT

Background: South African oil and gas projects face several risks, which, if not adequately managed, could lead to project failures and consequently halt upstream oil and gas activities in the country. Therefore, identifying the risk factors is critical for effective risk control, transfer, or management.

Purpose: The research aims to identify risk factors affecting oil and gas projects in South Africa. It further examines the identified risks to establish if they change as the project moves from the exploration to the development phase and establish whether the risks in the literature apply to South Africa. In addition, the research seeks to identify tools used to identify risk factors in South African oil and gas projects.

Methodology: The study adopted a qualitative methodology to identify the risk factors. The snowball sampling technique was adopted to recruit the participants. Data was collected from participants via an online self-administration survey until a saturation point was reached. The respondents were 26 diverse, experienced professionals from government agencies, oil and gas/energy companies, funding institutions, and consultants/contractors in the South African oil and gas sector.

Findings: The identified risk factors include regulatory uncertainty, a slow regulatory process, stringent NEMA financial provisioning regulations, public objections, challenging economic factors, geological/subsurface uncertainties geological/subsurface uncertainties, Inclined offshore weather and a lack of experienced human resource skills and local contractors. Data analysis revealed that the identified list of risk factors does not materially change as the projects move from one exploration phase to the development phase. Despite the remote location of South Africa from the regions with active oil and gas activities, the findings showed that the identified factors were not entirely unique to South Africa. The data further revealed that various tools are used to identify risk factors, but brainstorming was popular with most participants.

Value of study: The output from the study contributes to knowledge and lays the foundation for future exploration, evaluation and management of risk in South African upstream oil and gas projects. It also provides insights to stakeholders involved in the sector.

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LIST OF ABBREVIATIONS

ABBREVIATION	EXPLANATION
BBBEE	Broad-based black economic empowerment
BBO	Billion barrels oil
BP	British petroleum
DFFE	Department of forestry, fisheries and the environment
DMRE	Department of minerals and energy
E&P	Exploration and production
EPC	Engineering, procurement, and construction
HAZOP	Hazard and operability
HSE	Health and Safety
IRP	Integrated resource plan
Metocen	Combined wind, wave and climate (etc.) conditions as found on a certain location
MPRDA	Mineral and petroleum resources development act
MW	Mega wat
NEMA	National environmental management act
NGO	Non-governmental organisation
NTRs	Non-technical risks
OE	Oceans economy
OPASA	Offshore petroleum association of South Africa
PASA	Petroleum agency SA
PESTLE	Political, economic, sociological, technological, legal and environmental

PetroSA	Petroleum oil and gas corporation of south africa
PMI	Project management institute
RBS	Risk breakdown structure
SAOGA	South African oil & gas alliance
SWOT	Strengths, weaknesses, opportunities and threats
TCF	Trillion cubic feet
TCP	Technical cooperation permit
TECOP	Technical, environmental, commercial, operational, political
TR	Technical risk
UN	United nations
UPRB	Upstream petroleum resources development bill
USD	United States dollar

1. CHAPTER 1: PREAMBLE/INTRODUCTION

This chapter aims to introduce the research project and outline the research themes that will guide the study.

1.1 Background to the Research

Energy is one of the main critical pillars of global economic activities. It is central to human achievement, progress and survival (EI, 2024, p. 2). The Lack of access to energy hinders economic and human development. Energy is necessary to support the functioning of the economic and basic human needs(South Africa, 2019, p. 8). Arguably, every nation should endeavour to secure affordable, sustainable and dependable energy security. Despite the global climate change agreement made in Paris to transition from fossil to environmentally friendly energy sources, oil and gas, particularly gas, are expected to continue playing a pivotal role in the global energy mix to meet the ever-increasing energy demand. This is illustrated below in Figure 1-1.

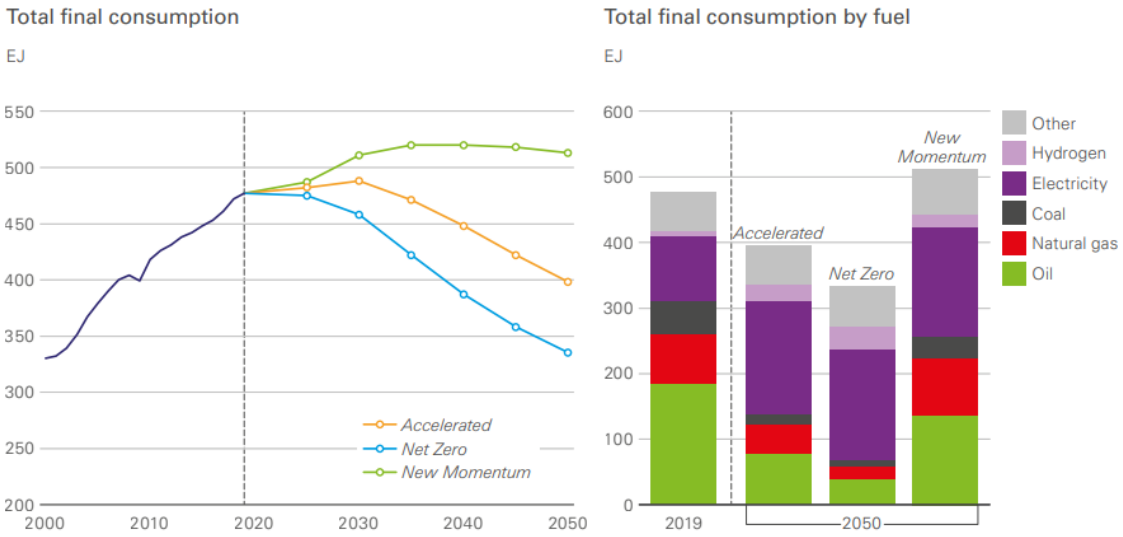

Figure 1-1: Global Energy Needs

Source: Adapted from (BP, 2023, p. 17)

Global natural gas demand is expected to continue rising, driven by the growing use in Asia and Africa, whilst the Oil demand is expected to plateau over the next ten years before declining as its use in transportation declines (BP, 2023, p. 41). The energy institute report highlighted that in 2023, fossil fuel consumption dropped by 0.4% to 81.5% as a percentage of primary energy (EI, 2024, p. 4). In South Africa, the South African integrated resource plan (IRP2019) projects that the gas/diesel's contribution to the energy mix will change from 3830 to 11930 MW by 2030 in South Africa (South Africa, 2019, p. 10). According to the South African ocean economy master workshop

document dated October 2015, the estimated South oil and gas resources are 9 billion barrels of Oil and 60 trillion cubic feet (TCF) of gas, which can sustain the country's need for a period of 40 and 375 years respectively (South Africa, 2015, p. 18). The prospective unconventional resource has since been updated by the Petroleum Agency SA to 28 BBO and 60 TCF of gas and oil, respectively. Meanwhile, the prospective unconventional gas resources are estimated at 274TCF (PASA, 2024a). Offshore oil and gas has the potential to provide an alternative to the current coal-dominated energy sector, where energy demand in the country has been growing faster than can be supplied. The rise in energy demand and continuous reliance on oil creates a need for many nations to explore and develop oil and gas projects through domestic, foreign or a combination of foreign and domestic investments. Oil and gas projects are capital-intensive and have a critical economic role in many hydrocarbon-rich countries. It is estimated that the South African offshore Upstream oil & gas sector could yield 130,000 jobs and contribute USD2.2 billion to the gross domestic product(South Africa, 2015, p. 18).

Oil and gas projects are, in their nature, complex undertakings characterised by highly uncertain but offer high reward/s if successful. Unsurprisingly, many oil & gas projects do not successfully meet their objectives. Risk management has been identified as one of the critical processes for improving project success. According to the PMI standard for risk management, successful organisations effectively and efficiently identify the risks that directly influence their goals and objectives(PMI, 2019, p. 4). Thus, effective project risk identification is critical for project success. There is a general agreement among many scholars that risk identification is the critical first step in the risk management process, as an unknown risk cannot be managed or controlled (Diekmann *et al.*, 1988, p. 14; Steyn *et al.*, 2017, p. 385; George, 2020, p. 973). Projects and policymakers cannot effectively manage the risks if they have not been identified, which could result in project failures and loss of investments.

Many authors have identified the risk factors in oil & gas projects in several countries (Van Thuyet *et al.*, 2007, pp. 178-185; Kassem *et al.*, 2020, p. 2767; Sohrabi and Noorzai, 2023, p. 124); however, the literature review suggests that risk factors encountered in South African oil & gas projects have not been fully explored.

Moreover, the existing studies did not explore the risks across phases. Consequently, there is limited information for policymakers, existing/future projects and academics. Therefore, there is a need to identify risks in oil and gas projects in South Africa.

The South African government, via its national oil company, PetroSA, has historically been the predominant company and, in most cases, the only company commercially operating/producing in the South African offshore upstream oil & gas sector in the last three decades. However, there has been a growing interest in the South African oil and gas sector following the recent oil and gas discovery discovery made by Total Energies. Regrettably, few projects have been stopped/delayed due to environmental lobby groups/ civil society organisations/activist groups opposing upstream oil and gas activities. In addition, the challenging metocen environmental conditions delayed the last drilling campaigns in South Africa(TotalEnergies, 2019). Consequently, many rights holders face challenges in implementing their work programmes/commitments.

It is evident that South African oil & gas projects are faced with several risks. The implication of these challenges include unexpected project cost increases, schedule delays, project cancellations and discouraged public and private investors in the sector. The manifestation of the risks could halt the upstream oil & gas exploration activities in South Africa, ultimately negatively impacting the overall economy and causing financial losses to operators/licence holders. Despite the inherent risks, the potential natural oil and gas resources available in South Africa are significant enough to justify investment in the sector. This could see South Africa, amongst others, create more jobs, increase the economy in general, and address energy security risks.

This study, therefore, aims to identify risk factors in the offshore upstream oil and gas sector in South Africa across exploration and development phases. It will focus on identifying the predominant risk factors across these phases and identify if risk factors change as the projects progress from one phase to another. The study's outcome can assist policymakers, project management academics and professionals better understand and manage risk factors in the South African upstream oil & gas sector.

1.2 Overview of Oil and Gas Projects Phases

Oil and gas projects are complex, highly specialised, and risky in nature. Oil and gas projects are mostly implemented in a phased approach to narrow the risks. The

generally accepted oil and gas project life cycle comprises five major steps/phases: exploration, appraisal, development, production, and abandonment(Rui *et al.*, 2018, pp. 668-669). Each phase presents unique hurdles and problems that could hold the project back or lead to failure (Nicholas and Steyn, 2008, p. 364).

Exploration is the first step to identify possible prospects and determine the hydrocarbon accumulation's location using various tools/methods such as seismic surveys. If a prospect is identified, an exploration well is drilled to confirm if the prospect has hydrocarbons. In addition, the location of the hydrocarbon accumulation is confirmed (Rui *et al.*, 2018, pp. 668-669).

The appraisal well is drilled to obtain more information on the size and extent of the reservoir. The appraisal phase aims to gather as much information as possible to define the reservoir and reduce uncertainty. Exploration of hydrocarbons is a high-risk venture with the ultimate objective of locating hydrocarbon reserves that can be commercial/economically exploited in a particular area (Suslick and Schiozer, 2004, p. 1; Zhai *et al.*, 2018, p. 631). The main risk factors in oil and gas exploration projects can be classified into three categories: geological (natural), environmental (such as society, economy and geography) and techno-economy parameters for oil and gas exploration. Geologic risk includes aspects such as the reservoir, structure, seal and hydrocarbon charge. Whilst economic uncertainties include costs, size of the discovery, available market/off-takers and market prices (Suslick and Schiozer, 2004, p. 1)

The development phase is the most capital-intensive stage, where production wells are drilled, and infrastructure is designed, constructed, pre-commissioned and commissioned.

The production well and infrastructure enable hydrocarbon production, which is either shipped or piped to the market.

The final phase is known as the abandonment phase, where after production is no longer commercially viable, production is ceased, facilities are dismantled, the wells

are abandoned and plugged, and the site will be cleaned and restored/rehabilitated as far as reasonably practicable.

1.3 Offshore Oil & Gas and Landscape in South Africa

PetroSA has historically been the predominant company producing hydrocarbons in the South African offshore upstream oil & gas sector over the last three decades. The first South African offshore oil & gas discovery was in 1969 following the establishment of the state-owned exploration company Soekor (Pty) Ltd, after which several concessions were granted to international oil & gas companies. Unfortunately, the companies withdrew from South Africa because of sanctions. Consequently, Soeker became the only company exploring in South African waters from the 1970s to the late 1980s (PASA, 2023). Soekor made several discoveries, some of which were developed, as illustrated in Figure 1-2.

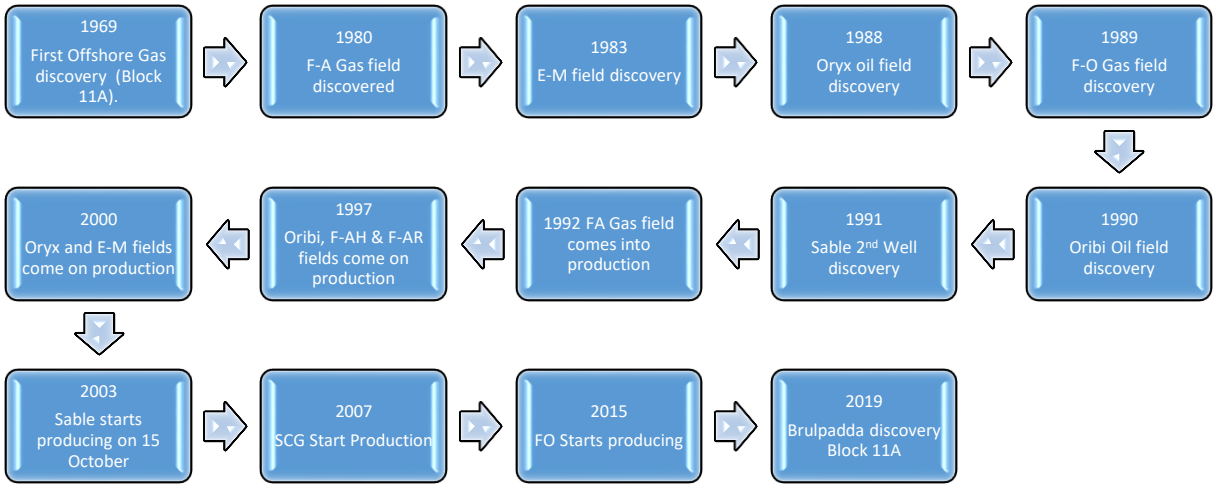

Figure 1-2: Overview of PetroSA Oil & Gas Projects

adapted from(PetroSA, 2024)

In the early days, the first offshore oil and gas exploration was granted under a minerals prospecting Lease (No. OP26) thereafter, and South Africa adopted the mining rights act of 1967, followed by the minerals act of 1991, which has since been superseded by the mineral and petroleum resources development act, No.28 of 2002 (MPRDA). The industry is waiting for the promulgation of the upstream petroleum resources development act (UPRB), which is expected to be the primary legislation for upstream petroleum activities in South Africa. Environmental aspects related to

upstream oil and gas activities are managed under the national environmental act of 1998 (NEMA) and associated regulations. According to the MPRDA, the department of minerals and energy (DMRE) is the custodian of the mineral and petroleum resources development act (MPRDA), whilst Petroleum Agency SA (PASA) has been designated to promote the exploration of oil and gas resources on behalf of the government. “The Agency regulates exploration and production activities, acts as the custodian of the national petroleum exploration and production (E&P) database, and is the repository of related geological data”(South Africa, 2002, pp. 64-65).

According to the Petroleum Agency SA, the following permits are issued for oil and gas E&P activities in South Africa: technical cooperation permit (TCP), reconnaissance permit, exploration right, and production right.

A TCP is a one-year, non-renewable permit allowing holders to undertake desktop studies and acquire existing seismic and other data. A reconnaissance permit, which is also a one-year, non-renewable permit, allows the holders to undertake geological studies such as geotechnical and geophysical surveys.

Holders of exploration rights are allowed to undertake all exploration activities, such as drilling. The validity period of an exploration right is three years, with an option to renew for three two-year terms.

Production rights are required for the development and production of oil and gas discoveries in South Africa. The production right can be issued for a renewable period of 30 years. According to (PASA, 2024b), there are 25 licences made up of 2 TCPs, 17 exploration and 6 production rights held by a combination of local, state-owned, and international oil companies.

In the last five years, the number of wells drilled in offshore South Africa is less than ten compared to nearly 300 wells drilled between the 70s and late 80s. However, there has been a growing interest in the South African oil and gas sector following the recent discovery made by Total Energies. In february 2019, Total Energies announced that it made a significant world-class oil and gas discovery in South Africa after drilling an

exploration well in what they describe as a challenging deepwater environment(TotalEnergies, 2019). Moreover, the thriving oil and gas discoveries in Nambia present an opportunity for the South African west coast, which is located in proximity to the Nambian discoveries. There is slow progress in South African Oil and Gas activities compared to some of its neighboring countries such as Namibia and Mozambique because many rights holders face challenges in implementing their work programs/commitments" The risk identified in this study highlighted some of the factors causing these challenges.

1.4 Problem Statement

Risk factors in South African upstream oil and gas projects are yet to be explored. The absence of research data concerning risks faced by upstream oil and gas projects in South Africa allows this study to be conducted. Furthermore, project delays because of inadequate risk identification create challenges for the licence holders, the state and other stakeholders within the oil and gas sector. The emergence of unidentified risk factors could lead to cost overruns, schedule delays and, ultimately, project cancellation.

1.5 Research Question

The research questions to be addressed by the study are:

a) What are the critical risk factors in the oil and gas exploration/appraisal and development project phases?
b) Do the risk factors significantly change as the project progresses from one phase to another?
c) Are risks in literature applicable to South Africa?
d) What are the common risk identification tools?

1.6 Research Aim

This study aims to identify risk factors in upstream oil & gas projects in South Africa.

1.7 Research Objective

The objectives of the research study are to:

a) Identify risk factors relevant to South African offshore upstream oil and gas projects,
b) Identify the most common risk identification tools,
c) Examine if the risk factors change when the project progresses from exploration to project development phases
d) Examine whether risks proposed in existing literature are relevant to South African oil & gas projects.

1.8 Structure of the report

The research will be organised as follows:

Chapter one introduces the research with the underlying background of the study in line with the problem statement. The chapter provides the context of the study based on the phenomenon. The section further outlines the research questions, aims, objectives and limitations.

Chapter two critically reviews previous literature on identifying risks in oil and gas projects. This chapter reviews the fundamentals of risk identification, evaluates different perspectives, and opinions on the risk faced by upstream oil and gas projects and identifies commonalities, weaknesses and conflicts.

Chapter three is the research methodology. It details the selected research approach and paradigm adopted to answer the research question and achieve the research aim. It justifies the selected paradigm and provides basic philosophical assumptions underpinning the paradigm that guided the research. It further details and justifies the selected plan for collecting and analysing evidence used to answer the research question. The chapter further details how ethical considerations were managed to ensure reliable and credible research findings. It includes details of how data was collected and analysed, how the participants were approached, and how they provided the information.

Chapter four discusses the findings from the collected data and compares these findings with those from the literature review.

Chapter five concludes the document by addressing how the research goal and objectives are met. It also presents the conclusions and recommendations of the research study.

2. CHAPTER 2: LITERATURE REVIEW

This chapter unpacks the fundamentals of risk identification, different perspectives, and opinions on the risk faced by upstream oil & gas projects and identifies commonalities, weaknesses and conflicts. It critically reviews previous literature on identifying risks in oil & gas projects.

2.1 Fundamentals of Risk Identification

PMI (2019, p. 1) defines project risk as an “uncertain event or condition that, if it occurs, can” positively or negatively affect project outcomes. For this study, risk will be viewed from a perspective of negative effects on project outcomes. Risks are inherent to projects and often cause time and cost overruns and poor quality (Van Thuyet *et al.*, 2007, p. 176) (Kassem, 2022, p. 33); as a result, project risk management is a critical project management element (PMI, 2021, pp. xiii&53-54). Risk management is a proactive approach that seeks to maximise an opportunity or prevent/minimise negative impact. It is a preventative process aimed at preventing the occurrence of potential risks and reducing the impact if the risks are realised. The process allows project teams to develop appropriate responses to areas with risks that cannot be completely mitigated.

Larson and Gray (2018, pp. 209-210) and Steyn *et al.* (2017, p. 363) view risk management as a four-step/process approach entailing risk identification, risk analysis, development of mitigation/response plans and monitoring. The omission of the risk planning process is the main difference from the PMI (2019, p. 28) risk management steps/processes. Risk identification, which is the focus of this study, is an integral part of risk management in which risks that may impact the project outcomes are identified (Larson and Gray, 2018, p. 210). The risk identification process detects/identifies and categorises risks and documents these risks. Once identified, the project team can avoid or reduce the risk to an acceptable level (Steyn *et al.*, 2017, p. 364). The output of the risk identification process is a comprehensive list of all possible risks and associated risk factors. PMI (2019, p. 129) suggests that risk should be described using a *three-part statement in the following form: "As a result of cause, risk may occur, which would lead to effect*". The first part of the *three-part statement is generally referred to as risk* factors, which this study aims to identify. According to Hatefi (2018, p. 42) a risk factor is an event or situation that increases

the probability of occurrence of a risk event. Similarly, Dictionary.com describes a risk factor as a *condition, behaviour, or other factors that increase risk*. Some authors have, however, interchangeably used the terms risk and risk factors. For example (Van Thuyet *et al.*, 2007, p. 192) describe the top ten risk factors they identified as major risks. In this report, risk and risk factors will be used interchangeably.

Scholars generally agree that risk factors should be exhaustively categorised; however, there is no agreement on a single categorisation scheme. The risks are commonly categorised according to their sources, namely internal or external, human or natural systems, risk breakdown structure, etc. In projects, internal risks could include technical risks that originate from within the project, and the project manager and stakeholders have measures to control them. On the other hand, external risks such as political, economic, social, environmental, and legal risk factors originate from external sources, and project managers or stakeholders have little or no control over them (Steyn *et al.*, 2017, pp. 365-366). The sources of risks play an essential role in simplifying the risk identification process.

Risk identification is challenging, complicated, time-consuming and expensive because no undelaying procedures exist to identify risks(Diekmann *et al.*, 1988, p. 14; Zhi, 1995, p. 321). However, different tools and techniques are used to identify risk, some summarised in **Table 2-1**Risks can be identified based on individual or group risk assessments.

Table 2-1: Common Tools & Techniques for identifying risks

Analogy	Historical information	What-if Analysis
Delphi Technique	Work breakdown structures.	Failure Mode and Effect Criticality Analysis
Brainstorming	Project schedule	Expert judgement
Interviews	Cost breakdown structures	Root cause analysis
Documents reviews	Surveys	Facilitation
Risk Checklist	Questionnaire	Lessons learnt

Diagram techniques (Process flows, cause and effect, influence, HAZOP, etc.)	5 Whys Technique	Prompt Lists. e.g. PESTLE, TECOP
Assumptions and constraints analysis	Strengths, Weaknesses, Opportunities & Threats	Risk breakdown structure

Adapted from (Nicholas and Steyn, 2008, pp. 366-369; Larson and Gray, 2018, pp. 210-211; PMI, 2019, pp. 131-135)

Brainstorming involves a multidisciplinary project team to identify a comprehensive set of risks in a risk identification workshop led by a facilitator. Expert judgment entails individuals or specialists identifying risks based on their previous experience. Experience from prior projects and knowledge from various sources is used to create a checklist of risks. In contrast, the prompt list approach involves a prompt list of a predetermined list of risk categories used as a guide to identify risks.

Risk can also be identified by analogy, which involves scrutinising records from analogous projects to identify risks in new projects. The project team can also review documents such as project scope, assumptions and constraints WBS, lessons learnt from previous projects, risk breakdown structure, project schedules, work breakdown structures and cost breakdown structures to identify project risks. Data analysis techniques that can be used include but are not limited to root cause analysis, Failure mode and effect criticality analysis, SOWT and document Analysis. In cause and effect, risks are identified through brainstorming sessions and notes on a cause-and-effect diagram, ensuring everyone's involvement. For WBS, every work package is scrutinised to identify potential risks.

Notably, the tools and techniques rely on the project team. Steyn *et al.* (2017, p. 385) and (Diekmann *et al.*, 1988, p. 14) affirm this view when stating that the experience and insight of the project team are essential for effective risk identification. This suggests that a competent team should effectively identify potential project risks using appropriate tools and methods.

Risks in projects cannot be entirely eliminated. However, several authors have argued that the identification of risk is the most critical and challenging part of risk agreement because if the risk is not identified, it cannot be effectively controlled, transferred or managed (Diekmann *et al.*, 1988, p. 14; Nicholas and Steyn, 2008, p. 385; Steyn *et al.*, 2017, p. 364). Comprehensive identification of project risk factors is critical because their emergence at a later project stage may threaten the project success. Therefore, it is important to identify as many relevant risks as possible early in the planning phase. Once identified, project managers can effectively assess them and develop mitigation and management strategies (Van Thuyet *et al.*, 2007, p. 193). According to (Zhi, 1995, p. 231), ignoring the identified risk is irresponsible and may result in unrealistic decisions. The list of project risks must be regularly reviewed and updated as the project progresses, as it is impossible to identify all risks. Moreover, the project is likely to encounter new risks as the project progresses through its life cycle.

2.2 Risk Management and Project Success

According to the PMI standard for risk management, effective and efficient risk identification is one of the critical characteristics of successful organisations (PMI, 2019, p. 4). Larson and Gray (2018, pp. 207-208) echoed the same view and believed that effective risk management improves the chances of reaching project objectives. Similarly, Waliu Adeniyi *et al.* (2022, p. 41) also argue that systematically examining the major risks is pertinent for project success. In the same light, Van Thuyet *et al.* (2007, p. 193) believe that thoroughly examining the significant risks affecting projects is critical for success. The success of projects is directly dependent on risk identification because risk identification enables the development of suitable mitigation/response plans and strategies (Kassem *et al.*, 2019, p. 858).

The results of the study aimed at examining the effect of risk management practices on project success undertaken by Kallow *et al.* (2022, p. 7) support the view that risk management practices influence project success. The author further advocated that risk management is a central component of project management that enhances overall project performance. Jarrah *et al.* (2022, p. 258) is another author who believes that

the probability of project success can be increased if risk management is integrated into project management processes.

In contracts, Amoah and Pretorius (2020, p. 631) studied projects implemented by a small South African construction Company and could not find convincing evidence regarding the relationship between risk management and project performance. They found that the company successfully implemented many projects even though no formal risk management practices were done before or during project execution (Amoah and Pretorius, 2020, p. 625). The projects successes were attributed to individual efforts in which management intervened where potential changes were escalated. Despite the result, the study acknowledges that a formal risk management process could improve project success.

From an Oil and Gas project perspective, Elhoush and Kulatunga (2017, p. 680) showed that despite not having written procedures for project risk management in the Libyan oil and gas industry, professionals believed project risk management could increase the overall project performance. Similarly, Rui *et al.* (2017, p. 17) perceived that the lack of risk management in the planning phase leads to poor project cost performance. A different oil and gas study by Farmahini Farahani *et al.* (2022, p. 595) also concluded that effective risk management in projects is vital for project success. It highlighted risk identification and prioritising as crucial aspects to minimise the risk impact. Similarly (Kassem *et al.*, 2019, p. 858) concluded that the success of oil and gas construction projects lies in identifying and defining the risk factors that may affect the project.

2.3 Identification of Risk Factors In Oil and Gas Projects

The upstream oil and gas projects are dynamic and require extensive capital investment, involve multiple stakeholders, depend on several complex technologies, and have significant environmental and social impact (Van Thuyet *et al.*, 2007, p. 176; Dehdasht *et al.*, 2017, p. 1). Each oil and gas project activity can encounter risks that could negatively impact the project or cause considerable risks to the environment, society, and economy (Rodhi *et al.*, 2017, p. 63). Khvostina *et al.* (2019, pp. 1-2) contend that the "main risks inherent in the functioning of oil and gas companies are internal (financial, investment, property, human resource, management, innovation,

information, production, operational, technical, technological, liquidity); and external (political, legal, socio-demographic, ecological, market, exchange, repayment, geological, weather", globalisation) which are comparable with the following risks listed by TotalEnergies as risks related to oil and gas exploration and production activities:

- the geological risks,
- failure to find expected commercial quantities of hydrocarbons,
- contractual risk from suppliers and contractors,
- funding challenges,
- equipment failures, environmental factors,
- technological challenges,
- market changes,
- adverse weather conditions;
- compliance with host country governmental requirements,
- equipment procurement,
- industrial action,
- competition,
- taxes and royalties, and
- disputes.

According to TotalEnergies (2014) any of these factors could lead to cost overruns, schedule delays and possible economic impact. Such risks should be effectively managed to increase the probability of project and business success. It can thus be argued that identifying the critical risks is critical to ensure effective risk management.

Several authors, including (Van Thuyet *et al.*, 2007; Kassem *et al.*, 2019; Kassem *et al.*, 2020; 2021; Farmahini Farahani *et al.*, 2022; Kassem, 2022; Sohrabi and Noorzai, 2023) have explored risk factors in oil and gas projects, as summarised in **Error! Reference source not found.** but these studies did not thoroughly explore the risk factors across all developmental phases of the project. Most studies primarily focus on risk factors during the construction /development phases. Moreover, there is limited literature on South African projects.

Van Thuyet *et al.* (2007, pp. 178-185) adopted a questionnaire survey and interviews to identify risk factors in Vietnam's oil and gas construction projects. The study

identified 59 risk factors and found that ten (10) factors, including bureaucratic government systems and long project approval procedures, poor design, incompetence of project teams, inadequate tendering practices and late internal approval processes from the owner, inadequate project organisation structure, improper project feasibility study; inefficient and poor performance of constructors, improper project planning and budgeting and design changes as some of the significant risks. The study did not categorise the risks but went a step further and identified appropriate strategies such as reforming the government system, training project executives, foreign collaboration, implementing contractor evaluation using multiple criteria decision-making techniques and enhancing project managers' authority to respond to these risks. The study demonstrated that oil and gas projects faced various risks and advocated that earlier identification could assist in developing mitigation plans.

In India, Rawat *et al.* (2023, p. 1) undertook a study to identify the top ten risks frequently impacting oil and gas projects and identified 105 by use of literature review and content analysis. The top risk factors identified by the study, which the author believed they impact project cost and schedule, are improper project management, change in economic parameters, currency exchange rate, government regulations and laws, contractor and subcontractors issues, Lack of skilled labour, delay in approvals, health and safety issues and force majeure (Rawat *et al.*, 2023). The study proposed various mitigation strategies such as penalty deductions, interim milestones, standby financing, insurance for political risks, performance bonds from the contractor, etc. The distinct feature of this study is that it considered risk across the entire oil and gas value chain.

In a study aimed at identifying risk factors in developing countries, Kassem *et al.* (2019, pp. 853-854) used Yemen as a case study to identify risk factors in developing countries. The study identified 51 risk factors categorised into external and internal risks with 13 groups. The finding showed that internal factors are more influential than external ones. Government instability, incorrect project cost estimation, government delay in decision-making, incorrect project schedule estimation, political situation and war in the country were identified as top risk factors. Apart from the political situation

and war in the country, the identified factors are comparable to those in Van Thuyet *et al.* (2007, pp. 178-185) studies. A similar study by Waliu Adeniyi *et al.* (2022, p. 60) with a focus on examining the effect of internal risk factors and government support on oil and gas projects used Malaysia as a reference nation and highlighted management, material, finance, design and government support as key risk factors that affect oil and gas construction projects in developing nations. It is, however, questionable if all the risks identified by both Waliu Adeniyi *et al.* (2022, p. 60) and Kassem *et al.* (2019, pp. 853-854) will be applicable in developing countries like South Africa with different legal frameworks, geological & and environmental conditions, geopolitical and security environments. There are fewer oil and gas activities in South Africa than in the two developing countries. Furthermore, factors such as geographical location should also be considered. This view is supported by the different risk factors identified in the two studies. In addition, Hatefi (2018, p. 49) argued that risk depends on the country, the extent of the industry cluster, the group of involved experts and the time period factors, which Kassem *et al.* (2019) overlook. Although Kassem *et al.* (2019) highlighted that the level of experience has an impact on how the risks are viewed, the study overlooks factors such as country, the extent of the industry cluster and time period.

Many other studies explored risk factors in developing nations without generalising their results to apply in other countries. For example, Kassem *et al.* (2021, p. 934) adopted a theoretical literature review method to identify critical risk factors faced by in oil and gas construction projects in Yemen. The study found 51 risk factors and associated sources. The factors were categorised into internal and external risk factors, but critical risks were not identified as they were not the primary focus of the research. Moreover, the impact of these factors on project success was not tested, but including the risk sources added much and enhanced the understanding of the risks. A similar list of risk factors was identified in a study that identified risk factors that negatively affected the success of oil and gas construction projects in Yemen (Kassem, 2022, p. 56). The identified risks were categorised under internal and external risk factors. The result highlighted that all categories significantly affect project success. The most significant categories in the internal risk factors are project management factors, feasibility of the study design, and resources material supply. Meanwhile, the most significant categories in the external risk factors are the political

factors and the country's economic and security factors. Both studies showed that oil and gas projects are faced with multiple risks, some of which are external to the project, and their emergence later may negatively impact the project if not identified in advance.

External risk factors delaying projects were identified in another study by Kassem *et al.* (2020, pp. 2770-2787) in Yemen. Twenty (20) risk factors grouped into six categories: economic, political, force majeure, environmental, safety and security-related risk factors were identified through a structured survey. In this study, political risks were deemed complex compared to other external factors. The study highlighted that external risk factors, such as government systems, economy, politics, security and stability, could negatively impact the projects, as also identified by Van Thuyet *et al.* (2007, pp. 179-181), Kassem *et al.* (2020) and Adeleke *et al.* (2021). It appears this is prevalent in developing countries with unstable policies, weak economies and enhanced security unrest(Cakir and Yassine, 2023, p. 219). Unfortunately, external risk factors are not within the project manager's control. According to Adeleke *et al.* (2021), “good governance and government involvement through the provision of subsidies, accessible financial markets, political stability, healthy economic policies, and a steady macroeconomic environment are crucial success factors of construction projects”. Governments should, therefore, provide a conducive environment for investment and the necessary facilities for the success of oil and gas projects (Kassem, 2022, p. 55). Similarly, Basak *et al.* (2021) also found that non-technical Risks (NTRs) regarded as external to have significant impact in project delays as compared to the technical risks (TRs) regarded as Internal risks (Basak *et al.*, 2021). In contrast (Cakir and Yassine, 2023, p. 219) found that internal risks affect the project performance as compared to external risks.

In Iran, which is also regarded as a developing economy, Dehdasht *et al.* (2017, p. 13 &17) identified 29 essential risk factors related to construction risks classified under technical, financial, environmental, design and construction, contractual, policy and political. The key risks identified by the study included the lack of budget appropriation, design errors, delay in contract milestone payments, poor materials quality, and materials shortage (Dehdasht *et al.*, 2017, p. 18). In another Iranian study by Sohrabi

and Noorzai (2023, pp. 132-133), 36 factors leading to the claims in Iran's Oil and Gas industry were identified using Delphi method and a questionnaire. The risks were grouped into eight categories: owner, designer, contractor, political, natural, social, cultural and economic. Risk factors related to contractor's financial delays, change orders and poor knowledge in project planning (owners & designers) were deemed the most important. Another review of oil & gas project (real-world gas injection project) in Iran identified 52 risks classified into three categories, of which the top risks included inadequate project management system, lack of well defined scope of work, changes in project requirements, lack of collaboration between multi-disciplined project teams, inadequate planning, poor project leadership, etc (Hatefi, 2018). The three studies produce varying risks, asserting that risk factors differ from time to time and from project to project.

From an African perspective, a study aimed at identifying factors affecting Nigerian oil and gas project performance identified subsurface complexity, technological, local content requirements, social/community factors, safety and security, and nature of partnerships as factors affecting projects in the Nigerian oil sector. Consistent with (Basak *et al.*, 2021), the NTR factors, which include local content requirements, social/community factors, safety and security, and the nature of partnerships, were found to influence Nigerian project performance more significantly (Rui *et al.*, 2018, p. 666). Except for security risks, the study introduced a number of factors not covered by the other studies referenced in this document. This is primarily because the study assessed the entire oil & gas value chain instead of a particular phase.

In Egypt, El Shehabya *et al.* (2022, p. 61) identified weather, poor project coordination, price of material increase, delays by the client, and stringent quality standards as the top five risk factors in Egyptian offshore oil and gas projects (El Shehabya *et al.*, 2022, p. 73). Weather is arguably one of the most critical risk factors in offshore construction projects, as extreme weather conditions can direly impact the quality, schedule and cost objectives.

In South Africa, Young (2009, pp. 352 – 355) undertook a case study of one of the South African petroleum companies and identified operational, HSE, legal, business,

environmental, financial, market, country and credit risks as the key risks faced by petroleum oil and gas companies in South African. The identified risks were based on the company's perspective and did not fully account for the perspective of other stakeholders. Furthermore, whether the company is involved in upstream Oil & gas projects is unclear. Lately, the South African draft gas master plan of 2022, developed with consultation of various stakeholders, adopted a combination of PESTEL and SWOT analysis and identified, amongst others, the following factors affecting the gas industry in South Africa (South Africa, 2021, pp. 37-46):

- Political-related factors such as mismanagement, intolerance and populist protests.
- Inability to obtain capital finance because of high upfront investment cost requirements.
- The risk of further currency weakness,
- Inability to adopt new technology; shortages of required skills, development cost, market uncertainty, Insufficient/Lack of funding, gas prices uncertainty; and stringent regulatory framework
- Potential negative social and environmental impact concerns which include soil and ecosystem disturbance, water contamination, environmental emissions and spills, and excessive scarce resource (energy and water) utilisation.
- Regulatory uncertainty.

Although the above list was explicitly developed for the gas industry, it could provide a reasonable basis for the current study as it follows similar themes of risks identified in other oil and gas projects referenced in this document. Notably, most of the identified risks fall within the category of external risks.

From a developed world perspective, a study aimed at identifying and classifying risk factors that could cause delays in upstream gas projects in Australia identified 70 risk factors classified under ten sources (Basak *et al.*, 2018, p. 7). The study identified the following risk factors as the major factors causing significant delays in Australian projects: changes to the project scope of work, frequent changes from the client, cost estimates not well defined and unrealistic project schedules, poor organisational structure, project complexities, conflict between contractor and subcontractor, delay in

material procurement, poor communication, planning, and exchange of data between parties involved, delay in resource mobilisation, limited contract experience and knowledge, delay of other parties' work, Improper planning and scheduling deficiencies, Improper project feasibility study, inadequate tendering and risk allocation, design/design changes, design complexity/inadequate and incomplete design, Difficulty in obtaining land/access right due to resistance from land owners, heritage permit and fluctuation in oil prices or market. The study's scope was limited to identifying the delay risk factors; it did not assess if the factors were applicable to other project objectives. Compared with studies in developing nations, government-related factors were not highlighted as critical factors in this study.

Other studies explored oil and gas project risk factors from various perspectives, such as engineering, procurement, and construction (EPC)'s view. Hatmoko and Khasani (2019, p. 8) mapped delay risk factors of EPC projects using a case study of an Indonesian project and identified 28 risks classified into four categories (engineering, procurement, construction and procurement). The key risk factors were the contractor's financial capability, long-lead materials delays, changes to the project scope of work, late detailed engineering design completion, and inexperienced contractors. Another similar study was undertaken by Mubin and Mannan (2013, p. 155), which was structured from the contractor's perspective and identified 162 risk factors classified into seven groups: engineering, proposal, financial and quality, human resources, procurement and contractual, project management and quality, health and safety. Off the 162 risk factors, 21 factors were identified as critical (Mubin and Mannan, 2013, pp. 161-164).

It is evident from the above brief literature review that oil and gas projects face several factors that vary from project to project. The literature reviews suggest that most studies employed a literature and/or questionnaire survey and interviews to identify risk factors in oil and gas Projects. There is a varying list of risk factors between the studies because every project is unique, and most are not geographically located in the same area, involve experts or undertaken in different periods (Hatefi, 2018, p. 49). At the same time, risk factors vary considerably across industries and countries (Van Thuyet *et al.*, 2007, p. 175). On the other hand, similar projects may have totally different risk characteristics in different regions (Zhi, 1995, p. 231). Nevertheless,

several studies have broadly categorised the identified risks into internal and external risks comprising technical, political, economic, and legal/regulatory.

It is also evident that if not identified, their management will be difficult, resulting in increasing the chances of the project not meeting its quality, cost, schedule and other objectives. Therefore, their identification during the planning phase is critical for project success.

Table 2-2: Summary of Risk Factors Identified in Previous Studies

Reference	Study Objectives	Country of Study	Risk categorisation	Number of identified Risk factors	Identified Risk(s) Key risk factors	Identification Method
(Van Thuyet *et al.*, 2007, p. 192)	Identification of risk factors in oil and gas construction projects	Vietnam	Not specified	**59**	• Bureaucratic government system, • Long project approval procedures, • Poor design, project team incompetence, • Poor tendering practices and approval delays, • Inappropriate project org structure, • Inadequate feasibility studies, Poor/Inefficient constructors performance, • Inadequate project plan and budget • Changes to the Design	Checklist Brainstorming Literature review & consulting experts
(Hatefi, 2018, p. 42)	Identifying and ranking	Iran	Project, Company and	**52**	• Poor/nonexistent project management system;	Experts took part

Reference	Study Objectives	Country of Study	Risk categorisation	Number of identified Risk factors	Identified Risk(s) Key risk factors	Identification Method
	risk factors from a completed project.		Stakeholder		• Inadequate scope of work estimation, • Unfrozen scope of works requirements, • Poor cooperation between consultants, suppliers or subcontractors, • Too much emphasis on technical specifications. • Planning without integration/consideration of project priorities, • Use of inadequate/invalid project assumptions, • Client requirements not received, • Poor project leadership and people skills, • Absence of precise/accurate information,	in meetings to identify risk factors

Reference	Study Objectives	Country of Study	Risk categorisation	Number of identified Risk factors	Identified Risk(s) Key risk factors	Identification Method
(Basak *et al.*, 2018)	Identify and classify risk factors that could cause delays in upstream gas projects	Australia	Internal & external (Client-related, consultant-related, contractor-related, procurement-related, site-related, management-related, contract-related, design-related, and construction/ project-related risk sources)	**70**	• Scope of work changes and or variations, • Imposing ambiguous cost estimates and unrealistic project schedules, • Inadequate project organisational structure and the use of multi-level decision-making bodies, • Project complexity, • Contractor and subcontractor Conflicts, • Procurement delays and substandard material • Poor planning, communication, and information sharing • Delay in mobilisation of resources required for commissioning/start	Literature review, industry experts interviews and survey

Reference	Study Objectives	Country of Study	Risk categorisation	Number of identified Risk factors	Identified Risk(s) Key risk factors	Identification Method
					• Poor time and resource estimates by contractors, • Delay due to the delay of other parties • Inadequate scheduling and planning, • Poor feasibility study, • Inadequate tendering and allocation of risk, • Unclear and complex detailed design, • Land/access rights challenges and • Unstable oil market prices	
(Hatmoko and Khasani, 2019)	Map delay risk factors of EPCM projects	Indonesia	Engineering, procurement, construction and installation	**28**	• The financial capability of the Contractor, • Delay in delivery of long-lead items,	Literature review and expert respondents

Reference	Study Objectives	Country of Study	Risk categorisation	Number of identified Risk factors	Identified Risk(s) Key risk factors	Identification Method
					• Project Scope of Work Changes, • Engineering design completion delays and • Absence of experience of contractors	
(Abduljabbar and Breesam, 2022)	Defining the most important factors affecting risks in the Iraqi oil and gas sector	Iraqi	Operational, financial and administrative, economic and political, and potential.	**114**	• Past wars explosive and mine, • Incorrect flammable materials storage. • Financial and administrative corruption • Mismanagement by managers or their assistants • Blacklisting of some companies • Decreased global Oil demand.	Brainstorming, Survey by open & close questionnaire.

Reference	Study Objectives	Country of Study	Risk categorisation	Number of identified Risk factors	Identified Risk(s) Key risk factors	Identification Method
					• The control of the oil areas and regions by terrorist groups. • Epidemics such as coronavirus disease.	
(Kraidi *et al.*, 2019)	Review the risk factors applicable to OGPs	Iraqi	Security and societal pipe location health and safety rules and regulations operational constraints	**30**	• Terrorism and sabotage, • Theft of products, • Corruption and lawlessness • Location of pipeline in Hot-Zones.	
(Khalilzadeh *et al.*, 2021)	Risk of exploration and exploitation projects	Iran	Time and cost Human resources Quality Procurement Scope Communications Other main risks	**17**	• Political and economic sanctions • Inability to attract foreign investments • The absence of regional infrastructure to implement oil and gas projects.	
(A. Kassem *et al.*, 2020)	To identify a risk matrix for	Yemen.	External and internal	**51**	• Incorrect project cost estimates,	Detailed literature

Reference	Study Objectives	Country of Study	Risk categorisation	Number of identified Risk factors	Identified Risk(s) Key risk factors	Identification Method
	factors affecting the success of Yemen's Oil and gas Construction projects				• Inaccurate scheduling, • Political instability, • Poor project feasibility study, • Delay in decision-making, • Lack of infrastructure projects, • Substandard material quality, • Labor shortage, • Low productivity, • Local content requirements and • Regular design changes.	review and expert judgment
(Kassem *et al.*, 2020, p. 2787)	Investigate the relationship between external risk factors and project success	Yemeni	Country & physical	**20**	• Economic crisis, • Foreign currency fluctuation, • Lack of infrastructure projects, High insurance and transport • Instability, regulations changes, country conditions, illegal support and nepotism • Inclement weather,	

Reference	Study Objectives	Country of Study	Risk categorisation	Number of identified Risk factors	Identified Risk(s) Key risk factors	Identification Method
					• Local people Responsibility toward society, Local People recruitment, direct language and culture • Environmental Pressure from environmental protection groups, Health & Safety, Waste treatment and • Security-related risk	
(Dehdasht *et al.*, 2017)	Determine the key risk groups and risk factors	Iran	Technical, Financial, Environmental, Design & Construction, Contractual, Policy and political	**29**	• Lack of financial allocation for a project, • Delays in paying contractors, • Inaccurate design drawings, • Poor material quality, • Materials shortage,	interviews & literature review
(Mubin and Mannan, 2013, pp. 161-164)	Risk factors EPC contracts for oil and gas projects	Pakistan	Engineering, proposal, financial and quality, human resources, procurement and contractual, project	**162**	• Simulation and risk-based planning, • Poor scheduling and	

Reference	Study Objectives	Country of Study	Risk categorisation	Number of identified Risk factors	Identified Risk(s) Key risk factors	Identification Method
			management and quality, health & safety		• Inadequate control of EPC contractor	
(Kassem *et al.*, 2019, p. 853)	Risk factors in oil and gas construction projects in developing countries	Yemeni	Internal & External	51	• Government instability, • Inaccurate project cost estimates, • Slow decision-making by the government, • Poor project scheduling • Political instability and • Security risks (war in the country)	Literature review and questionnaire.
(Kassem *et al.*, 2021)	Theoretical Investigation of the causes of risk in the oil and gas construction projects	Yemen	Internal & external	**51**	Not provided	Literature review and experts judgments
(Rawat *et al.*, 2023)	identifying the business risks	India	Various but not detailed	**105**	• Project cost escalation,	Literature review

Reference	Study Objectives	Country of Study	Risk categorisation	Number of identified Risk factors	Identified Risk(s) Key risk factors	Identification Method
	that cause a delay in…of the CGD sector in India.				• Poor project management practices, • Changes in macroeconomic factors • Changes in government regulations and laws, • contractor and subcontractors issues, • lack of skilled labour, • Delay in approvals, • HSE health and safety issues and • Acts of god/force majeure.	
(Kassem, 2022, p. 50)		Yemen	Internal & external	**51**	• Poor project management • Feasibility study design challenges, • Material supply risks. • Political issues • Economic and	Literature review, pilot study, and expert evaluation

Reference	Study Objectives	Country of Study	Risk categorisation	Number of identified Risk factors	Identified Risk(s) Key risk factors	Identification Method
					• Security factors.	
(Sohrabi and Noorzai, 2023, pp. 131-135)	Identify the importance of process groups in improving risk management performance.	Iran	Internal (owners risk, designers, contractors) and external (social & cultural, political, economic, natural, others)	**36**	• All 36 risks were Key factors	Interview using the Delphi method.
(South Africa, 2021)	gas master plan	South Africa	Political, economical social, technological legal and environment.	**7**	• Political intolerance and populist protests. • Inability to obtain capital finance. • Currency weakness, • Shortages of required skills, • Market uncertainty, • Insufficient/lack of funding, • Gas prices uncertainty • Stringent regulatory framework	PESTEL & SOWT

Reference	Study Objectives	Country of Study	Risk categorisation	Number of identified Risk factors	Identified Risk(s) Key risk factors	Identification Method
					• Regulatory uncertainty. • Social and environmental impact concerns	
Waliu Adeniyi *et al.* (2022, p. 60)	Examine the effect of internal risk factors and government support on oil and gas projects	Malaysia	Management, material, finance and design	• NA	• Poor Management, material, • finance risk • design factors	Online questinare survey

Format adapted from (Dehdasht *et al.*, 2017)

3. CHAPTER 3: METHODOLOGY & RESEARCH DESIGN

This section details the selected research approach and paradigm adopted in this research. Firstly, the chapter justifies the selected paradigm and provides basic philosophical assumptions underpinning the paradigm that guided the study. Lastly, the section details the research plan and methods adopted for collecting and analysing data to answer the research question.

3.1 Research Methodology

Saunders *et al.* (2007, p. 101) describe research as “an original investigation undertaken to contribute to knowledge and understanding in a particular field”. Common knowledge reveals that research has historically contributed to increasing knowledge in various fields or disciplines. According to Kumar (2019, p. 9), research is undertaken according to an established framework(s) of “philosophies, procedures, methods, and techniques tested for validity and reliability and is designed to be objective and unbiased”. It can thus be argued that strict adherence to the framework is critical to ensure the quality and trustworthiness of the inquiry/study. Over the past few years, various research approaches and methodologies have been developed and refined. The methodology selection for particular research is informed by the phenomenon's characteristics, the research problem, the researcher’s worldview and the researcher and the audience’s experiences (Creswell and Creswell, 2018, pp. 19-20). This highlights the importance of clearly describing the phenomenon under investigation and putting forward the researcher’s philosophical assumption and worldview.

Kumar (2019, p. 13) presented that research can be viewed from application, objective, and inquiry mode perspectives, as summarised in Table 3-1. From an application perspective, the purpose of this research falls within the prescript of applied research because it seeks to collect information about the risks faced by offshore upstream oil and gas projects in South Africa. On the other hand, the purpose/objective of this study falls within the exploratory and descriptive ambit/category. The study is exploratory because it seeks to explore/identify risk factors affecting upstream oil and gas projects in South Africa.

Table 3-1: Summary of Research Perspectives

Research perspective	Categories	Description	Relevance to this study	
			Yes	No
Application	Pure research	Pure research seeks to expand knowledge and is concerned with developing, examining, verifying, and refining research methods, procedures, techniques, and tools that form the body of research methodology. It involves developing and testing theories.		X
	Applied research	Applied research primarily Improves the practice by collecting information about various phenomenon or their aspects. The information from this research can be used for policymaking and or to enhance understanding of the phenomenon.	X	
Objective	Descriptive	Systematically describes or provides information and describes the attitude towards a situation, problem, or phenomenon.	X	
	Explanatory	Seeks to shed light on the nature of relationships (how and why) existing between aspects of the situation, problem, or phenomenon under investigation/study.		X
	Correlation	Discover and establish a relationship, association, or interdependence between two or more aspects of a situation, problem, or phenomenon.		X
	Exploratory	Used to explore an area/phenomenon where there is little or no literature or research. It could have multiple objectives: descriptive correlation and explanatory.	X	

Research perspective	Categories	Description	Relevance to this study	
			Yes	No
Enquiry Mode	Qualitative	It is rooted in social constructivism, phenomenology, hermeneutics, and verstehen tradition philosophy worldview/paradigms (Patton, 2015, p. 11). The philosophical assumptions are that the nature of reality is socially constructed (ontology), acceptable knowledge data is options written, spoken and visual accounts are considered/good data (Epistemology), whereas axiology is Value-bound(Saunders *et al.*, 2007, pp. 100-121). Qualitative research relies on the participant's views to explore and understand the phenomenon. Data are collected through interviews, observations or document analysis(Sharan and Elizabeth, 2016, p. 24). Qualitative researchers use unstructured/emerging approaches/open-ended questions to solicit participants's views. The most common qualitative methods are ethnography, grounded theory, case study and action research. Uses strategic case selection and purposeful sampling samples(Patton, 2015, p. 11). Data analysis is inductive and comparative, with richly descriptive findings presented in themes/categories(Sharan and Elizabeth, 2016, p. 42).	X	

Research perspective	Categories	Description	Relevance to this study	
			Yes	No
	Quantitative	It is rooted in positivism and logical positivism, scientific empiricism and realism philosophy/ worldview/paradigm(Patton, 2015, p. 11), which believes that reality exists and is observable, stable and measurable. The philosophical assumptions are that the nature of reality is real, external and independent one reality (ontology), acceptable data/knowledge is factual (epistemology), whereas it is Axiology is value-free(Saunders *et al.*, 2007, pp. 100-121). Quantitative research is an approach for testing objectives. It helps quantify the variation and diversity with a more flexible interactive strategy for eliciting and categorising responses to questions. Employs structured rigid/pre-determined methodology. Uses random, probabilistic samples(Patton, 2015, p. 11). Data analysis is deductive, and results are based on empirical observation and measurements.		X
	Mixed methods	Draws strength of both qualitative and quantitative paradigms to enhance the accuracy, depth, reliability and accuracy of the findings		X

adapted from (Patton, 2015; Kumar, 2019, pp. 13-34)

The identified factors could improve risk management practices in similar projects. The study drew insight from oil & gas professionals to describe their experience, in turn identifying the risk factors.

Table 3-1 above summarised three main enquiry modes rooted in varying philosophical stances or research paradigms. Research philosophy is a basic set of beliefs, whilst paradigm is a worldview. A worldview is described as a "way of thinking about and making sense of the real world" (Patton, 2015, p. 89). The terms philosophy and paradigm are used interchangeably in this study. The four widely used worldviews are positivism, constructivism, participatory and pragmatism. The research philosophy is critical because it lays the foundation for selecting research method, strategy, data collection techniques, and analysis procedures.

This study's philosophical concepts emanated from a constructivist qualitative worldview/paradigm, using qualitative methods and surveys as data collection instruments, as illustrated in Figure 3-1.

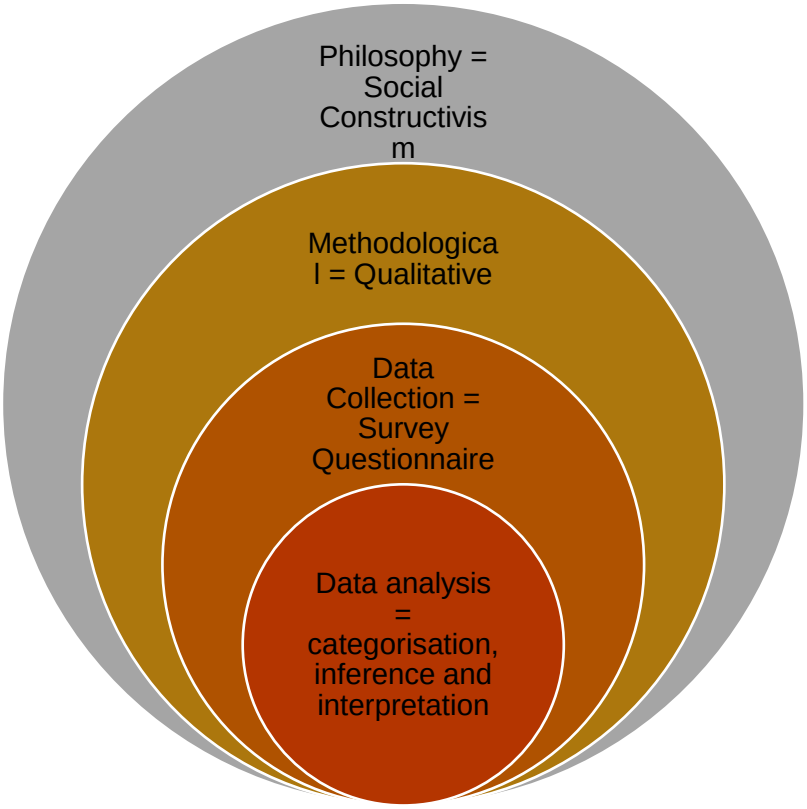

Figure 3-1: Research Methodology & Method Overview

adapted from (Saunders *et al.*, 2007, p. 103)

Constructivists follow a flexible, open approach to enquiry, believing that people continually endeavour to understand the world they live and work in (Kumar, 2019, p. 16) (Sharan and Elizabeth, 2016, p. 23; Creswell and Creswell, 2018, p. 8). On the contrary, positivism assumes that reality exists and that it is observable, stable, measurable, and waiting to be discovered (Sharan and Elizabeth, 2016, p. 23).

According to (Patton, 2015, p. 98), the core questions for a social constructivism study include how people constructed their reality, what is perceived as real, and what are the consequences of what is real. Qualitative research mainly focuses on understanding, explaining, exploring, discovering and clarifying situations, feelings, perceptions, attitudes, values, beliefs and experiences of a group of people. It uncovers and interprets these meanings (Sharan and Elizabeth, 2016, p. 25) by emphasising on describing and narrating experience rather than quantifying(Kumar, 2019, p. 16). According to Creswell and Creswell (2018, p. 8) qualitative research has often been used to explore concepts or phenomenons where there is little or no research. Similarly, Myers (2009, p. 9) echoes that qualitative research is good for exploratory research. Qualitative research has been frequently used to fill literature voids across many disciplines because it is based on the belief that people construct knowledge continuously as they engage in an activity or experience a phenomenon.

According to Diekmann *et al.* (1988, p. 14), risk identification depends on the project team's skills, insight and experience. The dependence of risk identification on participant's judgment, beliefs and people's opinions makes it a subjective process because risks can be viewed differently depending on the experience of the involved parties. Nicholas and Steyn (2008, p. 364) echo the same by describing risk identification and assessment as a subjective process. The subjectivity and reliance on people permit the use of qualitative research in risk identification. Furthermore, an exploratory qualitative study was deemed suitable because of the limited research on risk factors affecting South African upstream oil & gas projects. According to Myers (2009, p. 9), qualitative research is best for exploring subjects with less published research. Similarly, Sharan and Elizabeth (2016, p. 17) echoed the same view that qualitative research is suitable for undertaking an inquiry where there is a lack of theory or existing theory fails to explain a phenomenon adequately. This research gathered data from oil and gas experts/professionals to build literature on risk factors affecting

oil and gas projects in South Africa. Identifying risk factors affecting oil and gas projects in South Africa was possible by employing qualitative methods involving an open-ended survey questionnaire and conducting interviews/workshops with expert respondents across the oil and gas sector. The key benefit of following the qualitative approach is that participants freely provided their insights from their experience(Kumar, 2019, p. 16), which was translated to answer the research questions. Previous studies have used this approach to identify project risk factors. For example, Sohrabi and Noorzai (2023, p. 131) and Kassem *et al.* (2019, p. 850) adopted the qualitative approach to identifying risks. By adopting a combination of Delphi and open-ended questions, (Sohrabi and Noorzai, 2023) identified risk factors affecting the Iranian oil and gas construction industry. In a similar manner, Kassem *et al.* (2019, pp. 853-854) was able to solicit factors of risk in developing countries.

The limitations of the qualitative approach include the possibility of the researcher's biases, dependence on a few participants, complex data analysis, and the inability of participants to express themselves(Creswell and Creswell, 2018; Kumar, 2019). The disadvantage of qualitative research is that it is difficult to generalise to a larger population(Myers, 2009, p. 9). Even though lately there is a consensus on what constitutes qualitative inquiry, qualitative researchers historically had difficulty convincing audiences about their legitimacy (Creswell and Creswell, 2018, p. 180). Some scholars have criticised qualitative research, terming it unscientific, subjective, an outside approach that relies on "making things up as you go along, which has no way of verifying the true statement" (Denzin and Lincoln, 2018, p. 8). The study mitigated these challenges by strictly following the qualitative research strategy detailed in Section 3.4 and the philosophical assumptions underpinning the selected paradigm.

3.2 Research Design

The research plan had three main steps, as illustrated in Figure 3-2. The research background is covered in Chapter 1, followed by the literature review in Chapter 2. Primary data was collected through an open-ended survey questionnaire. After that, it was interpreted and analysed using data coding categorisation, inference and

interpretation strategies. Participants and other industry experts were contacted to validate the results. Thereafter, the final reporting was done.

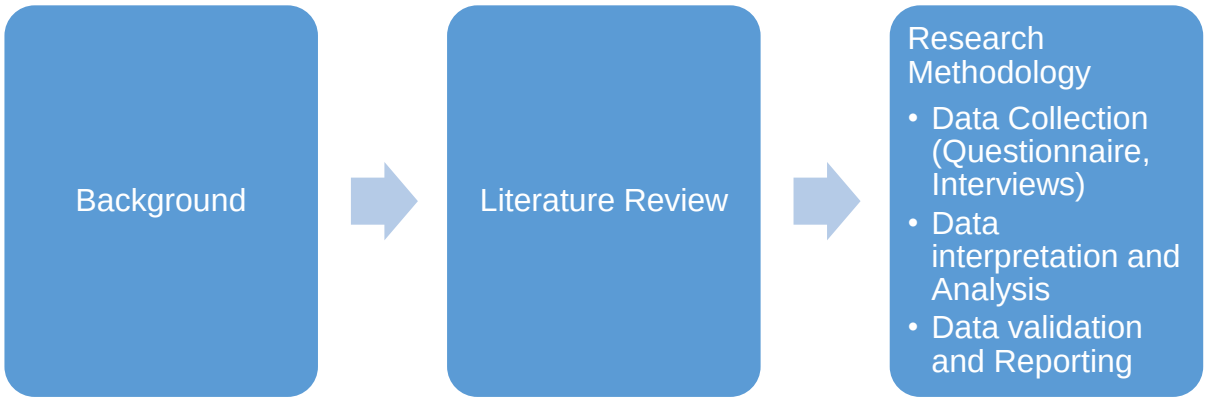

Figure 3-2:Overview of the Research Plan

3.2.1 Data Collection

The primary data source was a questionnaire survey issued to a population of oil and gas experts/professionals through electronic mail and online forms. The advantages of online questionnaire approaches are low cost, greater anonymity, reduced bias and broader geographic coverage. Data collection was further strengthened by sharing preliminary results with respondents and various groups across the South African oil and gas sector.

The research instrument was a survey questionnaire illustrated in section 7.1 (annexture A) consisting of semi-open-ended questions designed based on the review of past research papers and in accordance with the research objective and literature review. The questionnaires were reviewed by a risk expert in the oil and gas sector and an academic professional to ensure quality, validity, credibility, dependability, and relevance to South Africa and to ascertain that the questions are clear and precise and will yield truthful, accurate answers.

The questionnaire had three sections. The first section (Section A) contained introductory background information about the research respondents; the second section (Section B) is basic information about the participants. The last section

(Section C) had semi-open-ended questions structured to obtain information on risk factors based on participant experience. The open questionnaire was designed to encourage participants to contribute information based on their unique perspectives, practical knowledge, and experiences on the topic. The advantage of an open-ended questionnaire is that participants responded in their own voice and were not limited in providing their responses. The study was able to capture rich and detailed information on risk factors affecting Upstream oil & gas projects in South Africa.

The questionnaires and or links were distributed by email and whatsapp. The participants completed the forms online, and workshops and virtual and physical presentations were held.

3.2.2 Sample size

Probability and nonprobability sampling are the two main sampling types. In qualitative research, purposeful non-probabilistic sampling is predominantly used (Sharan and Elizabeth, 2016, p. 97). There is a wide range of purposeful sampling. For example, Patton (2015, p. 264) listed 40 purposeful sampling types group in 8 groups. According to (Saunders *et al.*, 2007), unique, maximum variation, convenience, and snowball are quantitative research's most commonly used sampling techniques. In purposive sampling, the participants or cases are selected based on their in-depth knowledge of the phenomenon under investigation or the richness of the information in order to yield insights and in-depth understanding. Patton (2015, p. 264) showed that the strengths of purposeful sampling primarily depend on selecting information-rich cases. The requirements of information-rich cases highlight the importance of knowledgeable and experienced participants for a successful qualitative study.

The study targeted diverse professionals involved in upstream oil & gas projects in South Africa. This included independent consultants, contractors, rights holders, policy makers, regulatory bodies, financial institutions and interested and affected parties. The sampling criteria sought to recruit knowledgeable individuals with experience and or involvement in the South African oil and gas sector. Their knowledge and

experience were critical to shed light on the inquiry. Given the specialist nature of upstream oil and gas projects, the target participants had at least a formal tertiary qualification and three years of experience in the oil and gas sector. In order to cover a representative range of perspectives, the research involved knowledgeable and experienced participants across all levels, from top positions to project team members or equivalent. This enabled the study to obtain diverse experiences and perspectives on Risk factors affecting South African upstream oil and gas projects, which aligns with the exploratory nature of this study. Van Thuyet *et al.* (2007, p. 176) used a similar approach to identify risk factors.

The sampling method was a combination of convenient and snowball or chain sampling, which involves distributing the survey to one or a few information-rich respondents within a target population who can be contacted and participants referenced by participating participants. The use of convenient sampling was considered because of the exploratory nature of this study. Convenient sampling has been criticised for its credibility and is likely to produce easy-to-attack information-poor cases and has been labelled lay and useless (Patton, 2015, pp. 309-310; Sharan and Elizabeth, 2016, p. 98); however, it is recommended for exploratory reach (Saunders *et al.*, 2007, p. 315). The study was strengthened by the use of snowball chain sampling, which is regarded as the most common sampling in qualitative research (Sharan and Elizabeth, 2016, p. 98). Snowball sampling is commonly used when it is difficult to identify members of the desired population (Saunders *et al.*, 2007, p. 232); however, it is difficult to use when the sample becomes relatively large(Kumar, 2019).

The questionnaire sought to acquire respondent's opinions on risk factors affecting oil & gas projects in South Africa based on their work experiences and judgment. The data was deemed sufficient once the saturation point, at which point no significant new information or insights about risk factors in the South African upstream oil & gas project were received, and when ongoing analysis produced robust categories and themes or findings. The saturation point was reached after responses from the 26 participants.

3.3 Data analysis

Data categorisation, inference, and interpretation strategy was used to analyse the collected data. The collected raw data was reviewed and organised into codes and themes that cut across all of the data sources to establish a meaningful understanding, as illustrated by the framework outlined in Figure 3-3. Data analysis was done in conjunction with data collection. However, an intensive analysis was done after sufficient data was collected.

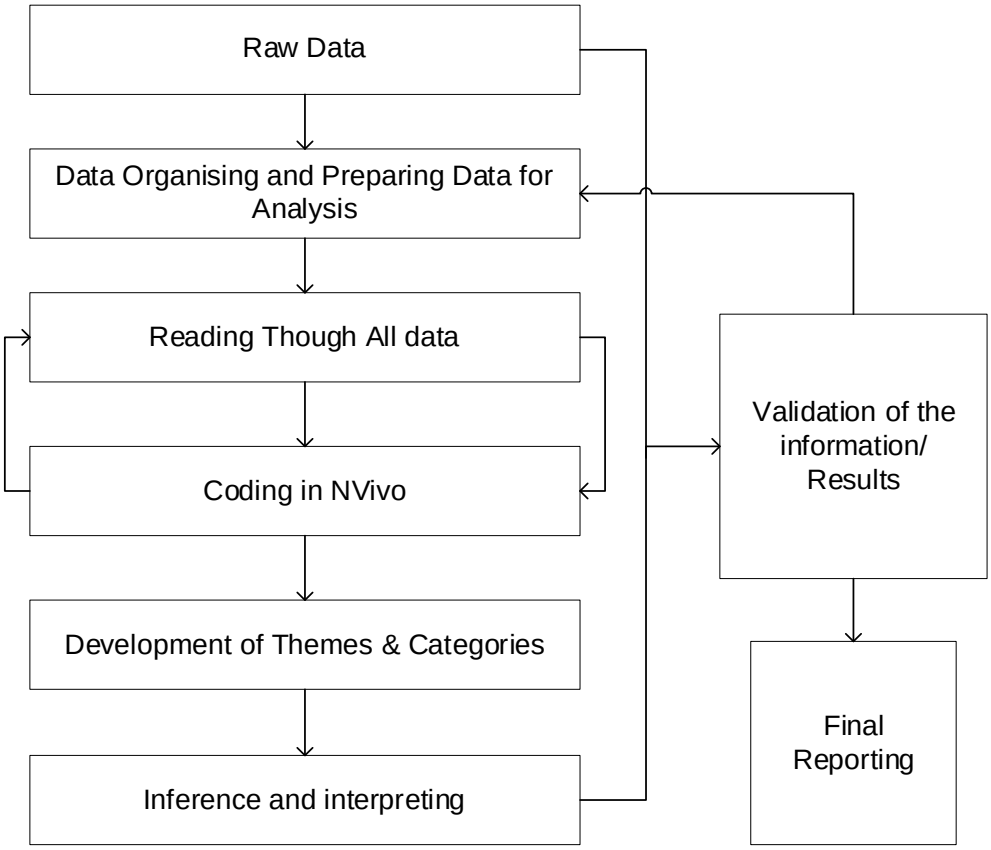

Figure 3-3: Data Analysis Framework

Adapted: (Creswell and Creswell, 2018, p. 194)

In the first stage of data analysis, raw data was prepared and read, followed by data coding NVivo™ Software and arranging data into themes and categories. NVivo is software used for qualitative data analysis. Data from interviews/surveys can be arranged/coded and analyzed to determine if there are patterns and themes in the

data. The software allows users to classify, sort, and arrange information, generating graphs and charts to visualise, interpret and report collected data.

Coding was an iterative process with frequent revisions as the data arrangement and collection process continued. The data coding and grouping was as shown in Table 3-2.

Table 3-2: Coding and grouping

Exploration Phase Risks	Description
External Risks	Factors emanating outside of the project
Economic Related Risks	Financial related factors
Environmental Related Risks	Natural occurring factors
Political and Regulatory	Government, legal & politics
Social Risks	Related to interested and affected parties
Internal Risks	Under the control of the project team
Geological Geophysical and Reservoir	Subsurface risks
Human Resource Skills Related Risks	Human Resource Skills Related Risks
Management Related Risks	Project management related
Operational Risks	Implementation related
Procurement Related Risks	Contracting related
Site Location-Related Risks	Geographical location
Development Risks Phase	
External Risks	Risk under control of the projects
Economic and Financial Related Risks	Financial related factors
Environmental Related Risk	Natural occurring factors
Political and Regulatory	Government, legal & politics
Social Risks	Related to interested and affected parties
Internal Risks	Under the control of the project team
Geological, Geophysics and Reservoir Related Risks	Subsurface risks
Operational	Execution and operational-related
Procurement Related Risks	Contracting related
Management Related Risks	Project management related
Site location Related Risks	Geographical location
Human Resource Skills	Human Resource Skills Related Risks

Final interpretation, validation, and reporting of the findings were made after reaching the saturation point.

3.4 Data Validity and Reliability

A research instrument is reliable if it is consistent, stable, predictable, and accurate (Kumar, 2019, p. 273). According to Kumar (2019, pp. 276-277), the trustworthiness of a qualitative study is determined by four indicators related to reliability and validity: credibility, transferability, dependability and confirmability. (Patton, 2015) put forward that the credibility of a qualitative inquiry depends on systematic in-depth fieldwork, systematic and coincidence analysis of data, and credibility of the inquirer and reader's philosophical view. The following strategy put forward by (Sharan and Elizabeth, 2016, p. 265) was followed to address the reliability and validity of this study.

Table 3-3: Strategy to Reliability and Validity

Indicators	Description	Strategy
Internal validity/credibility	How do research outputs match reality or the extent to which research findings are credible	Respondent/ expect validation in which feedback from respondents/expects will be solicited during the preliminary or emerging of findings. This helped address misinterpretation and allowed participants to fine-tune their input. Furthermore, the research was carried out ethically.
Reliability or Consistency	The extent to which the results can be replicated.	The assumptions and theory underlying the study were detailed. In addition, triangulation involving data from multiple sources was used to ensure consistency and dependability or reliability.
External validity or transferability	Applying findings from one study to other situations. extent to which the findings of a qualitative study can be generalised or transferred to other situations	The study sought to obtain a wide range of perspectives from diverse participants. Furthermore, a detailed description of the study's context has been provided to enable readers to compare the findings with their situations.

The preliminary results were presented to a wide range of industry experts to validate the results and obtain their opinions. Obtaining feedback from all the participants was impossible because data was submitted anonymously. The researcher present the results to the Offshore Petroleum Association of South Africa (OPASA), the South

African Oil & Gas Alliance (SAOGA) representative and the Petroleum Agency of South Africa (PASA). The researcher also presented the preliminary results at the Ocens Economy (OE) conference held in May 2024. OPASA is a group of exploration and production companies participating in the offshore upstream petroleum industry in South Africa. SAOGA seeks to promote the South African and Southern African oil and gas value chain, particularly in the upstream and midstream sectors. It is a public and private partnership that is publicly funded to carry out a wide range of industry development activities, such as training and promoting oil and gas activities in the country and region (SAOGA, 2024). The OE conference is a government-led initiative aimed at, amongst others, promoting initiatives for the development of the South African OE. The OE conference covered a wide range of participants, including logistics and shipping, offshore Oil and Gas, fisheries, tourism, and defence and security from various government departments, state-owned entities, the private sector, civil society, labour, and academia (DFFE, 2024)

The procedure of using expert judgment to confirm the identified risk factors has been widely used by many authors in the literature. For example (Fallahnejad, 2013, p. 138) used a similar approach to confirm a list of project delay factors. Similarly (Basak et al., 2018, p. 4), the consulted industry expects to check the relevance of the identified risk to the upstream industry. Kassem et al. (2019, p. 850) also relied, amongst others, on expert judgment to confirm the list of identified risks.

The participants were suitably experienced and qualified personnel. The experts were asked to provide feedback on the findings and any recommendations that could assist the study. There was a consensus among the participants regarding research question 1 finding; the risks identified are relevant to the South African oil and gas industry. Furthermore, most participants agreed with the findings relating to research questions two, three and four.

On research question 2, one participant argued that the project risk profile changes significantly when the project moves from exploration to development. However, the participant agreed with the list of identified risk factors but did not add new risks. Whilst this is valid, the assessment of the risk factors is outside the scope of the research. The scope of the research is limited to the identification of risk. A different participant enquired if the risk would be assessed and mitigation would be recommended.

Some matters raised during the data validation workshops include submitting an updated list of oil and gas rights holders and South Oil and Gas resource estimates.

For triangulation, the primary data was acquired from the questionnaire, and secondary data was acquired from interviews/workshops and literature. The primary data was validated against the secondary data using the triangulation method.

Triangulation in qualitative studies involves using multiple methods to analyse the data or gathering data from diverse sources to develop a comprehensive understanding of phenomena. It allows triangulation of data from interviews and literature(Myers, 2009, p. 10). The method is generally accepted in qualitative research to test the validity of outcomes Denzin (1978) and Patton (1999), as quoted by Nancy Carter. *et al.* (2014, p. 545). According to (Patton, 2015), triangulation provides diverse ways of looking at the phenomenon and adds credibility and confidence to the conclusion drawn (Patton, 2015, p. 77). By triangulating with multiple data sources, qualitative studies overcome the scepticism that greets a singular perspective(Patton, 2015, p. 77). It reduces bias and data distortion during analysis. Van Thuyet *et al.* (2007, p. 192) adopted triangulation to verify primary data collected via in-depth interviews was verified against secondary data from various sources. In the study, secondary data were specifically for triangulation purposes.

3.5 Ethical Considerations

The study followed the ethical Policy of the University of Cape Town and the standard ethical practices required of any reputable academic research. Annexure B of this research report includes an ethics clearance granted by the University of Cape Town for this study.

Respondents were treated with respect and humility. They were informed of the research purpose, and consent was sought before completing the questionnaires. With the exception of disclosing names or organisations, in some cases, the participants' anonymity and privacy were respected in this study. The participants were free to exercise their choice to participate or not. The participant's rights, needs, values, and desires were respected.

4. CHAPTER 4 : RESULTS

The research data was collected via an online self-administration survey from a diverse range of participants involved in the South African oil and gas sector. The survey form in Annexure A was used in this study. The process yielded 250 factors, summarised in Annexure C. Detailed information extracted from the survey forms is also provided in annexture D.

The participants included professionals from government agencies, oil and gas/energy companies (rights holders), funding institutions, and consultants/contractors, as summarised in Figure 4-1. The participants provided a list of riksf factors detailed Annexure C.

A snowball sampling approach was adopted to identify the participants for this study. The researcher contacted a few participants within his reach, some of whom recommended the other participants, resulting in 26 participants with diverse backgrounds and experiences. The data was deemed sufficient when no significant new information was received from the participants.

4.1 Participants profile

A total of 26 participants anonymously responded to the research survey. Some of the participants requested assurance that their anonymity would be protected. The assurance was confirmed because the online form did not require names and contact details. The collected data was screened to ensure suitability. Relevant data from all participants deemed usable has been used for the study. One participant did not consent to participate in the study but continued to submit the information. The participants were professional oil and gas sector experts with a wide range of qualifications and experience. Fifty-four per cent (54%) of participants are right holders/energy companies, followed by consultants/contractors and regulators at 23 and 19%, respectively. The fewest participants were from funding institutions, contributing to 4% of the total participants.

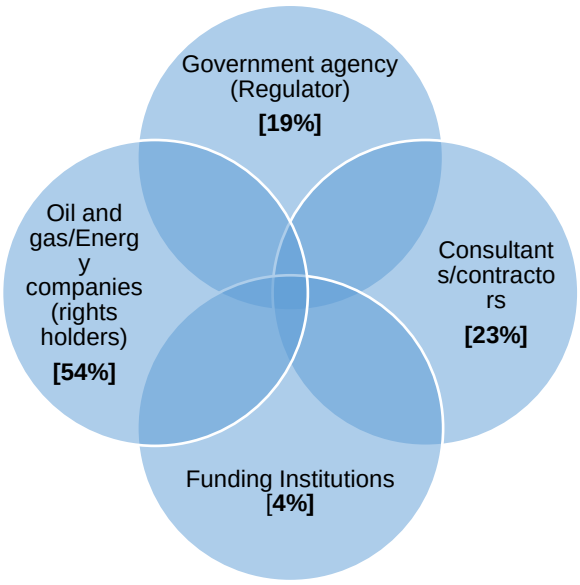

Figure 4-1: Participants overview

The participants occupy a wide range of positions, including geoscientists, engineers, managers, and executive managers, as detailed in Table 4-1.

Table 4-1 : Participants Positions

Respondents Job Title	Number of Participants
Unspecified	1
General Manager: Regulatory and Legal Affairs	1
Chief Geoscientist	1
Business Development Manager	1
Subsea Engineering Manager (Retired)	1
Managing Director	2
QA Manager	1
Drilling Engineer	2
Project Engineer	2
Acting Chief Risk and Compliance Officer	1
Marine construction consultant	1
Lead Geoscientist	1
Principal upstream concept development engineer	1
Risk Engineer	1
Geoscientist	2
Chief Operating Officer	1
Upstream Asset Manager	1
Country Representative	1

Respondents Job Title	Number of Participants
Consultant	1
Regional Manager	1
CEO	1
Principal Estimating Engineer	1

Fourteen (14) participants have been involved in both exploration and development projects, whilst five (5) have been involved in exploration only, and six (6) have been only involved in development phases. Only one (1) of the participants had not been involved in the execution of upstream projects.

The respondents possess at least seven (7) and over sixteen (16) years of experience in the oil and gas sector. Of the twenty-six (26) participants, seventeen (17) have over 16 years of individual oil and gas project experience, as shown in

Figure ***4-2***.

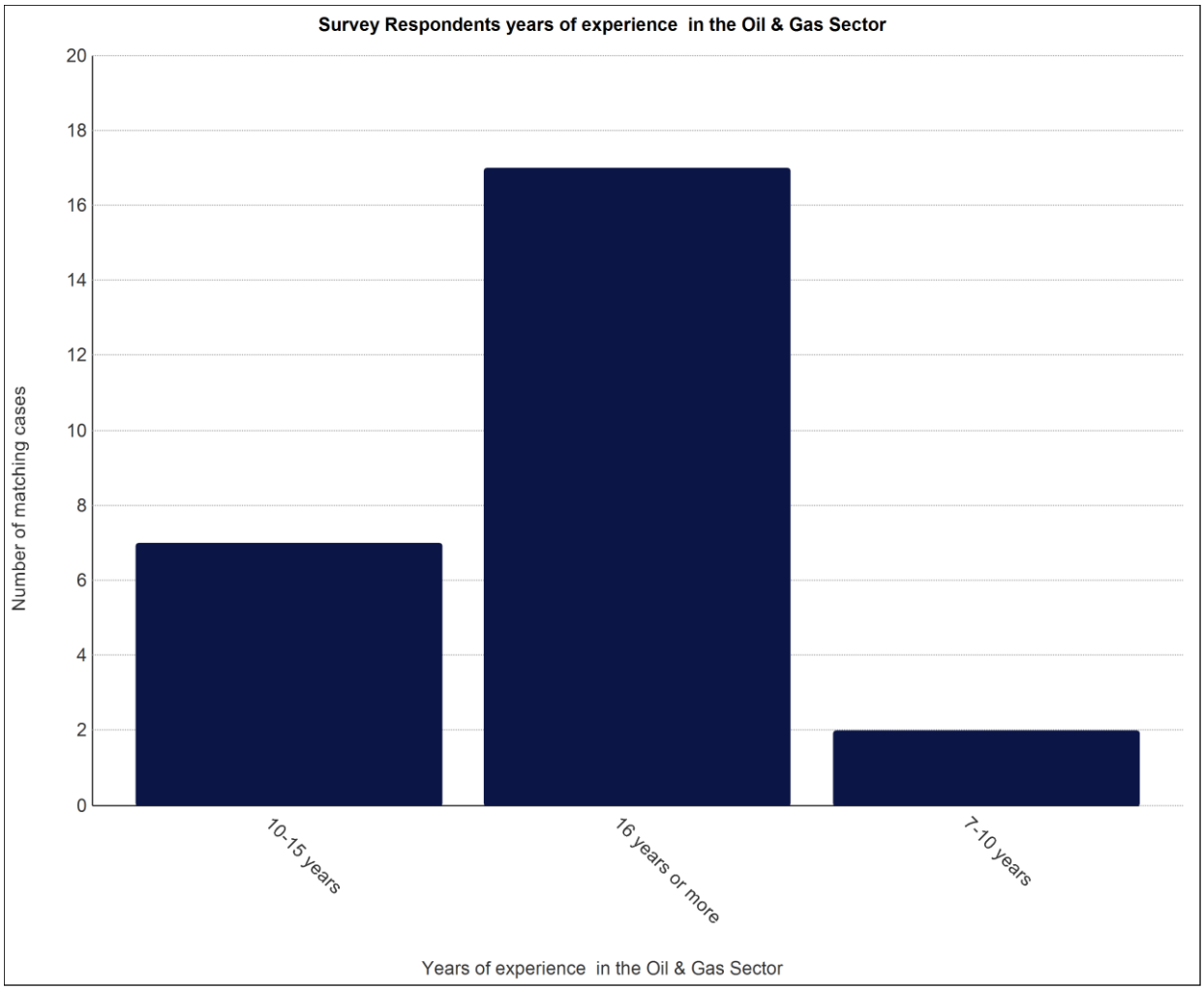

Figure *4-2*: Participant's Experience Overview

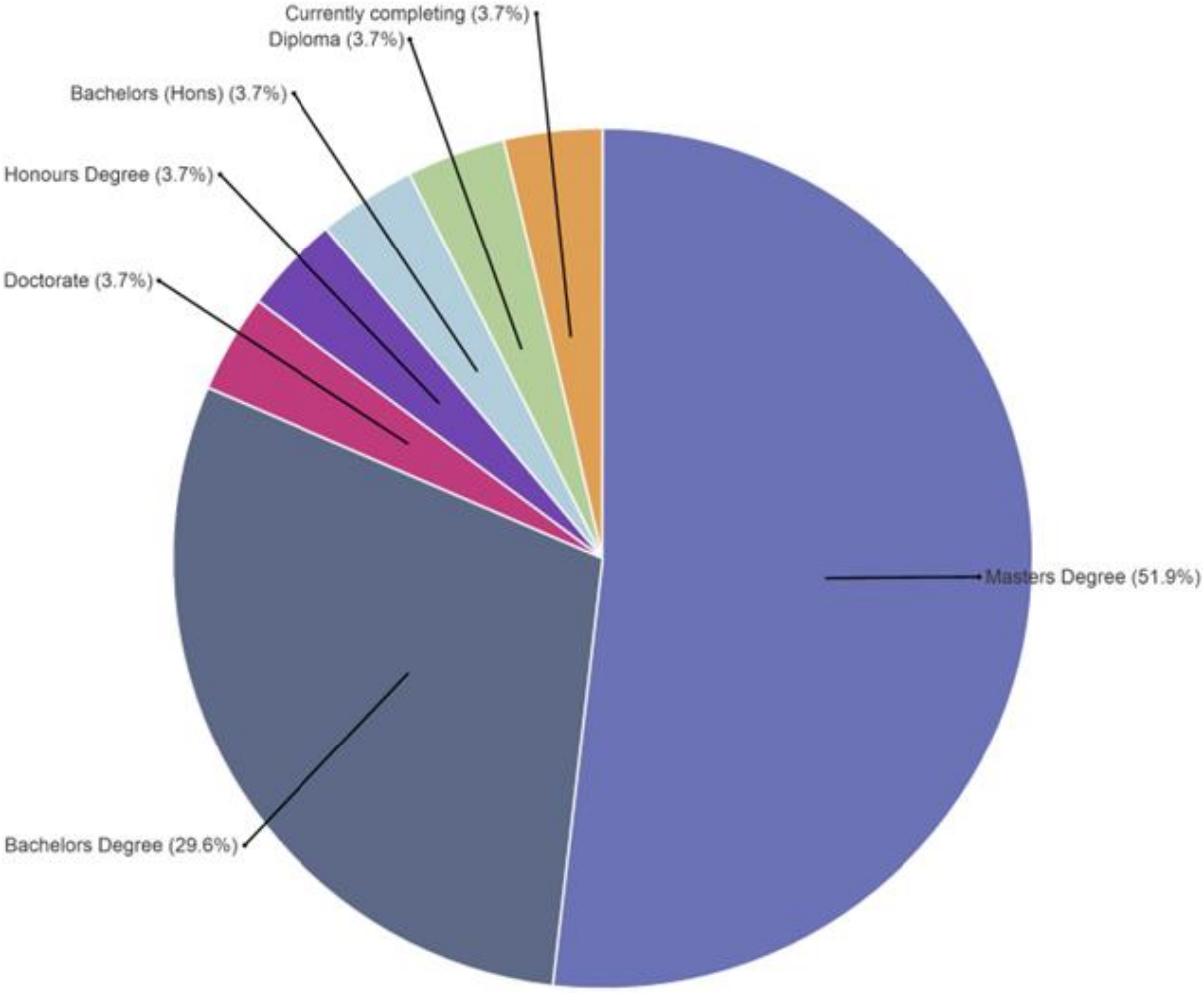

Figure ***4-3*** illustrates that all participants are qualified professionals with formal qualifications ranging from a Diploma to a PhD. The majority of respondents (52%) have a master's degree, and one of the participants is completing a master's degree.

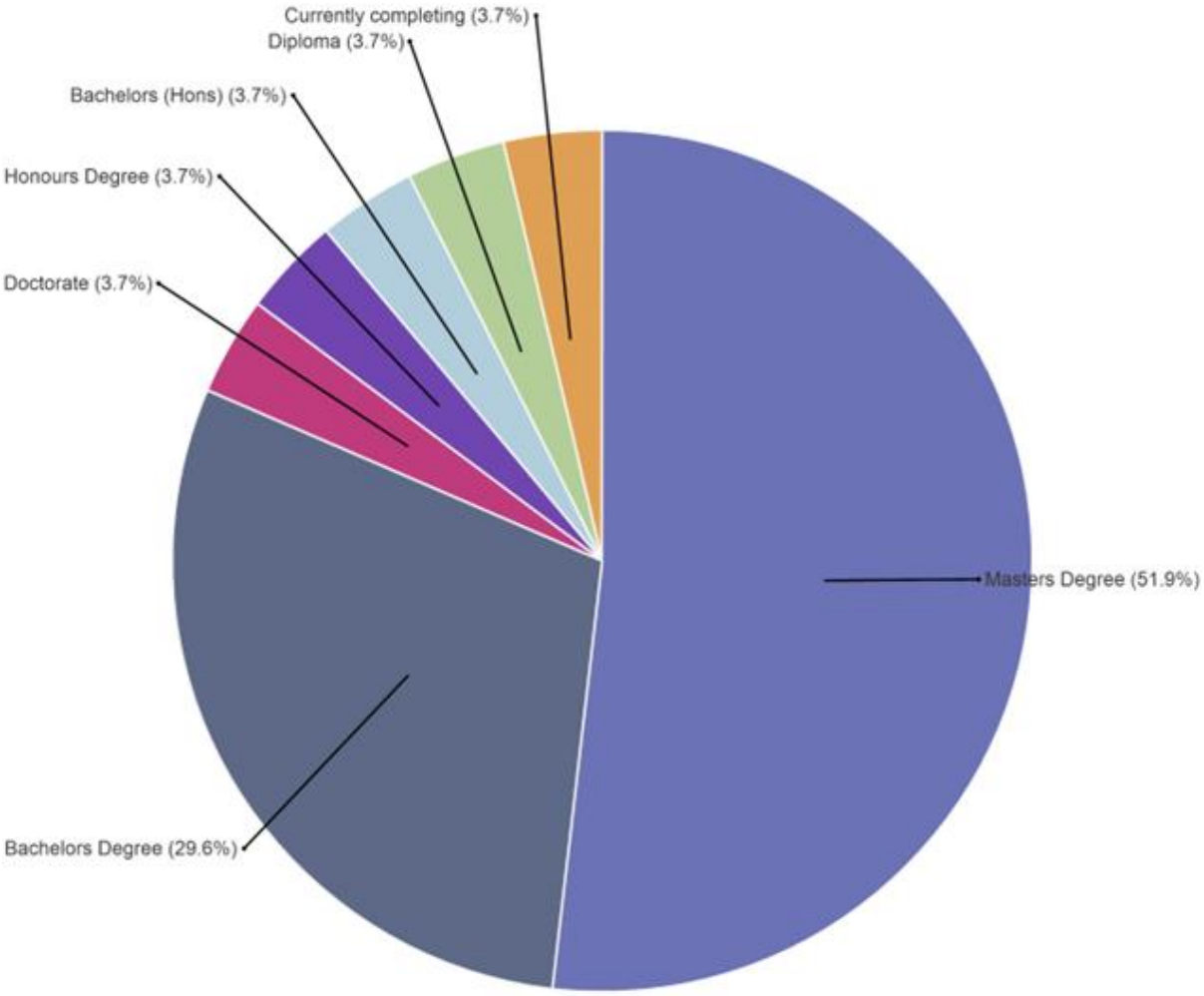

Figure 4-3: Participants Qualifications

One of the participants is a retired professional with extensive experience in South African upstream oil and gas projects.

4.2 Research results

The research questions of this study were as follows:

a) What are the critical risk factors in oil and gas projects (Exploration/appraisal and construction project phases)?
b) Do the risk factors significantly change as the project progresses from one phase to another?
c) What are the common risk identification tools?
d) Are risks in literature applicable to South Africa?

Survey questions distributed by email and via social media were employed to answer the research questions.

4.2.1 What are the critical risk factors in oil & gas projects?

To answer the research question relating to critical risk factors in South African oil and gas Projects, the participants/respondents were requested via an open question to identify and list critical risk factors affecting the exploration and development/construction phases of oil and gas projects in South Africa based on their individual experience. The participants were also allowed to add relevant comments which could be helpful to the study.

Results revealed various perspectives from stakeholders on risks faced by oil and gas projects in South Africa. The study identified 250 risk factors comprising 140 (56%) exploration and 110 (44%) development risks. NvIvO software was employed to organise/code the identified risks for the exploration and development phases. The factors were categorised/coded into two main themes: internal and external risk factors. The first step was to categorise factors as either internal or external. Thereafter, the subcategories were added under both internal and external factors. Both external and internal risks were further categorised and counted as summarised in Table 4-2

Table 4-2: Identified Risks Summary

Phase & Category	Description	No.
Exploration Phase Risks		**140**
External Risks	Factors emanating outside of the project	87

Economic Related Risks	Financial related factors	19
Environmental Related Risks	Natural occurring factors	7
Political and Regulatory	Government, legal & politics	42
Social Risks	Related to interested and affected parties	19
Internal Risks	Under the control of the project team	53
Geological Geophysical and Reservoir	Subsurface risks	10
Human Resource Skills Related Risks	Human Resource Skills Related Risks	13
Management Related Risks	Project management related	9
Operational Risks	Implementation related	5
Procurement Related Risks	Contracting related	9
Site Location-Related Risks	Geographical location	7
Development Risks Phase		**110**
External Risks	Risk under control of the projects	55
Economic and Financial Related Risks	Financial related factors	15
Environmental Related Risk	Natural occurring factors	8
Political and Regulatory	Government, legal & politics	21
Social Risks	Related to interested and affected parties	11
Internal Risks	Under the control of the project team	48
Geological, Geophysics and Reservoir Related Risks	Subsurface risks	5
Operational	Execution and operational-related	7
Procurement Related Risks	Contracting related	12
Management Related Risks	Project management related	8
Site location Related Risks	Geographical location	6
Human Resource Skills	Human Resource Skills Related Risks	17

External risks include economic, environmental, social, political, and regulatory risks. in contrast, internal risks include geopolitical, operational, procurement, site location, management, and human resource skills-related factors.

4.2.1.1 Exploration Phase Risk Factors

Under this phase, 140 risk factors were identified, which made up 62% and 38 % of external and internal risks, respectively. The results revealed that the majority (62%) of risk factors affecting the exploration project fall within external risk factors. Political and regulatory factors were prevalent, accounting for 30% of the total identified exploration risks.

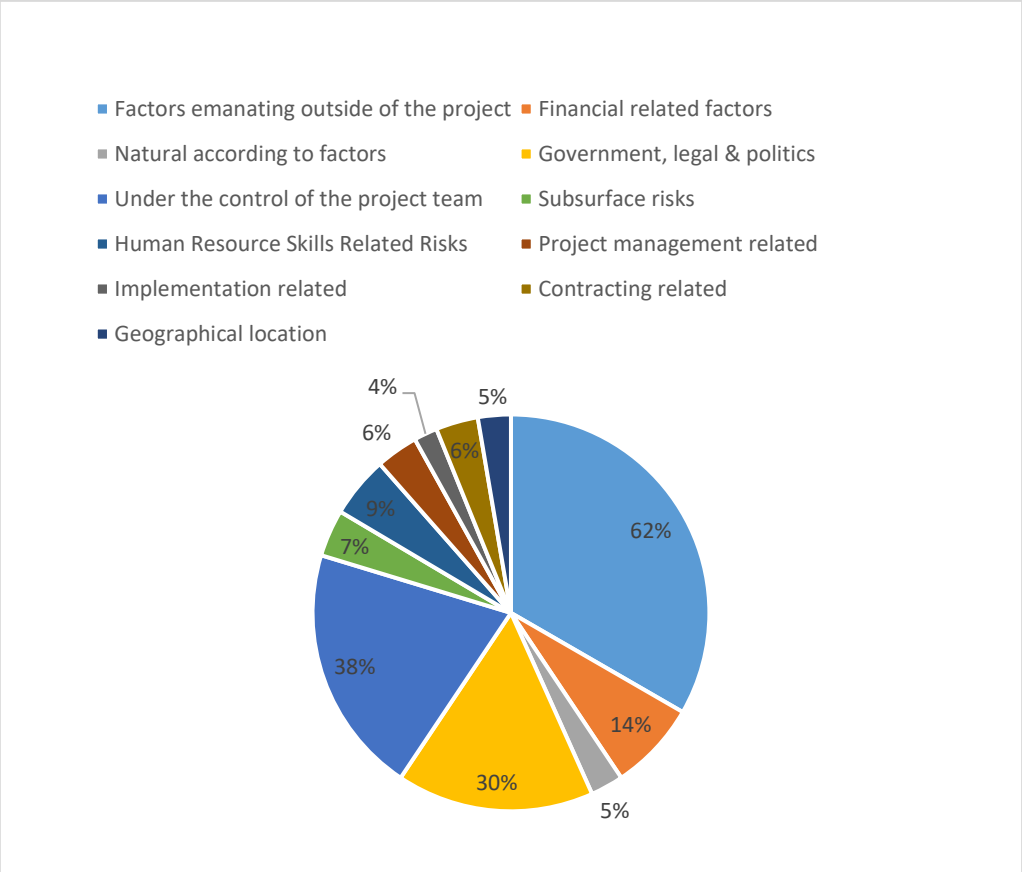

Figure 4-4: Exploration Risks

Most participants identified regulatory uncertainty as a risk factor in South African oil and gas projects. The respondents highlighted, amongst others, that the delays by the state/government in finalising the oil and gas regulatory framework (upstream petroleum bill) is one of the factors hampering the exploration and development of the oil and gas industry in South Africa. “The delayed finalisation (promulgation) of the upstream petroleum bill may give reason to exploration rights holders to delay exploration programs due to lack of certainty about future changes in law and fiscal regime.” Moreover, uncertainty in the regulations does not create a conducive environment for investors to complete their work programs. A slow regulatory process

and geopolitical shifts were among the factors raised in this category. A comment on geopolitical shifts is that they “may result in suppliers reluctance to part-take in South Africa or involving country”.

The category with the second most risk factors was economic risk factors, followed by social and environmental risks, accounting for 16%, 14% and 6% of identified factors, respectively. The factors raised by participants in the economic category include weak exchange rate, project financial viability, inability to fund the projects, weak economy, which includes weak/changing macroeconomic performance, etc. The marginal size of some discoveries and the transition to net zero carbon emissions appear to be contributing to the failure to secure project finance. For example, Standard Bank adopted a climate change policy in which, amongst others, the bank committed to supporting net zero emissions by reducing advances to upstream oil by 5% by 2030 (StandardBank, 2022).

Some of the identified social-related risks include, but are not limited to, public objections by environmental lobbyists, environmental interest groups, civil groups, Non-government organisation (NGOs), anti-fossil fuel groups, and interested groups. The other social risk relates to lengthy public engagements, public protests, and litigations resulting from environmental activism. This has been highlighted as one of the factors causing schedule delays, which have sometimes resulted in project cancellation, consequently deterring investment in the oil and gas sector. “ Disruptive interference by interest groups opposed to fossil fuels, including court action that stops oil and gas projects - slows down projects and repels potential investors." To this end, it was highlighted that stakeholder awareness and the determination of the environmental baseline are critical for the oil and gas sector as they are critical inputs that could aid in the sustainable exploration and exploitation of oil and gas resources.

Incline weather was repeated by a number of participants as one of the main environmental risk factors for South African offshore oil and gas projects. In addition, one participant expressed concern about “unpredictable external hazard risks such as storms, floods, earthquakes, and other natural disasters…” in the region “that they “may negatively affect exploration” Many participants believed that the challenging South African metocean condition has the potential to prolong project schedule and costs negatively. This may also limit the number of participants of small energy

companies that do not have the capital to secure advanced technologies required for South African maritime weather. The other environmental-related factors identified by participants include the transition to green energy. For example, "The progression of greener energy development and sustainability was perceived that it "can hinder the development of oil and gas projects…" The transition to net zero carbon emissions is thus one of the important focus areas that could impact oil and gas projects.

From an internal risk perspective, results pointed out that most of the identified internal risks were related to human resource skills. Numerous participants identified the lack of experienced human resource skills as the most worrying risk factor negatively affecting project cost. The participants believe that local skills are crucial for cost-effective implementation of projects. Many of the views related to skills apply to procurement-related factors wherein factors such as the lack/limited number of experienced contractors in the country were raised. The geographical location of South Africa compounds this in relation to countries with several active oil and gas projects. The need for local capacity and skills development is thus critical for the sector.

On the other hand, Geological risks accounted for 7% of the identified risk factors, whereas operational and management-related risks each accounted for 6%. The balance of internal risks fell within site location-related risks, in which, among other things, South Africa's geographical location was perceived to be a contributing factor to project costs.

4.2.1.2 Development Phase Risks

External risk factors also emerged as the dominant risk factors in the development phase, as illustrated in Figure 4-5. In this phase, the external risk factor category with the most risk falls within the political and regulatory category, where most participants listed regulatory uncertainty and slow regulatory process as some of their concerns. Other key external risk factors are challenging geotechnical and metocen conditions, public resistance, etc. Geopolitical shift is one of the few risks not identified in the development phase.

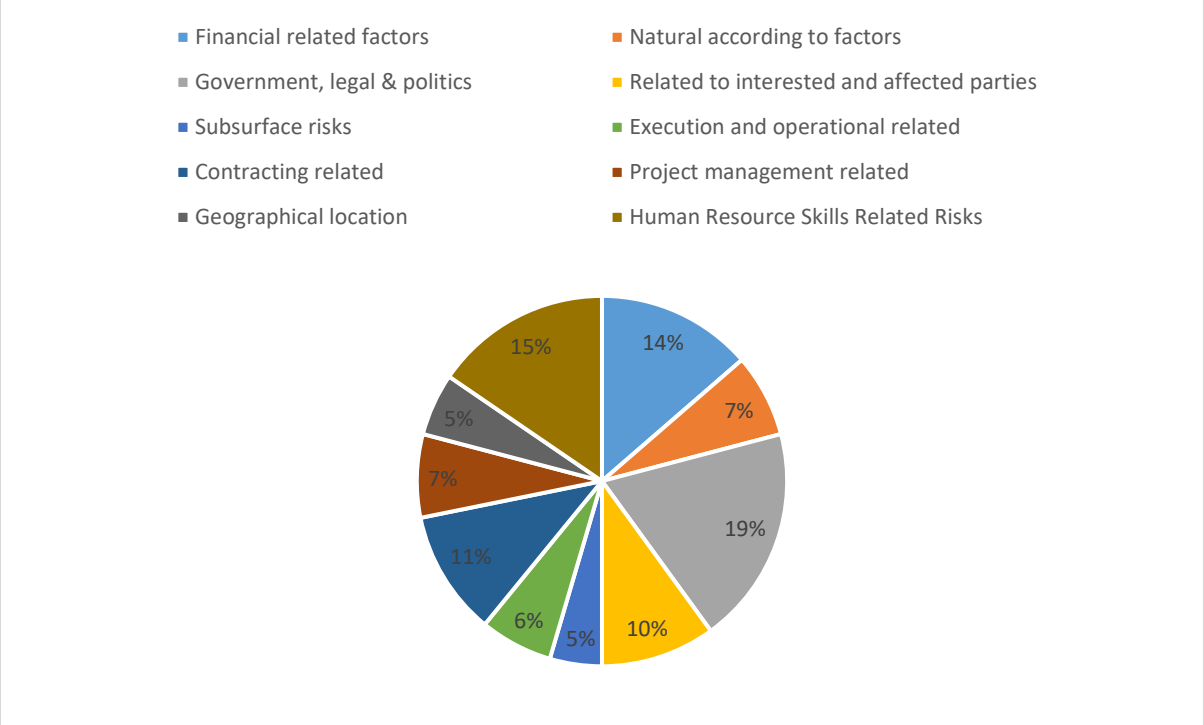

Figure 4-5: Summary of Development Risks

As with the exploration phase, most participants (16 of 48 internal risk factors) predominantly identified human resource skills-related risk factors under internal risk themes in the project development phase. Some participants believed adequate education, training, and experience are critical for project success. The involvement of South Africans in the projects is deemed essential for the "steady transfer of experience and skills to South Africans". Other skills-related factors included the loss of skills due to immigration and the lack of specialist skills such as drilling, subsea, cost estimation, and other upstream skills. Participants believe that skills-related

factors could impact quality, schedule, and ultimately project cost because of reliance on foreign skills. Although falling under the procurement category, the lack of local contractors and service providers was also viewed in a similar manner as skills-related risks. Moreover, one of the participants indicated that the "Lack of local complementary industries (like goods and service providers) may lead to higher project costs". Some of the other key internal risks in other categories include but are not limited to subsurface technical risks, equipment failure, lack of communication, lack of technological innovation and management, labour and limited lessons from past projects. Another interesting point raised under management-related risk factors is that “The absence of recent (within the last five years) offshore development projects in South Africa may contribute to underestimation of the duration and cost of finishing an offshore development project in South Africa.”

4.2.2 What are the common risk identification tools?

The survey questions consisted of a closed question aimed to answer research question 2, which sought to identify the most common tools used to identify risks. The participants were also given an opportunity to add any other identification tool over and above those listed on the survey questionnaire. Two (2) participants, 2 participants added identification tools that were not listed on the survey questionnaire. The added identification tool includes independent wholistic analysis of project aspects, previous data, modelling and analogy.

The result in Figure 4-6 demonstrates the prevalence of brainstorming as a predominant risk identification in Oil and Gas projects in South Africa, accounting for 27% of the results, followed by a process flowsheet, work breakdown structure, cause and effect diagram and a combination of various methods, with contributions of 19%, 12%, 12%, and 12 %, respectively. The checklist accounts for 8%, and the balance of the percentage is shared equally between HAZOP and independent and holistic analysis. One of the participants did not indicate that the risk identification tool was used.

The results indicate that the majority of participants from regulators and right holders used brainstorming. On the other hand, the majority of contractor/consultant

participants selected WBs as the risk identification tool. The use of HAZOP and process flow sheets was mainly by participants with an engineering background.

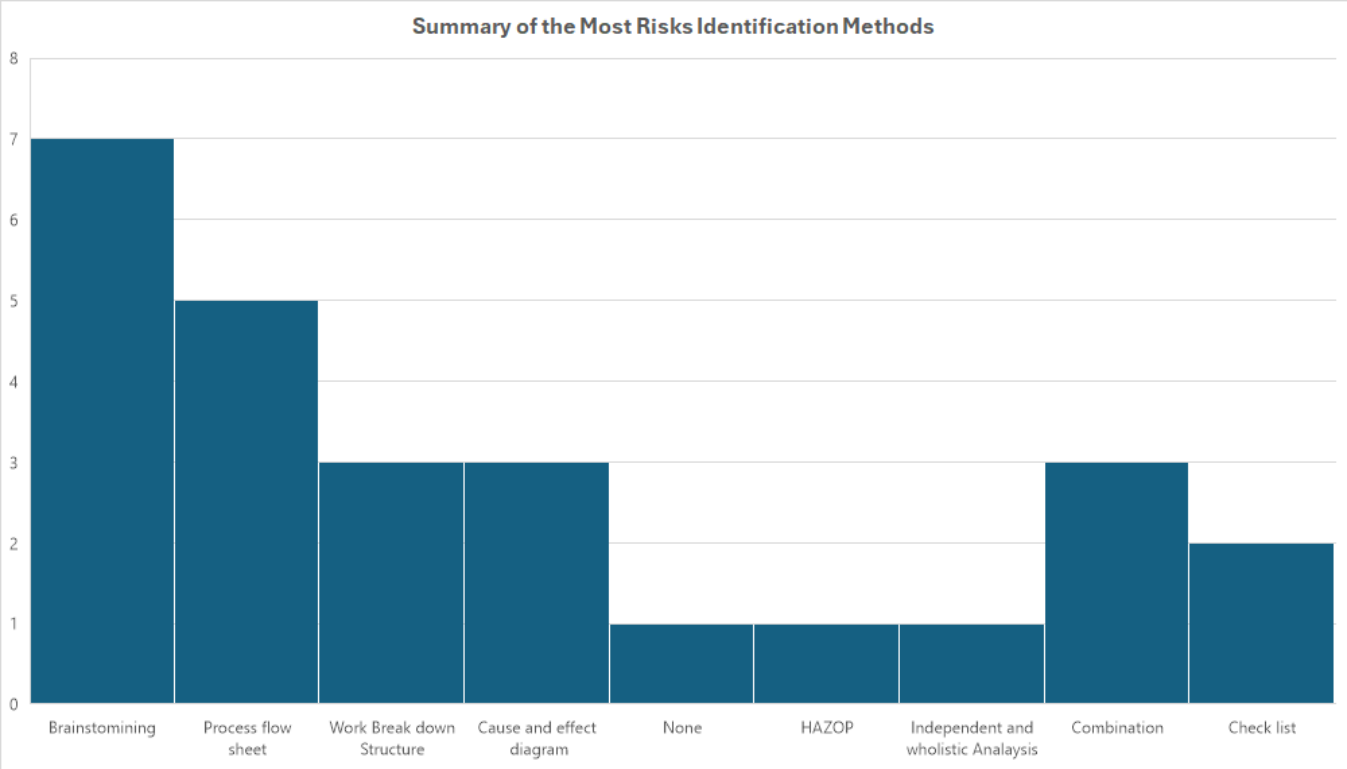

Figure 4-6: Summary of the Most Risks Identification Methods

4.2.3 Do the risk factors significantly change as the project progresses from one phase to another?

To answer the research question, the participants were requested by an open survey question to list risks affecting the exploration and development phase respectively.

Analysis of the data shows that despite the difference in a number of identified factors, there was no significant difference between risk factor descriptions in both the exploration and development phases. Repetition of the risk factors across the two phases was prevalent across various participants. Moreover, some participants clearly indicated that there is no significant difference between exploration and development risks. One interesting comment highlighted by one of the participants is that Exploration and development should be seen as a single continuum in which investors

do not invest in exploration if the scope for development seems to be threatened because the evaluation of an opportunity is done at inception, looking at the whole potential risk matrix from exploration to decommissioning.

In some cases, however, a few risk factors are listed in only one of the project phases. For example, in the exploration phase, the respondents were concerned with “Geological uncertainty that may lead to no or uneconomic hydrocarbons”, whereas, in the development phase, the geological concern was "Geological complexity (faults/connectivity) may result in reduced profits or increased costs”. A similar difference was noticed in the Reservoir/subsurface risks. In another factor relating to human resource skills, there was more emphasis that skills-related factors could impact quality, schedule, and ultimately project cost because of reliance on foreign skills in the development phase of the projects.

From a social risk perspective, the view from one of the respondents is that "Offshore deepwater development (risk of failing to manage labour apprehension of diver-less subsea technology): Previous offshore installation campaigns in South Africa were labour-intensive due to involvement of commercial diving and related services. Currently, the potential oil and gas fields are in deeper water, and commercial diving is not feasible for seabed works. In this case, failure by the production right holder to sufficiently sensitise stakeholders during consultations may lead to concerned organisations/communities instituting disputes over their exclusion from the project.”

During data validation, one of the participants highlighted that “Governments use fiscal incentives and non-stringent regulation in the exploration phase to attract investors. However, when the resources are discovered, states tend to change their regulatory framework to be more stringent to maximise their return on resource exploitation. As a result, companies request fiscal stability agreements upfront to protect or minimise the risk of not realising their investment due to potential changes in the fiscal environment. Furthermore, there tend to be more risks in the development phase where the social licence to operate is required. The government impose more requirements to uplift or upskill the country in the form of social labour plans and compliance with BBBEEE, which is not necessarily required in the exploration phase. Additionally, compliance with environmental regulations tends to be more stringent in the development phase. The regular environmental authorisation audits, emissions

quantifications, and the constant pressure to transition to cleaner energy imposes risks to the investors where the cost of environmental compliance does not only have a financial implication but also reputation risk to investors."

4.3 Are risks in literature applicable to South Africa?

The literature review in Chapter 2 shows that the oil and gas projects face several risk's factors. One of the goals of the literature review section was to identify risk factors identified in previous studies. The risk factors from previous studies, similar to those identified in this study, have been extracted and summarised in Table 4-3. Even though not all risks in the existing literature were listed by participants, the identified risk factors were similar to factors identified in other existing studies.

Table 4-3: Risk in Previous Studies Similar to those Identified in this Study

Reference	Examples of Identified Risk(s) similar to those identified in this study
(Van Thuyet *et al.*, 2007, p. 192)	• Bureaucratic government system, long project approval procedures, • Improper project planning and budgeting and design changes.
(Hatefi, 2018, p. 42)	• Poor or nonexistent project management system in the project, • Bad estimation of scope of work, • Lack of people skills in project leadership
(Basak *et al.*, 2018)	• Delay in material procurement, delivery and poor quality of procured material • Lack of communication, planning, and exchange of data between parties involved • Inadequate experience and knowledge of contractors in estimating time and resources
(Hatmoko and Khasani, 2019)	• The financial capability of the contractor, • Lack of experience of contractors
(Abduljabbar and Breesam, 2022)	• Financial and administrative corruption
(Kraidi *et al.*, 2019)	• Corruption and lawlessness

Reference	Examples of Identified Risk(s) similar to those identified in this study
(Khalilzadeh *et al.*, 2021)	• Failure to attract foreign investors to the project • Lack of necessary regional infrastructure
(A. Kassem *et al.*, 2020)	• Poor project cost estimates and scheduling • Political instability; • Slow decision-making; • Lack of infrastructure projects
(Kassem *et al.*, 2020, p. 2787)	• Economic crisis, • Unstable currency exchange rates, • Lack of infrastructure projects, • Regulatory uncertainty, • Inclement weather • Socioeconomic risks • Local content • Environmental Pressure from environmental protection groups
(Dehdasht *et al.*, 2017)	• Financial (Lack of financial allocation for a project" ..)
Waliu Adeniyi *et al.* (2022, p. 60)	• Poor management • Finance risk
(Mubin and Mannan, 2013, pp. 161-164)	• Poor project management (Planning, scheduling, estimating and controlling)
(Kassem *et al.*, 2019, p. 853)	• Inaccurate project cost estimating • Poor scheduling • Slow decision-making by the government • Country political situation
(Rawat *et al.*, 2023)	• Project cost escalation • Poor project management • Macroeconomic factors change • Government regulations and laws • Contractor and subcontractors issues • Lack of skilled labour
(Kassem, 2022, p. 50)	• Poor project management • Lack of resources

Reference	Examples of Identified Risk(s) similar to those identified in this study
	• Political risk • Country's economy.
(Sohrabi and Noorzai, 2023, pp. 131-135)	• Poor management • Project financial problems • Lack of labour (specialist and non-specialist) • Laws, licensing and regulations challenges • Geopolitical challenges • Financial and market instability
TotalEnergies (2014)	• the geological risks, • failure to find expected commercial quantities of hydrocarbons, • Funding challenges, • environmental factors, • Technological challenges, • market changes, • adverse weather conditions; • compliance with host country governmental requirements, • equipment procurement, • industrial action, • competition, • taxes and royalties

For example, from an external risk perspective, Van Thuyet *et al.* (2007, p. 192) found a bureaucratic government system and lengthy project approvals to be some regulatory-related factors. Regulatory and political related factors were also identified by several authors, such as Kassem *et al.* (2019, p. 853), (Kassem, 2022, p. 50), South Africa (2021), (Rawat *et al.*, 2023), which are consistent with the results of the current study. In addition, Sohrabi and Noorzai (2023, pp. 131-135) raised external factors such as Laws, licensing and regulations and Geopolitical challenges. Social/community factors were listed in a study by Basak *et al.* (2021), even though their complexity may not be similar to those in South Africa.

Economic factors such as funding challenges, market challenges, macroeconomic factors, and unstable Currency exchange rates were highlighted by previous authors such as Sohrabi and Noorzai (2023, pp. 131-135), Kassem (2022, p. 50) Waliu Adeniyi *et al.* (2022, p. 60), TotalEnergies (2014) Hatmoko and Khasani (2019).

Other internal risk factors associated with a lack of skilled and experienced human and service providers/contractors were previously identified by Hatmoko and Khasani (2019), Basak *et al.* (2018) and Rawat *et al.* (2023). Poor project management-related factors were also raised by a number of authors (Sohrabi and Noorzai, 2023, pp. 131-135), (Kassem, 2022, p. 50), Waliu Adeniyi *et al.* (2022, p. 60), (Mubin and Mannan, 2013, pp. 161-164). From a technical perspective, Geological uncertainty and failure to find expected commercial quantities listed by TotalEnergies (2014) are some subsurface factors in the literature.

This illustrates that most of the risks in the literature could emerge in South African oil and project projects. Therefore, the study's results are consistent with the existing literature, as they show that South African projects are exposed to some of the risks identified in the existing literature.

Although the participants raised geopolitical concerns, compared with some of the developing countries, the participants did not raise concerns about factors such as security, instability, and war. This could be because of peace and stability in the country. This is consistent with (Hatefi, 2018), who argued that risk depends on the country, the extent of the industry cluster, the group of involved experts and the time period factors.

5. CHAPTER 5: CONCLUSION

This chapter concludes the document by discussing how the research goal and objectives have been met. It also presents the conclusions and recommendations of the research study. In addition, the chapter presents the contributions of this research towards theory and practice, and finally, it provides recommendations for future research on this subject.

5.1 Research goal and objectives

This study strived to achieve four aims. Firstly, the study aimed to identify risk factors affecting the exploration and developing phases of oil & gas projects in South Africa. Secondly, the identified risk factors were examined to establish if they change as the project moves from exploration to development. Thirdly, data was analysed to establish whether the risks in the literature apply to South Africa. Lastly, the research sought to identify tools used to identify risk factors in South African oil and gas projects.

The research was conducted using a qualitative approach involving a survey questionnaire containing semi-open-ended questions. A combination of convenient and snowball sampling was used to reach the participants. The qualitative data was analysed using categorisation, inference and interpretation strategies. Preliminary results were presented to participants and various groups of industry experts in the South African oil and gas sector.

5.1.1 Risk factors in South African oil and gas projects

The survey questionnaire form used in this study had an open-ended question used to solicit a list of risk factors from a wide range of industry experts. The survey form was designed so that participants could list risk factors for the exploration and development phases, respectively. The process yielded 140 exploration phase risk factors and 110 development factors, which are provided in Annexure C. The risk list was analysed and categorised into two key categories: (a) external and (b) internal”

“External risks included but to limited to (i)economic, (ii)environmental, (iii)social, (iv)Political, and (v) regulatory risks. In contrast, internal risks include (i) geological geophysical and reservoir, (ii)operational, (iii)procurement, (iv) site location, (v)management, procurement and (vi) human resource skills-related factors.

The identified risk factors include regulatory (i.e. regulatory uncertainty, a slow regulatory process, stringent NEMA financial provisioning regulations), social (i.e. public objections), economic (i.e. challenging economic factors), technical (i.e. geological/subsurface uncertainties, geological/subsurface uncertainties), environmental (i.e. Inclined offshore weather, transitioning to zero carbon emissions) and human resource (i.e. lack of experienced human resource skills and local contractors).

Even though the identification of mitigation factors is beyond the scope of this report, the identified risk suggests a need to create an enabling economic, legislation, policy, and regulatory environment. Building local skills and stakeholder engagement will also be paramount.

5.1.2 Do the risk factors significantly change as the project progresses from one phase to another?

The lists of exploration and development phases risk factors were analysed after the risk factors were identified to establish if risk factors change as the project moves from one phase to another.

Data analysis revealed that the identified risk factors do not materially change as the projects move from one exploration phase to the development phase. However, during the data validation process, it was highlighted that the regulatory requirements, such as royalty regimes, environmental requirements, and local content, are more stringent during the development phase. Moreover, one participant strongly believed risk profiles significantly change when projects move to the development phase. Determining the change in risk profile involves quantifying the risk, which was beyond the scope of the current study.

5.1.3 What are the common risk identification tools?

The survey questionnaire contained a question requesting participants to indicate tools each participant uses to identify risks.

The results indicated that participants follow various systematic, structured, and formal approaches to identify the risk factors. The data revealed that various tools are used to identify risk factors, but brainstorming was popular among participants.

Brainstorming is often a multidisciplinary process in which team members identify potential risks from their area of responsibility. The added benefit of the process is that it offers an opportunity for the team to discuss interdependencies and interfaces.

5.1.4 Are risks in literature applicable to South Africa?

A comprehensive literature review was conducted to identify risk factors identified in past oil and gas studies. The risk from the literature was compared with the risk identified in this study.

Despite the remote location of South Africa from the regions with active oil and gas activities, the findings showed that the identified factors were not entirely unique to South Africa. For example, the lack of experienced human resource skills and local contractors in South Africa is consistent with findings from other developing nations. Therefore, South African projects has an opportunity to apply lessons learnt from other parts of the world in managing the identified risk. One of the distinct futures of the result is that the participants were not concerned with factors such as security and political and government instability identified in some of the developing countries. Despite this, South African exploration projects face more delays/challenges than other regional projects.

5.2 Implications of Findings

The identified factors could improve risk management practices in the South African oil and gas sector. The result of this study can aid academics, policymakers, energy companies and contractors in identifying critical risk factors in South African oil and gas projects. Understanding the risk factors will enable both stakeholders to identify areas of collaboration to analyse and manage the risks. It can enable policymakers to identify focus areas necessary to create enabling legislation, policy, and regulatory environment, thereby contributing to the ongoing efforts to encourage the development of the South African oil and gas sector. It also enables the sharing of information and different perspectives from various stakeholders.

From an academic perspective, the results create an awareness of possible risks in the sector and lay a foundation for future research in South African oil and gas project

risk factors. It provides literature insight on risk factors affecting the development of risk in South Africa.

5.3 Research Limitations and recommendations for future research

The study relied on a limited number of participants who used their personal experience and personal judgment to list the risk factors. Even though a saturation point was reached, the list of factors is subjective and cannot be regarded as a complete list of all potential factors because risk is viewed differently depending on the experience of the involved parties.

Moreover, as highlighted by Hatefi (2018, p. 49), risk depends on the country, the extent of the industry cluster, the group of involved experts and the period. Risks are adynamic; therefore, continuous research with a much more comprehensive range of participants is needed to enable better generalisation of the results.

During the data validation process, some participants highlighted the need to analyse the risk and recommend avoidance and mitigation strategies; therefore, future research is needed to assess/quantify the risks and recommend mitigation actions. The total assessment of risk could enable an informed empirical ranking of the risks.

Most of the identified risk factors were categorised under external groups. To this end, it would be essential to examine the relationship between external and internal risk factors to establish if an interrelationship exists.

5.4 Conclusion

In conclusion, this qualitative research achieved its objective and aim of identifying the risk factors faced by the South African oil and gas project. The identified risk factors include regulatory (i.e. Regulatory uncertainty, a slow regulatory process, stringent NEMA financial provisioning regulations), social (i.e. public objections), economic (i.e. challenging economic factors), technical (i.e. geological/subsurface uncertainties, geological/subsurface uncertainties), environmental (i.e. Inclined offshore weather, energy transitioning to zero carbon emissions) and human resource (i.e. lack of experienced human resource skills and local contractors). The research further established that risks do not change with the project phase, that some of the risks in the literature are applicable to South African projects and that brainstorming is the most used risk identification tool by participants.

The results provide critical insights for both literation and application. However, there is a wide range of subjects that future studies can explore. This includes but is not limited to the identification of avoidance and mitigation strategies and assessing the relationship between external and internal risk factors.

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7. ANNEXURE

7.1 Annexure A- Interview /Survey Questions

Informed Consent for participation in an academic research project

Identification of Risk Factors affecting the Development of Upstream Oil and Gas Projects in South Africa

Section A: Introduction

Dear prospective participant,

Please volutaly participate in a Master of Science (MSc) Research project seeking to identify prominent risk factors affecting Upstream Oil & Gas projects in South Africa. Ndavheleseni Sadiki, a student under the supervision of Dr. Tuan, senior academic staff at the University of Cape Town (UCT), are undertaking this research. The study's outcome will be submited to UCT for partial fulfilment of the Master of Sience in Project Management requirements.

It is anticipated that the identification of risk factors will provide valuable insight into the South African Oil & Gas sector.

The researcher has not identified any risks and no sensitive information is required from the participants. Approximately 45 minutes will be sufficient to complete the questionnaire. The participants are futher invited to summit any relavent comments that will aid the study. Your input will be will be protected with unreserved confidentiality.

Do not hesitate to cantact me via email at sdknda001@myuct.ac.za should you require any clarity about the study.

Thank you for your assistance.
Mr. Ndavheleseni Sadiki & Dr Tuan

Please provide your decision about participating in this study below.

Participant:

I_____(Print your name), fully understand the purpose of this research study and hereby **agree/disagree** (tick the most appropriate) to participate in the research.

Signature_____

Signed at_____on this_____Day

of_____Year_____

Researcher:

I, **Ndavheleseni Sadiki (**SDKNDA001**),** undertake to protect the data collected from this study by keeping it private and omitting all references to participant's details.

Signature_____

Researcher: Ndavheleseni Sadiki (SDKNDA001)

Thank you for your assistance.

Mr. Ndavheleseni Sadiki & Dr Tuan

Email: sdknda001@myuct.ac.za/ndavhes@gmail.com

Mobile/WhatsApp: +27721488460

Section B: General Profile of Respondent and Organisation

Please specify your Job Title: ……

How many years of experience do you have in the Oil & Gas Sector?

☐ None ☐ 1-3 years

☐ 4 – 6 Years ☐ 7-10 years

☐ 10 – 15 years ☐ 16 years or more

Have you been involved in either Upstream Exploration and Development Oil & Gas projects in South Africa?

☐ No- (None) ☐ Yes- Both

☐ Yes- Exploration Only ☐ Yes - Only Development

Please specify your highest academic qualification:

☐ Matric Certificate ☐ Diploma

☐ Bachelors Degree ☐ Masters Degree

☐ Doctorate ☐ Other

If other, please specify …….

Please specify your organisation's primary activities:

☐ Right holder ☐ Regulator

☐ Consultant/Contractor ☐ Other

If other, please specify …….

Section C: Risk Factors in Upstream Oil & Gas Projects

Please state the methodology/methodologies used for risk identification in your organisation:

☐	Brainstorming	☐	Wok break down the structure.
☐	Delphi Technique	☐	Process flow sheet
☐	Analogy	☐	Cause and Effect Diagram
☐	Checklist	☐	Project Network

If other, please describe the methodology……

Based on your experience and judgment, please list in order of priority 5- 10 **risk factors that negatively impact the Schedule, Quality, Cost and other project Objectives** of South African Upstream Oil & Gas projects in each of the phases listed below. Alternatively, describe the risk using the following format: *Factor* **A***, may* ***lead to effect X****."*

	Exploration & Appraisal Phase	Development Phase
Risk factors description	*e.g. Lack of experience local specialist skills* *Or* *The Lack of local skills may lead to high Project cost*	
Please indicate the risk categorised used in your organisation.	*e.g Internal & and external*	

7.2 Annexure B- Ethics Approval

UNIVERSITY OF CAPE TOWN
IYUNIVESITHI YASEKAPA · UNIVERSITEIT VAN KAAPSTAD

2023/08/11

EBE/00332/2023

RE: Research Ethics Committee Project Approval Letter

Dear Ndavheleseni Sadiki,

Your application for ethics review of your project titled

IDENTIFICATION OF RISK FACTORS IN THE DEVELOPMENT OF UPSTREAM OIL & GAS PROJECTS IN SOUTH AFRICA

has been reviewed and evaluated by the

Engineering & Built Environment Committee.

You may proceed with your research project titled:

IDENTIFICATION OF RISK FACTORS IN THE DEVELOPMENT OF UPSTREAM OIL & GAS PROJECTS IN SOUTH AFRICA

Please note that should:

(i) any serious or adverse effects to participants occur and/or,

(ii) aspect(s) of your current project change and/or

(iii) any unforeseen events that might affect continued ethical acceptability of the project occur then you should immediately report this to the approving REC. You may be required to submit an amendment to this application, in order to determine whether the changed aspects increase the ethical risks of your project.

Based on the information supplied your application has been successful and is approved.

Please note the following additional conditions associated with this approval:

(i)

Regards,

Engineering & Built Environment Committee.

7.3 Annexure C : Results Summary –Risks Factors

Exploration Phase Risks	**No.**	**Exploration Phase Risk Factors**	**No**	**Development Phase Risk Factors**
	140		110	
External Risks	87		55	
Economic Related Risks	19	1) Price risk: it will be difficult for oil/gas companies to invest in the country 2) Financial capabilities 3) Dependency for energy security 4) Lack of funding 5) Lack of funding/capital may lead to prospects not being pursued or lost to others 6) Changing Macroeconomic factors 7) Delaying operation to commence which in turn negatively affect the investors. 8) High costs and affordability of exploration and appraisal limiting activities and chance of a successful development. 9) Exogenous Factors such as the ZAR/USD exchange rate may lead to high Project Cost. drilling rigs for example are contracted internationally 10) The ability to secure debt funding/partnerships to share the risk may impact the achievement of the overall exploration project. 11) Securing an offtaker/processing facility to receive the oil/gas, will influence whether the project continues 12) Offshore oil and gas (risk of failing to secure funding for the exploration work program) 13) High cost of survey data acquisition and subsequent data processing may lead to repeated postponement of exploration plans and non-fulfilment of the required minimum work commitment as per the conditions of Exploration Right.	15	1) Availability of funding due to environmental resistance 2) poor returns on investment of previous development projects 3) Challenging economic conditions 4) Lack of funding 5) Lack of funding 6) Changing Macroeconomic factors 7) An onerous tax regime may lead to high project costs. 8) High costs and affordability of exploration and appraisal limiting activities and chances of a successful development 9) Exogenous Factors such as the ZAR/USD exchange rate may lead to high Project Cost. drilling rigs and infrastructure equipment/material for example are contracted internationally 10) The ability to secure debt funding/partnerships to share the risk may impact the achievement of the overall development project 11) A lack of facilities for oil and gas storage and processing can lead to divestment or Lack of progression in development 12) The Lack of local investment capabilities 13) Deepwater developments is VERY costly and requires a high IRR in order to justify the risks. 14) Escalation and rate of exchange 15) Lack of funds to support capital intensive exploration and development projects

		14) Funding - A lack of government funding leads to less projects being prioritised. 15) Competing national capital projects (Energy), as a result of lack item 5 above 16) Lack of funds to support capital intensive exploration and development projects 17) No / limited Exploration budget set aside due to competing projects with lower risk and lower gross margins 18) RSA Economic landscape (economic demands due to unsustainable policies) 19) Changing Macroeconomic factors		
Environmental Related Risks	7	1) Difficult offshore conditions - high seas/deep water 2) Weather incidents and climate changes may increase costs and disrupt scheduled 3) External Hazard risks – unpredictable external hazard risks such as storms, floods, earthquakes, and other natural disasters may negatively affect exploration 4) Condition of the ocean e.g. waiting on weather 5) Just Energy Transition 6) Unexpected bad weather may lead to delayed completion of offshore surveys and cost overruns. 7) The progression of greener energy development and sustainability can hinder the development of oil and gas projects. As this may be a priority for a first world country or nation, as a third world nation, South Africa is always playing catchup and has not reached it's energy demand and supply balance to move to greener energy in the time span that the world requires	8	1) Environmental risk: impacts of oil/ gas production on the environment 2) The challenging and sometimes uncertain offshore environment as regards water depths, and wind, wave and current climate 3) Challenging environmental conditions 4) Difficult offshore conditions - high seas/deep water 5) Weather incidents 6) Unexpected bad weather may lead to prolonged drilling of offshore wells and cost overruns 7) South African continental shelf is frequented by the Mozambique currents and the Agulhas currents. Also, there are eddie currents near the seabed and unpredictable midwater currents. one or a combination of these currents may severely overcome the ability of drilling rig to continue drilling activities and also the ability of subsea installation vessel/barge to continue with installation work 8) Geohazards and environmental risk can lead to operations either coming to a halt if not operated by a major oil and gas company such as Shell or Total Energies who can develop technologies
Political and Regulatory	42	1) Regulatory uncertainty to approve exploration activities 2) Delay in formulating national E&P policy 3) Non supportive Legal and social system	21	1) Lengthy Government approvals - project delays/project failure/project over runs 2) Delay in government approvals of certain activities

		4) Corruption and non transparent process 5) Changes to legislation (UPRDA/MPRDA) 6) Poorly implemented legislation 7) Geo-political shifts may result in suppliers reluctance to part-take in South Africa or involving country A results in country B pulling out. 8) Regulatory uncertainty may chase investors to other countries. 9) Legal - may arise from legal and regulatory duties 10) Political risks 11) Changing legal environment 12) Permits from authorities 13) Duration and uncertain outcome of ESIA studies 14) Poor regulation quality may lead to delays to project delivery and high project cost. 15) Non-compliance by operators may lead to loss of social and/or legal license to operate. 16) Weak contract laws may discourage the formation of joint ventures. 17) Regulators' approvals taking long; 18) Delays in the approval of permits/licenses 19) Uncertainty (and limited) Upstream Petroleum regulations may increase litigation and slow execution of the Work Programs 20) Offshore oil and gas (risk of making incurring an investment loss due to changes in law) 21) The delayed finalisation (promulgation) of the upstream petroleum bill may give reason to Exploration Rights holders to delay exploration programs due to Lack of certainty about future changes in law and fiscal regime 22) Onshore Gas (risk of licence/permit expiry before completing the work program) 23) The delayed finalisation (promulgation) of the upstream petroleum bill may give reason to Exploration Rights holders to		3) Risk of government not negotiating favourably the state's interest 4) Unclear involvement of South African government agencies in development opportunities 5) Poorly implemented legislation 6) Geo-political shifts 7) Regulatory uncertainty 8) Political risks 9) Changing legal environment 10) The caveat of the legislation to ringfence the funds for the development activities which ended up being used for something else instead of the work programme activities approved 11) Regulators' approvals taking long 12) Political leaders and community leaders to make false promises to communities about the benefits the will be made possible by the project 13) Uncertainty in legislation and thus commercial terms and outcomes deters investors. (Changes in the MPRDA was proposed in 2013 and is not yet promulgated) 14) Lack of government support to monetise indigenous gas - no support in providing a local market for gas discoveries 15) Environmental litigation 16) Restricted access to public information - POPI Act 17) Regulatory uncertainty 18) Politics vs sound business case - project failure / time and costs wasted 19) Corruption - if decision makers are not benefitting, projects don't go ahead 20) Regulatory uncertainty: Leads to slow investment decisions and makes it more difficult to raise capital 21) Slow regulatory process: Leads long delayed project developments, often resulting in missed commodity cycles

		delay exploration programs due to Lack of certainty about future changes in law and fiscal regime. 24) The currently delayed finalisation of Government-led Gas Master Plan may wad-off potential investors from choosing South African gas market. 25) Delay in enacting appropriate Bills and Acts - this leads to divestment of operating companies. 26) Uncertainty in legislation and thus commercial terms and outcomes deters investors. 27) Lack of government support to monetise indigenous gas 28) Incomplete Oil & Gas Legislative Framework (Upstream Petroleum Resources Development Bill and accompanying Regulations) - makes it difficult to evaluate projects and attract funding 29) Financial Provisioning Regulations that are not suitable for Oil & Gas - causes marginal projects to become uneconomic as the extractive industry type of provisioning is not practicable for Oil & gas 30) Marine Spatial Planning Process that could potentially limit scope of Oil & Gas activity in SA - if the MSP process continues in the current trajectory the ability of the oil and gas industry to expand in the future will be severely limited 31) Draft Marine Sector Plans that prohibit the laying of Oil & Gas Pipelines in vast areas of the SA offshore to protect certain Critical Biodiversity Areas - this would render some projects that aim to bring hydrocarbons onshore unviable 32) Item 2 above, may be due to Lack of or no local exploration activity by SOE 33) Skewed preference on local content shareholding to politically connected, rather than academia and capable BBBEE SMME's 34) No government's implementable strategy, either being on an NOC to NOC or PPP(public private partnership) basis		

		35) Restricted access to public information - POPI Act 36) Lengthy Government approvals - project delays/project failure/project over runs 37) Politics vs sound business case - project failure / time and costs wasted 38) Uncertainty in legislation - UPRDB in limbo for the last 10 years - companies too afraid to invest in such uncertainty 39) Corruption - if decision makers are not benefitting, projects don't go ahead 40) Regulatory uncertainty: Leads to slow investment decisions and makes it more difficult to raise capital 41) Slow regulatory process: Leads long delayed project developments, often resulting in missed commodity cycles 42) RSA Political landscape (Corruption, unpredictability, too many red-tapes)		
Social Risks	19	1) Environmental lobbyists risk: challenges the exploration activities 2) Risk of environmental litigation and impact on schedule 3) Protest from environmental activists 4) Environmental interest groups may delay starting of projects and push costs up. 5) Anti-development interests groups may lead to exploration being done in neighbouring countries and not RSA 6) Lack of stakeholder management e.g. lobbying environmentalist 7) Civil group and environmental lobbyist objecting oil and gas development. Delaying operation to commence which in turn negatively affect the investors. 8) NGOs challenging regulators' decisions in courts;	11	1) Protest from environmental activists 2) anti-development 3) Lack of stakeholder management e.g. Contractors 4) NGOs challenging regulators' decisions in courts; 5) Offshore deepwater development (risk of failing to manage labour apprehension of diver-less subsea technology):Previous offshore installation campaigns in South Africa were labour-intensive due to involvement of commercial diving and related services. At the moment, the potential oil and gas fields are in deeper water where commercial diving is not feasible for seabed works. In this case, failure by the Production Right holder to sufficiently sensitise stakeholders during consultations may lead to concerned organisations/communities instituting disputes over their exclusion from the project.

		9) Protests and legal action by anti-fossil fuel groups may lead to delays in stakeholder consultations, thereby delaying offshore surveys. 10) Prolonged disputes over land rights (where farmers want to be compensated for gas under their farms) may delay access to onshore gas exploration sites. 11) Lobbyists leads to a halt in the industry delaying operations such as seismic surveying and drilling wells. 12) Opposition to hydrocarbon exploration 13) Offshore development and exploration industry not well established in SA 14) Disruptive interference by interest groups opposed to fossil fuels, including court action that stops oil & gas projects - slows down projects and repels potential investors 15) Public objections to oil and gas development 16) Environmental litigation 17) Lengthy public consultation processes 18) Obtaining stakeholder buy-in or a social license to operate 19) Environmental Groups block projects due to Lack of knowledge and being subsidised by renewable Climate Change Opposition: Leads to frequent disruption of exploration and development programs, the undermining of security of tenure and increases costs		6) Production Right holder to ensure that any myths and false perceptions/promises are cleared during stakeholder consultation sessions, prior to project implementation. Failure by the Production Right holder to address community concerns may lead to fabrication works being delayed due to industrial actions, because fabrication sites are where communities can get access to. 7) Opposition to hydrocarbon exploration and development due to its negative impact on the environment leads to project delays and additional costs 8) Public objections to oil and gas development 9) Lengthy public consultation processes 10) Environmental Groups block projects due to Lack of knowledge and being subsidised by renewable 11) Climate Change Opposition: Leads to frequent disruption of exploration and development programs, the undermining of security of tenure and increases costs
Internal Risks	53		55	
GG&R Reservoir	10	1) Geological risk which pose difficulties in extracting and accessing significant gas/finds 2) Exploration drilling that poses failure to find commercial quantities of hydrocarbons 3) Geological uncertainty may lead to no or uneconomic hydrocarbons 4) Reserves not being realised (Subsurface risks)	5	1) Challenging geotechnical conditions 2) Geological complexity (faults/connectivity) may result in reduced profits or increased costs. 3) Reservoir complexities (water flooding, gas ratio for oil wells; pressure requirements) may lead to low profits/high additional costs.

		5) Drilling Risks 6) Geological risks 7) Lack of Experienced geological specialists may lead to ineffective models which may lead to poor quality reservoir discoveries. 8) Drilling of dry holes 9) The estimated low volumes of gas-in-place (estimated by the Petroleum Agency) may fail to compel Right Owners to use of high density survey technologies which are necessary for better quantification of available hydrocarbons., leading to poor data acquisition programs. 10) Geological formations within the region - for offshore development - majority or high volume reserves in South Africa are classified as deep sea, and/or tight formations, which are high risk and expensive to develop		4) The size of the resource that is being extracted; the cost of operations today requires large enough resources to make extracting it financially feasible 5) There remain subsurface technical risks that may cause the project not to perform as expected post development (i.e. reservoir compartmentalisation)
HR Skills Related Risks	13	1) Skilled manpower and competence availability 2) Lack of oil and gas skills in South Africa 3) Lack of experience and expertise in cost estimation, drilling 4) and expertise in subsurface 5) Lack of Experienced geological specialists may lead to ineffective models which may lead to poor quality reservoir discoveries. 6) lack of local skills 7) Limited Upstream specialists in the local market may impact Project Schedule, Cost and Quality. 8) QA/QC 9) Lack of local skills and contractors leads to increased costs and project delays 10) Limited or no skills development in offshore, including petrochemical value chain 11) Exploration and development done by multinational Oil & Gas does not support local skills and job opportunities.	17	1) Relatively limited overseas specialist experience offshore SA due to limited number and range of projects offshore South Africa 2) Loss of local specialist offshore engineering skills due to emigration 3) Relatively limited local offshore experience due to limited number of offshore development projects 4) Lack of transfer of skills, experience and responsibility to South Africans 5) Lack of oil and gas skills in South Africa 6) Lack of experience and expertise in cost estimation, subsea engineering and project management 7) Local skills base eroded; 8) work permits for foreign skilled nationals 9) resource constraints 10) Lack of experienced engineers may lead to poor quality wells and suboptimal production of resources. 11) lack of proper educational structures in STEM subjects

		12) Lack of Training and skills transfer - IOCs utilise their own country's expertise - regulation not geared for training - project over runs 13) Lack of institutional oil & gas experience and understanding: Leads to more difficulties in raising capital locally		12) A lack of local specialist skills and experience in both upstream and downstream can lead to a delay in progression and the need to "import" these skills which do not get transferred locally 13) Lack of Training and skills transfer - IOCs utilise their own country's expertise - regulation not geared for training - project over runs 14) Lack of institutional oil & gas experience and understanding: Leads to more difficulties in raising capital locally 15) Lack of specialty skills (Drilling, Subsea Engineering, Offshore Costing) - leads to high Project Cost and Schedules. 16) Usually, these projects are Mega-Projects, which happen once in a long time, skills transfers is very rare. No opportunity to learn 17) Lack of relevant evaluation matrix for individual projects (Investment Projects vs strategic Projects vs sustainability projects)
Management Related Risks	9	1) Cost - poor or inaccurate planning may lead to spending more money on a project 2) Lack of proper planning or scheduling 3) Inability to manage interface between subsurface/subsea and infrastructure. 4) Lack of stakeholder management e.g. lobbying environmentalist 5) Lack of quality control and assurance 6) Oil and Gas (risk of schedule delays and cost increase) 7) Scope 8) Supply chain management 9) Team collaboration	8	1) Lack of Communication in a project may potentially lead to misunderstandings that could lead to delays, rework, or even project failure 2) Failure to clearly define the scope may lead to scope creep, and the scope can expand beyond the initially defined scope 3) The inability to identify and manage skills and resources can have a negative impact, including delays in project timelines, increased costs, lower quality outputs, and decreased stakeholder satisfaction 4) Schedule Risk - any slips in schedule often increase costs 5) Poor or inaccurate planning may lead to spending more money on a project 6) Lack of proper planning or scheduling 7) Inadequate Project Management oversight leading to delays in schedule, reduced Quality on deliverables and potential cost increase 8) The absence of recent (within the last 5 years) offshore development projects in South Africa may contribute to underestimation of the duration and cost of finishing an offshore development project in South Africa

Operational Risks	5	1) Operational issues - poor implementation and process problems may lead to operational issues 2) Technology risk - potential financial and operational risks can arise from using new technology in a project 3) Drilling Risks 4) Complexity of the project 5) Potential blowouts, environmental incidents or other safety related risks	7	1) Equipment failure 2) Success may lead to beyond design life for some equipment. 3) Complexity of the project 4) Lack of technological innovation may make it prohibitively expensive to develop discoveries in harsh environments. 5) Potential blowouts, environmental incidents or other safety related risks 6) Health and safety risk: pose to operations and/or regulatory inspectors 7) Accidents may delay incom
Procurement Related Risks	9	1) Availability of Rig 2) logistics constraints 3) limited number of consultants and contractors with upstream experience in the country/region 4) Most materials required are sourced externally and costs therefore dependent on volatile exchange rates 5) A lack of facilities for upstream activities such as drilling ships and seismic vessels can delay the progression of upstream activities. 6) Supply chain management 7) Experienced contractors 8) Local Company Maturity - Upstream Projects (Exploration or development) are not like typical Projects, they require special skills, different project procedures, etc, thus resulting in re-works, and delayed processes due to Lack of understanding 9) A lack of facilities for upstream activities, such as drilling ships and seismic vessels, can delay the progression of upstream activities	12	1) Availability of services and labour 2) the Lack of substantial, established and experienced local capabilities in engineering, manufacturing, fabrication and marine construction 3) the absence of established company partnering arrangements and working practices needed for effective joint operating agreements 4) marine engineering industry severely cut back due to Lack of upstream development over recent decades 5) logistics constraints 6) port planning 7) Lack of local complementary industries (like goods and service providers) may lead to higher project costs. 8) Most materials required are sourced externally and costs therefore dependent on volatile exchange rates 9) Lack of local skills and contractors leads to increased costs and project delays 10) Competence of contractors used 11) Lack of resources, locally (Vessels, drilling rigs,) - leads to global importation which is costly and time-consuming. 12) Lack of local fabrication capacity (X-mas trees, subsea structures) - leads to global importation which is costly and time-consuming

Site Location Related Risks	7	1) The country is isolated, so the cost of services is high 2) The remoteness of RSA may push costs up. 3) Geographical isolation of South Africa 4) Global position of RSA - because of where RSA is located, this poses a business risk for vessel owners, hence for every project, one could expect an added premium to the vessel rates 5) Main oil exploration targets is in ultra deepwater environments which is very expensive and high risk. Only a few international companies have the appetite for this 6) Lack of or no local exploration activity by SOE 7) Lack of oil & gas infrastructure: Leads to slower and more expensive developments	6	1) Limited upstream activity 2) Geographic location away from existing developed oil and gas basins, and centres of established engineering and manufacturing 3) The Lack of a critical mass of local oil and gas offshore developments needed to create a thriving supply chain covering all phases of development 4) Remoteness 5) Offshore development and exploration industry not well established in SA - leads to increased costs 6) Lack of oil & gas infrastructure: Leads to slower and more expensive developments

7.4 Annexure D- Filled questionnaire forms extract

ID	Paricipant 1
Please specify your Job Title	General Manager: Regulatory and legal Affairs
How many years of experience do you have in the Oil & Gas Sector?	10-15 years
Have you been involved in Upstream Exploration and Development Oil & Gas Projects in South Africa?	Yes - Only been involved in Exploration project/s
Please specify your highest academic qualification.	Masters Degree
Please specify your organisation's primary activities.	Regulator
Please state the methodology/methodologies used for risk identification in your organisation.	Process flow sheet
Based on your experience and judgment, please list in order of priority 5- 10 risk factors that negatively impact the Schedule, Quality, Cost and other project Objectives of South African Upstre...	#Regulatory uncertainty to approve exploration activities #Geological risk which pose difficulties in extracting and accessing significant gas/finds #Exploration drilling that pose failure to find commercial quantities of hydrocarbons #Environmental lobbyists risk: challenges the exploration activities #Price risk: it will be difficult for oil/gas companies to invest in the country
Based on your experience and judgment, please list in order of priority 5- 10 risk factors that negatively impact the Schedule, Quality, Cost and other project Objectives of South African Upstre...2	#Environmental risk: impacts of oil/ gas production on the environment #Health and safety risk: pose to operations and/or regulatory inspectors # delay in government approvals of certain activities: timeouts processing of application pertaining to certain activities # risk of government not negotiating favourably the state's interest
Please add any comments relevant comments that may aid the study	Government's role in attracting investment without compromising oil and gas business

ID	Paricipant 2
Please specify your Job Title	Chief Geoscientist
How many years of experience do you have in the Oil & Gas Sector?	16 years or more
Have you been involved in Upstream Exploration and Development Oil & Gas Projects in South Africa?	Yes - Have been involved in both Exploration and Development Projects
Please specify your highest academic qualification.	Masters Degree
Please specify your organisation's primary activities.	E&P national company (NOC)
Please state the methodology/methodologies used for risk identification in your organisation.	Process flow sheet
Based on your experience and judgment, please list in order of priority 5- 10 risk factors that negatively impact the Schedule, Quality, Cost and other project Objectives of South African Upstre...	1. Delay in formulating national E&P policy 2. Skilled manpower and competence availability 3. Financial capabilities 4. Non supportive Legal and social system 5. Dependency for energy security 6. Corruption and non transparent process
Based on your experience and judgment, please list in order of priority 5- 10 risk factors that negatively impact the Schedule, Quality, Cost and other project Objectives of South African Upstre...2	Same as above
Please add any comments relevant comments that may aid the study	NIL

ID	Paricipant 3
Please specify your Job Title	Business Development Manager
How many years of experience do you have in the Oil & Gas Sector?	16 years or more
Have you been involved in Upstream Exploration and Development Oil & Gas Projects in South Africa?	Yes - Only been involved in Development project/s
Please specify your highest academic qualification.	Masters Degree
Please specify your organisation's primary activities.	Funding
Please state the methodology/methodologies used for risk identification in your organisation.	Structure Due Diligence based on checklist
Based on your experience and judgment, please list in order of priority 5-10 risk factors that negatively impact the Schedule, Quality, Cost and other project Objectives of South African Upstre...	Risk of environmental litigation and impact on schedule Changes to legislation (UPRDA/MPRDA) Country is isolated so cost of services is high
Based on your experience and judgment, please list in order of priority 5-10 risk factors that negatively impact the Schedule, Quality, Cost and other project Objectives of South African Upstre...2	Availability of funding due environmental resistance Availability of services and labour Limited upstream activity
Please add any comments relevant comments that may aid the study	

ID	Participant 4
Please specify your Job Title	Subsea Engineering Manager (Retired)
How many years of experience do you have in the Oil & Gas Sector?	16 years or more
Have you been involved in Upstream Exploration and Development Oil & Gas Projects in South Africa?	Yes - Only been involved in Development project/s
Please specify your highest academic qualification.	Bachelors Degree
Please specify your organisation's primary activities.	Consultant/Contractor
Please state the methodology/methodologies used for risk identification in your organisation.	Hazard identification and risk assessment of all aspects of a project from concept selection to operation
Based on your experience and judgment, please list in order of priority 5- 10 risk factors that negatively impact the Schedule, Quality, Cost and other project Objectives of South African Upstre...	The following factors will result in negative schedule and cost effects on any upstream oil and gas projects offshore South Africa: - geographic location away from existing developed oil and gas basins, and centres of established engineering and manufacturing - the challenging and sometimes uncertain offshore environment as regards water depths, and wind, wave and current climate - the lack of substantial, established and experienced local capabilities in engineering, manufacturing, fabrication and marine construction - the lack of a critical mass of local oil and gas offshore developments needed to create a thriving supply chain covering all phases of development - the absence of established company partnering arrangements and working practices needed for effective joint operating agreements - poor returns on investment of previous development projects - unclear involvement of South African government agencies in development opportunities
Based on your experience and judgment, please list in order of priority 5- 10 risk factors that negatively impact the Schedule, Quality, Cost and other project Objectives of South African Upstre...2	The following factors will result in negative schedule and cost effects on any upstream oil and gas projects offshore South Africa: - geographic location away from existing developed oil and gas basins, and centres of established engineering and manufacturing - the challenging and sometimes uncertain offshore environment as regards water depths, and wind, wave and current climate - the lack of substantial, established and experienced local capabilities in engineering, manufacturing, fabrication and marine construction - the lack of a critical mass of local oil and gas offshore developments needed to create a thriving supply chain covering all phases of development - the absence of established company partnering arrangements and working practices needed for effective joint operating agreements - poor returns on investment of previous development projects - unclear involvement of South African government agencies in development opportunities
Please add any comments relevant comments that may aid the study	International oil and gas development companies claim to be devoting a greater percentage of their investment capital to non-oil and gas renewable energy projects. Consequently oil and gas investments tend to be focused on locations where returns are greatest, and unfortunately that is not South Africa at the moment, partly for the reasons given under 9. above but also for the current political and economic climate in Southern Africa.

ID	Participant 5
Please specify your Job Title	Managing Director
How many years of experience do you have in the Oil & Gas Sector?	16 years or more
Have you been involved in Upstream Exploration and Development Oil & Gas Projects in South Africa?	Yes - Only been involved in Development project/s
Please specify your highest academic qualification.	Doctorate
Please specify your organisation's primary activities.	Consultant/Contractor
Please state the methodology/methodologies used for risk identification in your organisation.	Combination of some of the above
Based on your experience and judgment, please list in order of priority 5-10 risk factors that negatively impact the Schedule, Quality, Cost and other project Objectives of South African Upstre...	Responding only for Development Projects
Based on your experience and judgment, please list in order of priority 5-10 risk factors that negatively impact the Schedule, Quality, Cost and other project Objectives of South African Upstre...2	Challenging economic conditions Challenging geotechnical conditions Challenging environmental conditions Relatively limited overseas specialist experience offshore SA due to limited number and range of projects offshore South Africa Loss of local specialist offshore engineering skills due to emigration Relatively limited local offshore experience due to limited number of offshore development projects Lack of transfer of skills, experience and responsibility to South Africans
Please add any comments relevant comments that may aid the study	It is essential that South Africans are involved in the exploration and development of offshore projects, together with overseas specialists and that there is a steady transfer of experience, skills and most importantly responsibility to South Africans.

ID	Participant 6
Please specify your Job Title	QA Manager
How many years of experience do you have in the Oil & Gas Sector?	10-15 years
Have you been involved in Upstream Exploration and Development Oil & Gas Projects in South Africa?	Yes - Have been involved in both Exploration and Development Projects
Please specify your highest academic qualification.	Bachelors Degree
Please specify your organisation's primary activities.	National Oil and Gas Company
Please state the methodology/methodologies used for risk identification in your organisation.	Brainstorming
Based on your experience and judgment, please list in order of priority 5- 10 risk factors that negatively impact the Schedule, Quality, Cost and other project Objectives of South African Upstre...	Lack of funding Difficult offshore conditions - high seas/deep water Protest from environmental activists Lack of oil and gas skills in South Africa Poorly implemented legislation
Based on your experience and judgment, please list in order of priority 5- 10 risk factors that negatively impact the Schedule, Quality, Cost and other project Objectives of South African Upstre...2	Lack of funding Difficult offshore conditions - high seas/deep water Protest from environmental activists Lack of oil and gas skills in South Africa Poorly implemented legislation
Please add any comments relevant comments that may aid the study	Delays in the UPRDA Bill is hampering the exploration and development of the Oil and Gas industry in South Africa. This leaves the whole process rudderless, which result in delays of projects.

ID	Participant 7
Please specify your Job Title	Drilling Engineer
How many years of experience do you have in the Oil & Gas Sector?	16 years or more
Have you been involved in Upstream Exploration and Development Oil & Gas Projects in South Africa?	Yes - Have been involved in both Exploration and Development Projects
Please specify your highest academic qualification.	Masters Degree
Please specify your organisation's primary activities.	Right holder
Please state the methodology/methodologies used for risk identification in your organisation.	Brainstorming
Based on your experience and judgment, please list in order of priority 5- 10 risk factors that negatively impact the Schedule, Quality, Cost and other project Objectives of South African Upstre...	Geological uncertainty may lead to no or uneconomic hydrocarbons Lack of funding/capital may lead to prospects not being pursued or lost to others Geo-political shifts may result in suppliers reluctance to part-take in South Africa or involving country A results in country B pulling out. Remoteness of RSA may push costs up. Environmental interest groups may delay starting of projects and push costs up. Anti-development interests groups may lead to exploration being done in neighboring countries and not RSA Regulatory uncertainty may chase investors to other countries. Weather incidents and climate changes may increase costs and disrupt scheduled
Based on your experience and judgment, please list in order of priority 5- 10 risk factors that negatively impact the Schedule, Quality, Cost and other project Objectives of South African Upstre...2	Geological complexity (faults/connectivity) may result in reduced profits or increased costs. Reservoir complexities (water flooding, gas ratio for oil wells; pressure requirements) may lead to low profits/high additional costs. Lack of funding; Geo-political shifts; remoteness; anti-development; regulatory uncertainty ; weather incidents as above. Equipment failure may add on costs. Accidents may delay income. Success may lead to beyond design life for some equipment.
Please add any comments relevant comments that may aid the study	Risks not in order of priority though!

ID	Participant 8
Please specify your Job Title	Project Engineer
How many years of experience do you have in the Oil & Gas Sector?	10-15 years
Have you been involved in Upstream Exploration and Development Oil & Gas Projects in South Africa?	Yes - Only been involved in Development project/s
Please specify your highest academic qualification.	Masters Degree
Please specify your organisation's primary activities.	Right holder
Please state the methodology/methodologies used for risk identification in your organisation.	Brainstorming
Based on your experience and judgment, please list in order of priority 5- 10 risk factors that negatively impact the Schedule, Quality, Cost and other project Objectives of South African Upstre...	1.Operational issues - poor implementation and process problems may lead to operational issues 2.Technology risk - potential financial and operational risks can arise from using new technology in a project 3.Legal - may arise from legal and regulatory duties 4.External Hazard risks – unpredictable external hazard risks such as storms, floods, earthquakes, and other natural disasters may negatively affect exploration 5.Cost - poor or inaccurate planning may lead to spending more money on a project
Based on your experience and judgment, please list in order of priority 5- 10 risk factors that negatively impact the Schedule, Quality, Cost and other project Objectives of South African Upstre...2	1.Lack of Communication in a project may potentially lead to misunderstandings that could lead to delays, rework, or even project failure 2.Failure to clearly define the scope may lead to scope creep and the scope can expand beyond the initially defined scope 3.The inability to identify and manage skills resource can have a negative impact including delays in project timelines, increased costs, lower quality outputs, and decreased stakeholder satisfaction 4.Schedule Risk - any slips in schedule often increase costs 5.Poor or inaccurate planning may lead to spending more money on a project
Please add any comments relevant comments that may aid the study	

ID	Participant 9
Please specify your Job Title	Acting Chief Risk and Compliance Officer
How many years of experience do you have in the Oil & Gas Sector?	16 years or more
Have you been involved in Upstream Exploration and Development Oil & Gas Projects in South Africa?	Yes - Have been involved in both Exploration and Development Projects
Please specify your highest academic qualification.	Masters Degree
Please specify your organisation's primary activities.	Manufacturer
Please state the methodology/methodologies used for risk identification in your organisation.	HAZOP, Root Cause, Enterprise Risk Management, FMEA, TRA, MHI, HRA, HIRA, cause and effect, checklist, WBS etc
Based on your experience and judgment, please list in order of priority 5-10 risk factors that negatively impact the Schedule, Quality, Cost and other project Objectives of South African Upstre...	Lack of proper planning or scheduling Lack of experience and expertise in cost estimation Lack of experience and expertise in drilling Lack of experience and expertise in subsurface Reserves not being realised. Subsurface risks Drilling Risks Availability of Rig Geological risks Condition of the ocean e.g. waiting on weather Inability to manage interface between subsurface/subsea and infrastructure. Lack of stakeholder management e.g. lobbying environmentalist Lack of quality control and assurance Political risks Changing legal environment Changing Macroeconomic factors Complexity of the project
Based on your experience and judgment, please list in order of priority 5-10 risk factors that negatively impact the Schedule, Quality, Cost and other project Objectives of South African Upstre...2	Lack of proper planning or scheduling Lack of experience and expertise in cost estimation Lack of experience and expertise in subsea engineering Lack of experience and expertise in project management Inability to manage interfaces between subsurface/subsea and infrastructure. Lack of stakeholder management e.g. Contractors Lack of quality control and assurance Lack of proper constituted project team (all disciplines need to be catered for). Political risks Changing legal environment Changing Macroeconomic factors Complexity of the project
Please add any comments relevant comments that may aid the study	Proper alignment between the Exploration and Development needs to be understood and socio-economic factors needs to be taken into consideration before any exploration or surveys can be done. All stakeholders need to be engaged and managed throughout the project.

ID	Participant 10
Please specify your Job Title	Marine construction consultant
How many years of experience do you have in the Oil & Gas Sector?	16 years or more
Have you been involved in Upstream Exploration and Development Oil & Gas Projects in South Africa?	Yes - Have been involved in both Exploration and Development Projects
Please specify your highest academic qualification.	Bachelors Degree
Please specify your organisation's primary activities.	Consultant/Contractor
Please state the methodology/methodologies used for risk identification in your organisation.	Cause and Effect Diagram
Based on your experience and judgment, please list in order of priority 5-10 risk factors that negatively impact the Schedule, Quality, Cost and other project Objectives of South African Upstre...	Permits from authorities; Duration and uncertain outcome of ESIA studies; Govt Policy uncertainty; logistics constraints; geographical isolation of South Africa; Just Energy Transition
Based on your experience and judgment, please list in order of priority 5-10 risk factors that negatively impact the Schedule, Quality, Cost and other project Objectives of South African Upstre...2	Local skills base eroded; work permits for foreign skilled nationals; marine engineering industry severely cut back due to lack of upstream development over recent decades; logistics constraints; port planning and resource constraints
Please add any comments relevant comments that may aid the study	

ID	Participant 11
Please specify your Job Title	Drilling Engineer
How many years of experience do you have in the Oil & Gas Sector?	10-15 years
Have you been involved in Upstream Exploration and Development Oil & Gas Projects in South Africa?	Yes - Have been involved in both Exploration and Development Projects
Please specify your highest academic qualification.	Bachelors Degree
Please specify your organisation's primary activities.	Right holder
Please state the methodology/methodologies used for risk identification in your organisation.	Brainstorming
Based on your experience and judgment, please list in order of priority 5- 10 risk factors that negatively impact the Schedule, Quality, Cost and other project Objectives of South African Upstre...	1. Poor regulation quality may lead to delays to project delivery and high project cost. 2. Non-compliance by operators may lead to loss of social and/or legal license to operate. 3. Lack of Experienced geological specialists may lead to ineffective models which may lead to poor quality reservoir discoveries. 4. Weak contract laws may it discourage the formation of joint ventures.
Based on your experience and judgment, please list in order of priority 5- 10 risk factors that negatively impact the Schedule, Quality, Cost and other project Objectives of South African Upstre...2	1. Lack of reliable infrastructure for processing and delivering extracted resources may lead to delays in project delivery. 2. Onerous tax regime may lead to high project costs. 3. Lack of experienced engineers may lead to poor quality wells and suboptimal production of resources. 4. Lack of local complementary industries (like goods and service providers) may lead to higher project costs. 5. Lack of technological innovation may make it prohibitively expensive to develop discoveries in harsh environments.
Please add any comments relevant comments that may aid the study	

ID	Participant 12
Please specify your Job Title	Lead Geoscientist
How many years of experience do you have in the Oil & Gas Sector?	16 years or more
Have you been involved in Upstream Exploration and Development Oil & Gas Projects in South Africa?	Yes - Only been involved in Exploration project/s
Please specify your highest academic qualification.	Masters Degree
Please specify your organisation's primary activities.	Regulator
Please state the methodology/methodologies used for risk identification in your organisation.	Brainstorming
Based on your experience and judgment, please list in order of priority 5- 10 risk factors that negatively impact the Schedule, Quality, Cost and other project Objectives of South African Upstre...	lack of local skills
Based on your experience and judgment, please list in order of priority 5- 10 risk factors that negatively impact the Schedule, Quality, Cost and other project Objectives of South African Upstre...2	lack of proper educational structures in STEM subjects
Please add any comments relevant comments that may aid the study	better basics STEM from primary schooling

ID	Participant 13
Please specify your Job Title	
How many years of experience do you have in the Oil & Gas Sector?	16 years or more
Have you been involved in Upstream Exploration and Development Oil & Gas Projects in South Africa?	Yes - Have been involved in both Exploration and Development Projects
Please specify your highest academic qualification.	Masters Degree
Please specify your organisation's primary activities.	Regulator
Please state the methodology/methodologies used for risk identification in your organisation.	
Based on your experience and judgment, please list in order of priority 5-10 risk factors that negatively impact the Schedule, Quality, Cost and other project Objectives of South African Upstre...	Civil group and environmental lobbyist objecting oil and gas development. Delaying operation to commence which in turn negatively affect the investors.
Based on your experience and judgment, please list in order of priority 5-10 risk factors that negatively impact the Schedule, Quality, Cost and other project Objectives of South African Upstre...2	The caveat of the legislation to ringfence the funds for the development activities which ended up being used for something else instead of the work programme activities approved.
Please add any comments relevant comments that may aid the study	To consult legal department at PASA

ID	Participant 14
Please specify your Job Title	Principal upstream concept development engineer
How many years of experience do you have in the Oil & Gas Sector?	16 years or more
Have you been involved in Upstream Exploration and Development Oil & Gas Projects in South Africa?	Yes - Have been involved in both Exploration and Development Projects
Please specify your highest academic qualification.	Bachelors Degree
Please specify your organisation's primary activities.	Right holder
Please state the methodology/methodologies used for risk identification in your organisation.	Wok break down the structure
Based on your experience and judgment, please list in order of priority 5-10 risk factors that negatively impact the Schedule, Quality, Cost and other project Objectives of South African Upstre...	Regulators' approvals taking long; NGOs challenging regulators' decisions in courts; limited number of consultants and contractors with upstream experience in the country/region; Most materials required are sourced externally and costs therefore dependent on volatile exchange rates; High costs and affordability of exploration and appraisal limiting activities and chance of a successful development.
Based on your experience and judgment, please list in order of priority 5-10 risk factors that negatively impact the Schedule, Quality, Cost and other project Objectives of South African Upstre...2	NGOs challenging regulators' decisions in courts; High costs and affordability of exploration and appraisal limiting activities and chances of a successful development; Limited number of consultants and contractors with upstream experience in the country/region; Most materials required are sourced externally and costs therefore dependent on volatile exchange rates; Regulators' approvals taking long;
Please add any comments relevant comments that may aid the study	Not applicable

ID	Participant 15
Please specify your Job Title	Risk Engineer
How many years of experience do you have in the Oil & Gas Sector?	10-15 years
Have you been involved in Upstream Exploration and Development Oil & Gas Projects in South Africa?	No
Please specify your highest academic qualification.	Honours Degree
Please specify your organisation's primary activities.	Right holder
Please state the methodology/methodologies used for risk identification in your organisation.	Process flow sheet
Based on your experience and judgment, please list in order of priority 5-10 risk factors that negatively impact the Schedule, Quality, Cost and other project Objectives of South African Upstre...	Priority in descending order: 1. Delays in the approval of permits/licenses etc 2.Exogenous Factors such as the ZAR/USD exchange rate may lead to high Project Cost. drilling rigs for example are contracted internationally. 3. The ability to secure debt funding/partnerships to share the risk may impact the achievement of the overall exploration project. 4. Limited Upstream specialists in the local market may impact Project Schedule, Cost and Quality. 5. Uncertainty (and limited) Upstream Petroleum regulations may increase litigation and slow execution of the Work Programs 6. Potential blowouts, environmental incidents or other safety related risks 7. Drilling of dry holes
Based on your experience and judgment, please list in order of priority 5-10 risk factors that negatively impact the Schedule, Quality, Cost and other project Objectives of South African Upstre...2	Priority in descending order: 1. Securing an offtaker/processing facility to receive the oil/gas, will influence whether the project continues. 2. Exogenous Factors such as the ZAR/USD exchange rate may lead to high Project Cost. drilling rigs and infrastructure equipment/material for example are contracted internationally. 3. The ability to secure debt funding/partnerships to share the risk may impact the achievement of the overall development project. 4. Inadequate Project Management oversight leading to delays in schedule, reduced Quality on deliverables and potential cost increase. 4.Potential blowouts, environmental incidents or other safety related risks
Please add any comments relevant comments that may aid the study	

ID
Please specify your Job Title
How many years of experience do you have in the Oil & Gas Sector?
Have you been involved in Upstream Exploration and Development Oil & Gas Projects in South Africa?
Please specify your highest academic qualification.
Please specify your organisation's primary activities.
Please state the methodology/methodologies used for risk identification in your organisation.
Based on your experience and judgment, please list in order of priority 5-10 risk factors that negatively impact the Schedule, Quality, Cost and other project Objectives of South African Upstre...
Based on your experience and judgment, please list in order of priority 5-10 risk factors that negatively impact the Schedule, Quality, Cost and other project Objectives of South African Upstre...2
Please add any comments relevant comments that may aid the study

Participant 16
Project Engineer
16 years or more
Yes - Only been involved in Development project/s
Bachelors (Hons)
Right Holder; Joint Venture Partner
Cause and Effect Diagram
Offshore oil and gas (risk of failing to secure funding for the exploration work program): High cost of survey data acquisition and subsequent data processing may lead to repeated postponement of exploration plans and non-fulfilment of the required minimum work commitment as per the conditions of Exploration Right. Offshore oil and gas (risk of making incurring an investment loss due to changes in law): The delayed finalization (promulgation) of the upstream petroleum bill may give reason to Exploration Rights holders to delay exploration programs due to lack of certainty about future changes in law and fiscal regime. Oil and Gas (risk of schedule delays and cost increase): Unexpected bad weather may lead to delayed completion of offshore surveys and cost overruns. Offshore oil and gas (risk of unplanned time extension): Protests and legal action by anti-fossil fuel groups may lead to delays in stakeholder consultations, thereby delaying offshore surveys. Onshore Gas (risk of licence/permit expiry before completing the work program): Prolonged disputes over land rights (where farmers want to be compensated for gas under their farms) may delay access to onshore gas exploration sites. Gas (risk of deferred or cancelled investment): The currently delayed finalization of Government-led Gas Master Plan may wad-off potential investors from choosing South African gas market. Onshore shale gas (risk of poor data acquisition): The estimated low volumes of gas-in-place (estimated by the Petroleum Agency) may fail to compel Right Owners to use of high density survey technologies which are necessary for better quantification of available hydrocarbons., leading to poor data acquisition programs.
Offshore development of Oil and Gas (risk of schedule delay and cost increase): Unexpected bad weather may lead to prolonged drilling of offshore wells and cost overruns. This may also cause delays during installation of subsea infrastructure, and related platforms. Offshore development of Oil and Gas (risk of insufficient planning): The absence of recent (within the last 5 years) offshore development projects in South Africa may contribute to underestimation of the duration and cost of finishing an offshore development project in South Africa. Offshore deepwater development (risk of underestimating the strength and impact of currents): South African continental shelf is frequented by the Mozambique currents and the Agulhas currents. Also, there are eddie currents near the seabed and unpredictable midwater currents. one or a combination of these currents may severely overcome the ability of drilling rig to continue drilling activities and also the ability of subsea installation vessel/barge to continue with installation work. Offshore deepwater development (risk of failing to manage labour apprehension of diver-less subsea technology): Previous offshore installation campaigns in South Africa were labour-intensive due to involvement of commercial diving and related services. At the moment, the potential oil and gas fields are in deeper water where commercial diving is not feasible for seabed works. In this case, failure by the Production Right holder to sufficiently sensitize stakeholders during consultations may lead to concerned organizations/communities instituting disputes over their exclusion from the project. Onshore fabrication of project facilities (risk of industrial action during project implementation): In South Africa it is common for political leaders and community leaders to make false promises to communities about the benefits the will be made possible by the project. It is the responsibility of the Production Right holder to ensure that any myths and false perceptions/promises are cleared during stakeholder consultation sessions, prior to project implementation. Failure by the Production Right holder to address community concerns may lead to fabrication works being delayed due to industrial actions, because fabrication sites are where communities can get access to.
Comment 1: There is too much focus how to address the provision of gas for electricity generation in South Africa. The Gas Utilization Master Plan (GUMP) is yet to be finalized, and this delay may exacerbate potential investors' perception that policy uncertainty may continue to deter investment in upstream oil and gas exploration and development. To reduce risks asscoiated with upstream oil and gas investments in South Africa, the policy position and the upstream petroleum bill are to be finalised.

ID	Participant 17
Please specify your Job Title	Geoscientist
How many years of experience do you have in the Oil & Gas Sector?	7-10 years
Have you been involved in Upstream Exploration and Development Oil & Gas Projects in South Africa?	Yes - Only been involved in Exploration project/s
Please specify your highest academic qualification.	Masters Degree
Please specify your organisation's primary activities.	Regulator
Please state the methodology/methodologies used for risk identification in your organisation.	Brainstorming
Based on your experience and judgment, please list in order of priority 5-10 risk factors that negatively impact the Schedule, Quality, Cost and other project Objectives of South African Upstre...	1. Delay in enacting appropriate Bills and Acts - this leads to divestment of operating companies. 2. Funding - A lack of government funding leads to less projects being prioritised. 3. The progression of greener energy development and sustainability can hinder the development of oil and gas projects. As this may be a priority for a first world country or nation, as a third world nation, South Africa is always playing catchup and have not reached it's energy demand and supply balance to move to greener energy in the time span that the world requires. 4. Lobbyists leads to a halt in the industry delaying operations such as seismic surveying and drilling wells. 5. A lack of facilities for upstream activities such as drilling ships and seismic vessels can delay the progression of upstream activities.
Based on your experience and judgment, please list in order of priority 5-10 risk factors that negatively impact the Schedule, Quality, Cost and other project Objectives of South African Upstre...2	1. A lack of facilities for oil and gas storage and processing can lead to divestment or lack of progression in development. 2. A lack of local specialist skills and experience in both upstream and downstream can lead to a delay in progression and the need to "import" these skills which do not get transferred locally. 3. The size of the resource that is being extracted; the cost of operations today requires large enough resources to make extracting it financially feasible. 4. Geohazards and environmental risk can lead to operations either coming to a halt if not operated by a major oil and gas company such as Shell or Total Energies who can develop technologies. 5. The lack of local investment capabilities gives a greater advantage to international companies in determining how the resource gets utilised.
Please add any comments relevant comments that may aid the study	

ID	Participant 18
Please specify your Job Title	Chief Operating Officer
How many years of experience do you have in the Oil & Gas Sector?	10-15 years
Have you been involved in Upstream Exploration and Development Oil & Gas Projects in South Africa?	Yes - Have been involved in both Exploration and Development Projects
Please specify your highest academic qualification.	Diploma
Please specify your organisation's primary activities.	Right holder
Please state the methodology/methodologies used for risk identification in your organisation.	Process flow sheet
Based on your experience and judgment, please list in order of priority 5-10 risk factors that negatively impact the Schedule, Quality, Cost and other project Objectives of South African Upstre...	Scope Supply chain management QA/QC Team collaboration Experienced contractors
Based on your experience and judgment, please list in order of priority 5-10 risk factors that negatively impact the Schedule, Quality, Cost and other project Objectives of South African Upstre...2	Repeat of previous question
Please add any comments relevant comments that may aid the study	N/A

ID	Participant 19
Please specify your Job Title	Upstream Asset Manager
How many years of experience do you have in the Oil & Gas Sector?	16 years or more
Have you been involved in Upstream Exploration and Development Oil & Gas Projects in South Africa?	Yes - Have been involved in both Exploration and Development Projects
Please specify your highest academic qualification.	Bachelors Degree
Please specify your organisation's primary activities.	Right holder
Please state the methodology/methodologies used for risk identification in your organisation.	Checklist
Based on your experience and judgment, please list in order of priority 5-10 risk factors that negatively impact the Schedule, Quality, Cost and other project Objectives of South African Upstre...	1 - Opposition to hydrocarbon exploration and development due to its negative impact on the environment, leads to project delays and additional costs. The ESIA process and appeals can take years. 2 - Uncertainty in legislation and thus commercial terms and outcomes deters investors. (Changes in the MPRDA was proposed in 2013 and is not yet promulgated). 3 - Offshore development and exploration industry not well established in SA - leads to increased costs 4 - Lack of government support to monetise indigenous gas - no support in providing a local market for gas discoveries 5 - Lack of local skills and contractors leads to increased costs and project delays 6 - Main oil exploration targets is in ultra deepwater environments which is very expensive and high risk. Only a few international companies has the apetite for this
Based on your experience and judgment, please list in order of priority 5-10 risk factors that negatively impact the Schedule, Quality, Cost and other project Objectives of South African Upstre...2	1 - Opposition to hydrocarbon exploration and development due to its negative impact on the environment, leads to project delays and additional costs. The ESIA process and appeals can take years. 2 - Uncertainty in legislation and thus commercial terms and outcomes deters investors. (Changes in the MPRDA was proposed in 2013 and is not yet promulgated). 3 - Offshore development and exploration industry not well established in SA - leads to increased costs 4 - Lack of government support to monetise indigenous gas - no support in providing a local market for gas discoveries 5 - Lack of local skills and contractors leads to increased costs and project delays 6 - Deepwater developments is VERY costly and requires a high IRR in order to justify the risks. There remains subsurface technical risks that may cause the project not to perform as expected post development (i.e. reservoir compartmentalization)
Please add any comments relevant comments that may aid the study	

ID	Participant 20
Please specify your Job Title	Country Representative
How many years of experience do you have in the Oil & Gas Sector?	7-10 years
Have you been involved in Upstream Exploration and Development Oil & Gas Projects in South Africa?	Yes - Only been involved in Exploration project/s
Please specify your highest academic qualification.	Masters Degree
Please specify your organisation's primary activities.	Right holder
Please state the methodology/methodologies used for risk identification in your organisation.	Independent and wholistic analysis of each aspect of the project
Based on your experience and judgment, please list in order of priority 5-10 risk factors that negatively impact the Schedule, Quality, Cost and other project Objectives of South African Upstre...	1. Incomplete Oil & Gas Legislative Framework (Upstream Petroleum Resources Development Bill and accompanying Regulations) - makes it difficult to evaluate projects and attract funding 2. Financial Provisioning Regulations that are not suitable for Oil & Gas - causes marginal projects to become uneconomic as the extractive industry type of provisioning is not practicable for oil & gas 3. Disruptive interference by interest groups opposed to fossil fuels, including court action that stops oil & gas projects - slows down projects and repels potential investors 4. Marine Spatial Planning Process that could potentially limit scope of Oil & Gas activity in SA - if the MSP process continues in the current trajectory the ability of the oil and gas industry to expand in the future will be severely limited 5. Draft Marine Sector Plans that prohibit the laying of Oil & Gas Pipelines in vast areas of the SA offshore to protect certain Critical Biodiversity Areas - this would render some projects that aim to bring hydrocarbons onshore unviable
Based on your experience and judgment, please list in order of priority 5-10 risk factors that negatively impact the Schedule, Quality, Cost and other project Objectives of South African Upstre...2	The answers here will be similar to what is above. Exploration and Development should be seen as a single continuum. An investor does not invest in exploration if the scope for development seems to be threatened, because evaluation of an opportunity is done at inception, looking at the whole potential risk-matrix from exploration to decommissioning.
Please add any comments relevant comments that may aid the study	Risk analysis in oil & gas projects is very vast and complex. Projects are risk-evaluated from geological, geophysical, petroleum engineering, facilities infrastructure, environmental, legislative, political, contractual, market, financing and other perspectives.

ID	Participant 21
Please specify your Job Title	Consultant
How many years of experience do you have in the Oil & Gas Sector?	16 years or more
Have you been involved in Upstream Exploration and Development Oil & Gas Projects in South Africa?	Yes - Have been involved in both Exploration and Development Projects
Please specify your highest academic qualification.	Masters Degree
Please specify your organisation's primary activities.	Consultant/Contractor
Please state the methodology/methodologies used for risk identification in your organisation.	Wok break down the structure
Based on your experience and judgment, please list in order of priority 5- 10 risk factors that negatively impact the Schedule, Quality, Cost and other project Objectives of South African Upstre...	
Based on your experience and judgment, please list in order of priority 5- 10 risk factors that negatively impact the Schedule, Quality, Cost and other project Objectives of South African Upstre...2	1)Thorough studies and composition of hydrocarbon reserves must be made to select the best process and materials for extraction. 2)Flow regimes for hydrocarbon reserves must be developed to avoid reservoir collapses. 3)Through studies on Weather and sea-state (profile of current, wave heights and period, direction of sea-state, etc.) 4)Thorough studies on soil structure and details for before design and implementation of structures or anchoring 5)Level of completion of Engineering and Procurement when going for tender of fabrication and installation 6)Level of completion of Engineering and Procurement when going for implementation 7)Competence of contractors used 8)Competence of equipment used for installation in weather and sea-state conditions 9)The project must be scheduled from start to finish and reviewed monthly. 10)Cost of the project must be reviewed monthly based on design, procurement, and construction. 11)Escalation and rate of exchange must be monitored on a three monthly basis.
Please add any comments relevant comments that may aid the study	

ID	Participant 22
Please specify your Job Title	Managing Director
How many years of experience do you have in the Oil & Gas Sector?	16 years or more
Have you been involved in Upstream Exploration and Development Oil & Gas Projects in South Africa?	Yes - Only been involved in Development project/s
Please specify your highest academic qualification.	Masters Degree
Please specify your organisation's primary activities.	Consultant/Contractor
Please state the methodology/methodologies used for risk identification in your organisation.	Wok break down the structure
Based on your experience and judgment, please list in order of priority 5-10 risk factors that negatively impact the Schedule, Quality, Cost and other project Objectives of South African Upstre...	1. Limited or no skills development in offshore, including petrochemical value chain 2. Item 2 above, may be due to lack of or no local exploration activity by SOE 3. Exploration and development done by multinational Oil & Gas does not support local skills and job opportunities. 4. Skewed preference on local content shareholding to politically connected, rather than academia and capable BBBEE SMME's 5. No government's implementable strategy, either being on an NOC to NOC or PPP(public private partnership) basis 6. Competing national capital projects (Energy), as a result of lack item 5 above.
Based on your experience and judgment, please list in order of priority 5-10 risk factors that negatively impact the Schedule, Quality, Cost and other project Objectives of South African Upstre...2	Same as above
Please add any comments relevant comments that may aid the study	Support for academic, innovation and technology development in the energy and petrochemical for economic growth

ID	Participant 23
Please specify your Job Title	Geoscientist
How many years of experience do you have in the Oil & Gas Sector?	16 years or more
Have you been involved in Upstream Exploration and Development Oil & Gas Projects in South Africa?	Yes - Only been involved in Exploration project/s
Please specify your highest academic qualification.	Bachelors Degree
Please specify your organisation's primary activities.	Regulator
Please state the methodology/methodologies used for risk identification in your organisation.	Brainstorming
Based on your experience and judgment, please list in order of priority 5-10 risk factors that negatively impact the Schedule, Quality, Cost and other project Objectives of South African Upstre...	Public objections to oil and gas development Environmental litigation Lengthy public consultation processes Restricted access to public information - POPI Act Obtaining stakeholder buy-in or a social license to operate
Based on your experience and judgment, please list in order of priority 5-10 risk factors that negatively impact the Schedule, Quality, Cost and other project Objectives of South African Upstre...2	Public objections to oil and gas development Environmental litigation Lengthy public consultation processes Restricted access to public information - POPI Act Regulatory uncertainty
Please add any comments relevant comments that may aid the study	

ID	Participant 24
Please specify your Job Title	Regional Manager
How many years of experience do you have in the Oil & Gas Sector?	16 years or more
Have you been involved in Upstream Exploration and Development Oil & Gas Projects in South Africa?	Yes - Have been involved in both Exploration and Development Projects
Please specify your highest academic qualification.	Masters Degree
Please specify your organisation's primary activities.	Right holder
Please state the methodology/methodologies used for risk identification in your organisation.	Cause and Effect Diagram
Based on your experience and judgment, please list in order of priority 5-10 risk factors that negatively impact the Schedule, Quality, Cost and other project Objectives of South African Upstre...	1. Lack of funds to support capital intensive exploration and development projects 2. Lengthy Government approvals - projects delays/project failure/project over runs 3. Politics vs sound business case - project failure / time and costs wasted 4. Lack of Training and skills transfer - IOCs utilise their own country's expertise - regulation not geared for training - project over runs 5. Uncertainty in legislation - UPRDB in limbo for the last 10 years - companies too afraid to invest in such uncertainty 6. Environmental Groups block projects due to lack of knowledge and being subsidized by renewable. 7. Corruption - if decision makers are not benefitting, projects don't go ahead 8. No / limited Exploration budget set aside due to competing projects with lower risk and lower gross margins
Based on your experience and judgment, please list in order of priority 5-10 risk factors that negatively impact the Schedule, Quality, Cost and other project Objectives of South African Upstre...2	1. Lack of funds to support capital intensive exploration and development projects 2. Lengthy Government approvals - projects delays/project failure/project over runs 3. Politics vs sound business case - project failure / time and costs wasted 4. Lack of Training and skills transfer - IOCs utilise their own country's expertise - regulation not geared for training - project over runs 5. Uncertainty in legislation - UPRDB in limbo for the last 10 years - companies too afraid to invest in such uncertainty 6. Environmental Groups block projects due to lack of knowledge and being subsidized by renewable. 7. Corruption - if decision makers are not benefitting, projects don't go ahead 8. No / limited development budget set aside due to competing projects with lower risk and lower gross margins
Please add any comments relevant comments that may aid the study	Enabling legislation required that is a balance between ROI and State benefitting will lead to less project delays and increased exploration

ID	Participant 25
Please specify your Job Title	CEO
How many years of experience do you have in the Oil & Gas Sector?	10-15 years
Have you been involved in Upstream Exploration and Development Oil & Gas Projects in South Africa?	Yes - Have been involved in both Exploration and Development Projects
Please specify your highest academic qualification.	Bachelors Degree
Please specify your organisation's primary activities.	Right holder
Please state the methodology/methodologies used for risk identification in your organisation.	Process flow sheet
Based on your experience and judgment, please list in order of priority 5-10 risk factors that negatively impact the Schedule, Quality, Cost and other project Objectives of South African Upstre...	1. Regulatory uncertainty: Leads to slow investment decisions and makes it more difficult to raise capital 2. Slow regulatory process: Leads long delayed project developments often resulting in missed commodity cycles 3. Climate Change Opposition: Leads to frequent disruption of exploration and development programs, the undermining of security of tenure and increases costs 4. Lack of oil & gas infrastructure: Leads to slower and more expensive developments 5. Lack of institutional oil & gas experience and understanding: Leads to more difficulties in raising capital locally
Based on your experience and judgment, please list in order of priority 5-10 risk factors that negatively impact the Schedule, Quality, Cost and other project Objectives of South African Upstre...2	1. Regulatory uncertainty: Leads to slow investment decisions and makes it more difficult to raise capital 2. Slow regulatory process: Leads long delayed project developments often resulting in missed commodity cycles 3. Climate Change Opposition: Leads to frequent disruption of exploration and development programs, the undermining of security of tenure and increases costs 4. Lack of oil & gas infrastructure: Leads to slower and more expensive developments 5. Lack of institutional oil & gas experience and understanding: Leads to more difficulties in raising capital locally
Please add any comments relevant comments that may aid the study	

ID	Participant 26
Please specify your Job Title	Principal Estimating Engineer
How many years of experience do you have in the Oil & Gas Sector?	16 years or more
Have you been involved in Upstream Exploration and Development Oil & Gas Projects in South Africa?	Yes - Have been involved in both Exploration and Development Projects
Please specify your highest academic qualification.	Currently completing my masters in data science
Please specify your organisation's primary activities.	Right holder
Please state the methodology/methodologies used for risk identification in your organisation.	Various methods, Previous data, modelling, industry expects, analogy, etc
Based on your experience and judgment, please list in order of priority 5-10 risk factors that negatively impact the Schedule, Quality, Cost and other project Objectives of South African Upstre...	-RSA Political landscape (Corruption, unpredictability, too many red-tapes) -RSA Economic landscape (economic demands due to unsustainable policies) - Local Company Maturity - Upstream Projects (Exploration or development) are not like typical Projects, they require special skills, different project procedures, etc, thus resulting in re-works, and delayed processes due to lack of understanding. -Global position of RSA - because of where RSA is located, this poses a business risk for vessel owners, hence for every project, one could expect an added premium to the vessel rates. -Geological formations within the region - for offshore development - majority or high volume reserves in South Africa are classified as deep sea, and/or tight formations, which are high risk and expensive to develop -
Based on your experience and judgment, please list in order of priority 5-10 risk factors that negatively impact the Schedule, Quality, Cost and other project Objectives of South African Upstre...2	-Lack of specialty skills (Drilling, Subsea Engineering, Offshore Costing) - leads to high Project Cost and Schedules. -Lack of resources, locally (Vessels, drilling rigs,) - leads to global importation which is costly and time-consuming. -Lack of local fabrication capacity (X-mas trees, subsea structures) - leads to global importation which is costly and time-consuming. - Usually, these projects are Mega-Projects, which happen once in a long time, skills transfers is very rare. No opportunity to learn - Lack of relevant evaluation matrix for individual projects (Investment Projects vs strategic Projects vs sustainability projects)
Please add any comments relevant comments that may aid the study	Perhaps to also include the study to evaluate the cost benefit of local manufacturing capacity/skill to at lease serve the African market, however not influenced by local politics and corruption