Joint Ventures in the Oil and Gas Industry

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Joint Ventures in the Oil and Gas Industry

by

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A THESIS
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Abstract

The oil and gas industry is considered one of the largest economic drivers in the world. This industry is responsible for the employment of millions of people and revenues of billions of dollars. These facts indicate the importance of this industry and its impact on the world. Oil and gas projects, especially unconventional ones, encounter a great deal of obstacles that organizations and companies are not willing to face alone. Joint ventures can, therefore, be utilized to execute projects and overcome these problems; and, joint ventures have become a crucial part of oil and gas industry.

Joint ventures, however, are complex and contain many risks that can result in their failure. Assessing major risk factors that can impact the success of a joint venture before entering into a deal would allow organizations and companies to make informed decisions. The main objective of the study; therefore, was the development of a framework that supports oil and gas companies in making decisions to successfully execute joint venture projects by evaluating the involved strategic risk factors. Joint ventures in the oil and gas industry were examined, joint venture success measures were established, and the risk factors that affect the likelihood of joint venture success were investigated. As a result, a tool has been developed that can help participants evaluate a potential joint venture.

This research followed a robust research approach which consisted of both qualitative and quantitative methods. Many steps were involved in the research methodology, including a pilot study, document examination, interviews, questionnaires and analysis. These steps were done to obtain more information regarding the risks and their implications upon entering into joint venture deals.
As a result, two success measures were established and verified: 1) financial measures and 2) a sustainability measure. The statistics extraction method then was used to generate three major risk components from 23 risk factors: 1) joint venture boundary, 2) governance and management, and 3) external issues. These outcomes and their relationships were utilized to develop the final model.
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Dedication

To My mom, Norah, my wife, Bashaer, and my entire family
# Table of Contents

Abstract ........................................................................................................................................ ii
Acknowledgements ....................................................................................................................... iv
Dedication ....................................................................................................................................... vi
Table of Contents ........................................................................................................................... vii
List of Tables .................................................................................................................................... x
List of Figures and Illustrations ......................................................................................................... xii
Epigraph.......................................................................................................................................... xiv

CHAPTER ONE: INTRODUCTION .................................................................................................1
  1.1 Introduction..............................................................................................................................1
  1.2 Problem Statement and Significance ......................................................................................3
  1.3 Research Objectives ...............................................................................................................4
  1.4 Literature Review ....................................................................................................................5
    1.4.1 Introduction ....................................................................................................................5
    1.4.2 Joint ventures .................................................................................................................6
      1.4.2.1 Governance and control of the joint venture ............................................................7
      1.4.2.2 Performance of a joint venture ..............................................................................8
      1.4.2.3 Contributions and financing ...................................................................................8
      1.4.2.4 Joint Ventures documentations .............................................................................9
    1.4.3 Joint Venture Phases ........................................................................................................10
      1.4.3.1 Joint Venture Planning ..........................................................................................11
      1.4.3.2 Joint Venture Formation .......................................................................................11
      1.4.3.3 Joint Venture Operation .........................................................................................12
      1.4.3.4 Joint Venture Dissolution .....................................................................................13
    1.4.4 Joint venture arrangement ...............................................................................................13
  1.5 Research Methodology and Steps ..........................................................................................17
    1.5.1 Identification and Establishment of Success Measurements ........................................20
    1.5.2 Identification of the Strategic Risk Factors and their Characteristics .........................22
    1.5.3 Development of a predictive model for joint ventures in the oil and gas industry ..........23
    1.5.4 Sampling Identification ...............................................................................................24
  1.6 Thesis Structure .....................................................................................................................25

CHAPTER TWO: ESTABLISHING SUCCESS MEASUREMENTS OF JOINT VENTURE PROJECTS IN THE OIL AND GAS INDUSTRY ....................................................................27
  2.1 Introduction ............................................................................................................................27
  2.2 Background ............................................................................................................................31
    2.2.1 Joint Venture Types .......................................................................................................31
    2.2.2 Performance of joint ventures .....................................................................................33
  2.3 Research Methodology ..........................................................................................................36
    2.3.1 Literature review .........................................................................................................36
    2.3.2 Interviews ....................................................................................................................39
    2.3.3 Questionnaire ..............................................................................................................41
List of Tables

Table 1.1 Summary of the research methodology .......................................................... 19
Table 2.1: Examples of some joint ventures ...................................................................... 29
Table 2.2: Main differences among the three types of JV .................................................. 32
Table 2.3: Summary of JV measures .................................................................................. 40
Table 2.4: Organization type and position type of each participant .................................... 43
Table 2.5: Experience level of and number of JV projects for each participant .................. 43
Table 2.6: Descriptive statistical analysis of measures ......................................................... 45
Table 2.7: Weight of the correlation among measures ....................................................... 49
Table 2.8: Total Variance for JV Performance Measures .................................................... 51
Table 2.9: Accepted components and their loading weight ................................................. 55
Table 2.10. First Component Reliability Test ..................................................................... 57
Table 2.11: Second Component Reliability Test ................................................................. 58
Table 3.1: Weight of the correlation coefficient among risk factors .................................... 87
Table 3.2: Total explained variance .................................................................................... 89
Table 3.3: Factor loading matrix among factors and risks .................................................. 90
Table 3.4: Statistical characteristics of joint venture boundary component ....................... 93
Table 3.5: Statistical characteristics of compatibility and governance component .............. 94
Table 3.6: Statistical characteristics of the external and communication component .......... 96
Table 4.1: Example of relationship coefficient ................................................................. 123
Table 4.2: JV boundary component and its impact ............................................................. 124
Table 4.3: Compatibility component and its impact ............................................................ 125
Table 4.4: External component and its impact ................................................................. 126
Table 4.5: Characteristics of each model ........................................................................... 128
Table 4.6: Beta and significance for the third model ......................................................... 129
Table 4.7: Parameters for actual JVs ................................................................. 135
Table 4.8: Actual and predicted values of JVs .......................................................... 135
List of Figures and Illustrations

Figure 1.1: Joint venture phases........................................................................................................... 10
Figure 1.2: The contractual arrangement among parties in an EPC strategy................................. 15
Figure 1.3: The relationship among parties in an EPC contract with PMC................................. 16
Figure 1.4: The relationships among parties in an EPCM strategy............................................... 17
Figure 1.5: General research design.................................................................................................. 18
Figure 1.6: Detailed illustration of the research steps and the major findings ............................... 21
Figure 2.1: Detailed research methodology steps.............................................................................. 38
Figure 2.2: JV measures with respect to the mean score ................................................................. 46
Figure 2.3: Detailed diagram of the data analysis process............................................................... 47
Figure 2.4: Component number with eigenvalues ........................................................................... 52
Figure 2.5: Detailed diagram of the data analysis process............................................................... 54
Figure 2.6: Model between observed and uncovered variables..................................................... 61
Figure 2.7: A summary of the relationship among measures .......................................................... 63
Figure 3.1: Illustration of the process of research methodology .................................................... 72
Figure 3.2: Detailed research methodology steps.............................................................................. 82
Figure 3.3: Detailed flowchart of the data analysis process............................................................. 84
Figure 3.4: Eigenvalues with the number of extractable factors..................................................... 90
Figure 3.5: Importance of each risk factor in the planning phase.................................................. 98
Figure 3.6: Importance of each risk factor in the formation and negotiation phase .................... 99
Figure 3.7: Importance for each risk factor in the operation and implementation phase .......... 101
Figure 3.8: Importance of the extracted components and JV phases............................................ 103
Figure 3.9: Relationship between the JV boundary component and the two success measures. 105
Figure 3.10: Relationship between the compatibility component and the two success measures................................................................................................................................. 106
Figure 3.11: Relationship between the external component and the two success measures ..... 107
Figure 3.12: A summary among risk components, JV phases, and JV success measures ........ 111
Figure 4.1: Summary of the first phase ........................................................................ 117
Figure 4.2: Summary of the second phase ...................................................................... 118
Figure 4.3: Process of the conceptual model ................................................................. 119
Figure 4.4: Detailed flowchart of the model development process ................................. 121
Figure 4.5: Histogram for the main model data ............................................................... 131
Figure 4.6: Homoscedasticity test .................................................................................. 132
Figure 4.7: Success meter for the total degree of success ............................................... 133
Figure 4.8: Comparison between the actual and predicted success rates in the first JV ..... 136
Figure 4.9: Comparison between the actual and predicted success rates in the second JV 137
Figure 4.10: Comparison between the actual and predicted success rates in the third JV 137
Epigraph
CHAPTER ONE: INTRODUCTION

1.1 Introduction

The oil and gas industry is considered one of the largest economic drivers in the world. In fact, some consider it the largest and most important economic sector globally. This industry is responsible for the employment of millions of people and for revenues in the billions of dollars (American Petroleum Institute [API], 2015). These facts indicate the importance of this industry and its impact on the world. Each country and company implement new methods and techniques that will hopefully result in growing their economy (Inkpen & Moffett, 2011).

The estimated values of launching strategic alliance activities, including joint ventures, in the global oil and gas industry in 2013 and 2014 were $235 billion and $266 billion, respectively. In fact, the amount of transactions led to a 13% increase as well. All of the segments of the oil and gas sector have seen increases in the number of deals, particularly upstream (Ernst & Young, 2014; Young, 2015).

Many oil and gas companies have begun to establish ties with either independent players or other equivalent companies. Oil and gas companies from all over the world have begun partnering more vigorously (Shuen, Feiler, & Teece, 2014; Ernst & Young, 2012). The past years have seen a significant rise in oil companies’ investments in conventional and unconventional oil fields (Ernst & Young, 2012; Vanderklippe, 2012). The complex nature of this business has led these companies to adapt strategic alliances, particularly joint ventures, as
approaches for project execution. It is anticipated that joint ventures will continue to be extremely important in the foreseeable future. Indeed, 52% of oil companies specified that they are planning to establish joint ventures in near future (Ernst & Young, 2011; Jelinek and Pettit, 2012, Pwc, 2015).

Although the number of joint venture deals is high, it has been noticed that their success rate has not exceeded 55% in two decades (Bamford, Ernest, & Fubini, 2004). Success can be accomplished when parents companies meet the goals of JV. In general, joints ventures have the tendency to have a high failure rate, due to complexity (Bleeke and Ernst, 1995; Klein and Zif, 1994; Stiles, 1994). Bamford et al. (2004) found that, out of 2000 joint ventures, 53% of joint ventures were successful, i.e. each participant achieved their goals of the joint venture.

A few studies have investigated joint ventures in the oil and gas industry and attributed the failures to high costs. Other research has indicated that the low success rate was due to the lack of sufficient commitment to joint venture by the involved companies (Jelinek and Pettit, 2012; E&Y, 2011). A report by KPMG (2011) indicated that 80% of joint ventures failed to create the value for which they intended. Joint ventures, however, provide excellent opportunities for oil and gas companies to achieve strategic goals if they are structured and implemented correctly (Bamford et al., 2004).

This study was aimed at examining the current joint ventures in the oil and gas industry and their associated strategic risks and at subsequently developing a framework to help companies to make decisions regarding joint ventures. A reliable framework will support oil and gas
companies in the successful execution of their joint venture projects and allow them to strike more deals and initiate projects with confidence.

1.2 Problem Statement and Significance

It can be seen that an abundance of investment opportunities are available in the oil and gas industry, now and in the future. This industry has seen unprecedented activity and has had to be highly adaptive in its effort to meet the prediction that the global demand for energy resources will increase by 30-40% by 2030 (Inkpen & Moffett, 2011). The opportunities to invest in this field are enticing many oil and gas companies to start making deals in the field. In fact, most companies have started to do so, but have been slowed and impacted by many obstacles and barriers that effect their projects financially and economically, such as massive capital costs and high risk. Therefore, companies are leaning toward joint ventures as tools to overcome these obstacles and execute projects (Pettit, 2012; Grant, 2012).

Many of these joint ventures have, however, failed before they even got started or disappeared within their first few years (Kogut, 1989; Killing, 2012; Wagas, 2014). The joint ventures have not been executed in an effective way and lack evaluations of the associated risk factors, resulting in many joint venture failures. The success rate of joint ventures affects future joint ventures and projects, with many investing opportunities in the oil and gas industry still waiting to be executed and utilized.

This research was aimed at studying current and past joint ventures in the oil and gas industry
and subsequently offering key considerations to support the oil and gas companies’ joint venture decision-making process by evaluating their risks. In particular, this investigation has resulted in the development of a model to help the oil and gas industry in evaluating the risks of joint ventures and enabling their successful execution. The study is expected to answer the following questions:

- What are the success measurements of joint ventures and how can they be used?
- What are the major strategic risk factors in oil and gas joint ventures that can affect success?
- How are these factors correlated and what construct are they measuring?
- What are the most critical risks in each JV’ phase?
- What is the relationship between the risk factors and the success measures?

1.3 Research Objectives

The overall goal of this research was the development of a framework that supports oil and gas companies in making decisions to successfully execute joint venture projects by evaluating strategic risk factors.

A set of objectives must be met in order to fulfill this research’s goal:

- Study and exploration of the literature related to joint ventures;
- Examination of current joint venture practices in the oil and gas industry;
- Identification and establishment of the measurements of degree of success of joint ventures;
• Identification of risk factors in the oil and gas industry through the collection of data from different sources using different methods; and,
• Examination of the relationship among risk factors, measurements and joint ventures phase.

1.4 Literature Review

1.4.1 Introduction

Collaboration and alliances among competitors has seen an exponential growth and alliances have been utilized to sustain business and gain a competitive advantage. The increasing number of alliances in today’s oil gas industry is considered an effective way to decrease cost and manage risk for the participants (Karuranga, Asti, Musonera, & Mohiuddin, 2014). Business environmental changes, such as governmental policy, have led companies to adapt to form alliances. In fact, firms derive 15–20% of their revenues, assets, or income from alliances (Ernst & Bamford, 2005). Alliances are a proven procedure to assist firms to gain information, mitigate risks, create technological capabilities, and access resources and reserves (Eisenhardt & Schoonhoven 1996, Powell, Koput, & Smith-Doerr, 1996).

Strategic alliances in the oil and gas industry come in a variety of shapes and forms, and each one serves the purposes and objectives of the participants. These relationships are planned and implemented based on participants’ needs. The relationships among participants can be different in structure and form, and joint ventures (JV) are the most used in the oil and gas industry.
1.4.2 Joint ventures

The Oxford English Dictionary defines a JV as a business enterprise in which two or more companies enter a temporary partnership. According to Culpan (2002), two or more organizations collaborate together to create an independent business through sharing their resources. Wallace (2004) defined JVs as two or more firms coming together to accomplish specific goals that would not be achievable by one. Hebert (1996, p. 1) defined JVs as “… a shared equity and decisions making arrangement involving two or more firms (parents).” The term ‘joint venture” implies that the parent companies must have mutual goals and a sense of collaboration and also suggests multiple independent players coming together in a time constrained task to achieve common goals. A JV can take different forms or sizes, depending on the needs of the involved participants. Generally, JVs involve two companies; however, sometimes business circumstances and the scale of a project require the collaboration of more partners. In general, JVs come in two different types: 1) corporation JV and 2) contractual JV (Grant, 2012).

There has been a new wave of collaborative deals in different oil and gas sectors with goals of gaining access to assets, oil and gas reserves, and advantageous production places (Pettit, 2011; Jelinek and Pettit, 2012). With a noticeable increase in the exploration and production segment, substantial JV deals have surfaced in the oil and gas industry. Exploration and production projects have seen more JVs than other oil and gas segments, due their complexity and the involvement of high capital costs and risks (Grant, 2012; Vandrklippe, 2012). The use of JVs are common in different industries. JVs have a long history in oil and gas with more emphasis in the upstream segment (exploration and production). Midstream and downstream
activities, such as pipelines and facilities, have used JVs as well. However, JVs can be extremely complex and may not always work if not implemented correctly (Grant, 2012; Bamford et al., 2004)

1.4.2.1 Governance and control of the joint venture

Having different objectives can usually lead to a highly demanding for JVs, which should be discussed and negotiated in detail during the early stages (Pearce, 1997; Shenkar, 1990). This negotiation phase allows for a smooth decisions making process and for JVs to be successful. The levels of equity and management responsibility are examples of issues that need to be considered during the negotiation phase. Also, control of JVs should be split among parent companies and not based on equity or contributions; ideally, control should be spit based on the relative expertise (Beamish & Lupton, 2009). Moreover, there are a number of elements that need to be considered in this process, which are sometimes neglected, such as a JV manager’s attitude, prior experiences and relationships, and the effect of cultural differences on governance (Grant, 2012).

The level of involvement of a JVs’ parent company is critical and should be discussed in detail. There is a wide range of potential approaches that could be adapted to outline the level of involvement of the parent company such as a passive approach and loose-tight approach (Bamford et al., 2004).
1.4.2.2 Performance of a joint venture

The subject of performance in JVs has been thoroughly discussed in academia. For more than thirty years, authors have researched this topic from different perspectives and its contribution to businesses. Beamish and Lupton (2009) published a paper that summarized more than twenty years of research covering different aspects of JVs, including performance. According to their work, JV performance can be described as “the outcome of the strategies implemented by managers and employees” (Beamish & Lupton, 2009). Defined as such, what creates a suitable performance measure and how it differs among industries is open to interpretation (Griffith, Cavusgil & Xu, 2008).

There are two major performance measurers of a JV: subjective and objective measures. While subjective measures are based on the opinions and satisfactions of JV managers, objective measures are based on independent data that can be obtained from third parties; such data can be in regard to survival, longevity, stability, and profitability (Geringer & Hebert, 1991). There are arguments on the appropriateness of these two measures in the evaluation of JV performance (Beamish & Lupton, 2009). One author suggested that subjective measures are more important because the goals of JVs differ from one project to another and because subjective measures capture the opinions of the involved managers (Anderson, 1990). However, other authors argued that subjective measures are biased, which limits their ability to effectively evaluate JV performance (Julian, 2005).

1.4.2.3 Contributions and financing

JVs are often linked to the financial contributions arrangement between parties. The structure of these arrangements has a huge influence on the survival of a JV. Also, the level of
commitment and parent company engagement are often linked to the financial contribution of the parent companies. In general, the level of commitment of the parent companies to the JVs is proportional to the financial contributions (Inkpen & Hoffett, 2011).

Contributions made by parent companies are considered the funding source of JVs and come in different forms: 1) cash, 2) capital (shares), 3) assets (such as intellectual property), 4) skills and key personnel. In some cases, political influence can be considered as one of the contributions (Badiru & Osisanya, 2013).

1.4.2.4 Joint Ventures documentations

While standard forms for JV documentation are being used, there are no forms for more complicated JV arrangements. This lack of documentation is due to the structural differences and complexities, which are unique to individual JVs. However, a combination of standard forms, such as the Canadian Association of Petroleum Landman (CAPL) and the Association of International Petroleum Negotiation (AIPN), can be utilized to build a robust form. In large and complex JVs, concepts and ideas are captured from deal to deal (Grant, 2012). These forms should encompass all the aspects of JVs; the following are the most crucial:

- Scope of the JV
- Control rights and responsibility
- Financial contributions
- Dispute resolution methods
- Confidentiality and intellectual property
- Employees and human resources
- Insurance
Cultural differences

In conclusion, the JV will continue to be a part of the oil and gas industry, and firms should embrace this fact. A well-managed JV can deliver great value to all participants. The high risk and capital costs of oil and gas projects are also driving companies to form JVs. However, JVs are complex environments and can have substantial implications if not implemented correctly (Grant, 2012).

1.4.3 Joint Venture Phases

Many painful outcomes may result from JV failure. JV partners may lose money, credibility, proprietary technology, assets and management focus. In the following sections, describe each JV phases and their key areas. The four key phases in the JV lifecycle can be summarized as presented in Figure 1.1 (Ernst & Young, 2011).

Figure 1.1: Joint venture phases (Ernst & Young, 2011).
1.4.3.1 Joint Venture Planning

There are a few points need to be considered on this phase as follows:

- Defining the Scope

  The explicit and clear definition of the scope of work and its boundary are vital and should be discussed and understood. Physical assets should be included as well as the potential market that the JV is planning to serve (Ernst & Young, 2011).

- Business Analysis

  Business analysis of a joint venture is playing a key role and should contain a number of analysis and to different outcomes. These scenarios can include:

  1. Financial considerations (i.e. oil price, inflation),
  2. Production, and

  By careful testing of the financial impact of a wide range of situations, it would be easier for parents to understand any possible implications. Also, it allows parent to realize their expectation and be aware of the possible outcomes of the JV (Ernst & Young, 2011).

1.4.3.2 Joint Venture Formation

This phase deals with the development and negotiation of many of planning phases steps.

- Location Planning

  Planning reports should be chosen and short listed. The legal environment of the JVs must be completed and understood. Reports should a wide ranges of elements such (Ernst & Young,
2011):

- Regulatory approvals,
- Environmental assessment,
- Licenses requirement,
- Governing laws,
- Local asset land ownership rights.

- Financing

Details of JVs funding must to be explained and agreed upon. This includes:

- Definition and value of the financial contributions, and
- Capital structuring of the JVs,

- Dispute Mechanism

It is crucial that there is a clear dispute solving mechanism and resolution process. It should include details such as defining escalation mechanisms, involving stakeholders and referencing laws.

1.4.3.3 Joint Venture Operation

Structuring JVs properly is critical to their success. Execution of JVs should be aligned with its expectations. Undermining the JV initial rationale will create many problems.

- Organizational structure

Policies, organizational design, decisions making process and cultural difference are vital to
JVs’ success. Parents should pay close attention to many aspects when developing JVs’ teams including communication methods, comfort, loyalty, responsibilities and simplicity (Ernst & Young, 2011).

- Parent involvement

JVs partners need to present explicit rules for sustaining control over strategic direction of JVs. Parent can adapt different methods to control and govern JVs such as loose-tight approach. Moreover, they must allow JVs management committee freedom to manage on a day-to-day basis to reduce rigid decision-making process (Ernst & Young, 2011).

1.4.3.4 Joint Venture Dissolution

JVs termination may be a planned event when specific goals have been met. It should be an occasion that has been anticipated. A few option are available for parent to choses from as follows (Ernst & Young, 2011):

- Sale to a third party,
- Sale to one of the parents, and
- Separation between parents

1.4.4 Joint venture arrangement

In the above sections, the relationship among owners (horizontal relationships) has been discussed in detail. This section sheds a light on the contractual arrangement between the parent
companies of the JV and contractors. There are different kinds of contractual arrangements, which can be used in oil and gas industry.

Oil and gas projects are considered complex, and they come in different sizes and arrangements. Meeting project objectives, therefore, is difficult and challenging. The process of contracting in early stages is vital to ensure a project’s success. Choosing the appropriate contact strategy should take several elements under considerations such as risk allocation, responsibilities distributions, interfaces, and time constraints. The contract strategy is a key factor to determine the entire project’s realizations. The two fundamental strategies are presented in the following sections (Schramm, Meißner, & Weidinger, 2010).

- Engineering, procurement and construction (EPC)

In an engineering, procurement, and construction (EPC) contract, a solo company is responsible for engineering, procurement, and construction activities. It includes the entire supply including materials and equipment, design, engineering, procurement, construction, and installation. Also the contactor is responsible for commissioning training and testing as well.

The EPC contractor is the only channel which controls the commutation and coordination with the owner regarding any major activities involved in the project (Jaques, 2004). Also, responsible for meeting the expected performance levels according to the projects’ requirements. The owner company is responsible to administer the contract in terms of its contractual arrangement and interface management as seen the Figure 1.2 (Schramm et al., 2010).
Figure 1.2: The contractual arrangement among parties in an EPC strategy (Schramm et al., 2010).

In some case, owners are not capable to manage the contact in house and as a result they hire a project management consultant (PMC) as seen in Figure 1.3. There a wide range of services PMC can provide such as supervision, scope definition, contract tendering and scheduling (McDonald, 2008). The contractual agreement is only between the owners and PMC which indicates that the PMC must maintain a safe distance from contractors.
• Engineering, Procurement, and Construction Management (EPCM)

In engineering, procurement, and construction management (EPCM) contracts, a firm is contracted to provide these services in effort to support owners to manage the entire project. The EPCM contractor is responsible for design, execute procurement process, manage construction process, and negotiate. In other words, EPCM is the representative of behalf of the owner as Figure 1.4 shows.
1.5 Research Methodology and Steps

A combination of qualitative (descriptive) and quantitative (numerical) research methods was used to perform this research. In other word exploratory method was followed to conduct this research. Qualitative methods followed by a quantitative model were utilized in the research design of this study (Gay, Mills, & Airasian, 2011). The research methodology process was divided into several phases based on their order in the design, as shown in Figure 1.5.

Figure 1.4: The relationships among parties in an EPCM strategy (Schramm et al., 2010).
The first phase was the foundation of the research design. In this phase, the researchers reviewed the literature related to strategic alliances and joint ventures, particularly in the oil and gas industry. A review of the related studies in academia and private agencies was also included. A pilot study was performed to 1) gather more information, 2) validate the findings from the literature review steps, and 3) explore the topic and research problem (Prescott and Soeken, 1989). The pilot study consisted of qualitative and quantitative activities on a small scale.
In the second phase, the researchers utilized qualitative and quantitative methods to shortlist and prioritize the most critical strategic risk factors of JVs and their measures and also determine relationships and correlations with the help of statistical tools, in order to have a better understanding of the identified factors and their interaction. The relationships of the risk factors’ impacts on JVs were also examined. The third phase was the last phase and involved the design and development of the framework for the evaluation of JV risks. The framework will support oil and gas companies in making decisions regarding their JV activities. The highlights of the research methodology are summarized in Table 1.1.

Table 1.1 Summary of the research methodology

<table>
<thead>
<tr>
<th>Research Methodology</th>
<th>Data Collection Instruments</th>
<th>Analysis Strategies</th>
<th>Justification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Qualitative</td>
<td>- Observation</td>
<td>- Categorization</td>
<td>- To allow the researcher to study the problem closely.</td>
</tr>
<tr>
<td></td>
<td>- Interviews</td>
<td>- Interpretation</td>
<td>- To identify the risk factors and JV measures.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quantitative</td>
<td>- Questionnaires</td>
<td>- Descriptive and</td>
<td>- To understand the relation of the risk factors among</td>
</tr>
<tr>
<td></td>
<td></td>
<td>inferential statistics analysis</td>
<td>each other and their impact on JVs.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Data reduction</td>
<td>- To discover and identify the clusters.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>techniques, such as principal components analysis (PCA).</td>
<td></td>
</tr>
</tbody>
</table>

In order to achieve the ultimate goal of this study, a few steps were taken. Three major milestones were met by the researcher, as shown in Figure 1.6 and summarized in Appendix A:
1) Identification and establishment of the success measurements;
2) Identification of the strategic risk factors and their characteristics; and,
3) Development of a predictive model for JV in oil and gas industry.

1.5.1 Identification and Establishment of Success Measurements

This first step introduces one part of the research study that was intended to assist the oil and gas industry establish more successful contractual joint venture projects by examining the most critical strategic risk factors and their relationships with success measurements. Various indicators were evaluated to identify the proper tools that can be used to measure a JV’s likelihood for success. This research discusses many criteria for JVs that were collected and tested using a literary review, interviews, contract agreements, and questionnaires.

An in-depth analysis of the collected indicators and their contribution in measuring the degree of success of JVs is presented. These indicators are discussed empirically and reported on using organized instruments. Data analysis included a descriptive analysis of the indicators and their ability to measure the degree of success of JVs. A data extraction method was first used to prioritize the proper measures and then to categorize them into more common criteria.
To ensure the validity of the data analysis result, different tests were conducted, including

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**Figure 1.6: Detailed illustration of the research steps and the major findings**
reliability and internal consistency. A structural equations model was used following the extraction method to validate its results and the correctness of the model.

1.5.2 Identification of the Strategic Risk Factors and their Characteristics

In this step, current and past joint ventures in the oil and gas industry were evaluated, and key factors in evaluating the risks involved when oil and gas companies engage in JV decision-making processes were considered. In particular, this investigation aimed at supporting the oil and gas industry in addressing the risks of JVs and to enable their successful execution.

There has been a lack of solid research conducted on the subject of identifying and examining major strategic risk factors of JVs in the oil and gas industry. Private consulting agencies have discussed the issue, but they have not provided solid and thorough research. A few previous studies investigated this matter, but only with a minor focus; and, the studies failed to present the big picture. The aim of this step was the presentation of the issue in a holistic way by considering the major risk factors and the impact the factors have on different elements of JVs, such as phases and success measurements.

Several strategic risk factors were identified by the researchers through data collection. As a result, 23 risk factors were shortlisted and used to develop a survey. Consequently, three factors were extracted using Principal component Analysis (PCA) tool. These components were constructed and named by combining the most highly related factors together.
1.5.3 Development of a predictive model for joint ventures in the oil and gas industry

The results from first and second steps were used in this step. First, the measurements and their contribution in measuring the degree of success of joint ventures were established. Next, the major risk factors were identified and categorized, and their impacts on the success of JVs were determined. The risk factors’ relationships with success measurements was also explored. In this step, the risk factors were then used to measure the degree of success; each factor had its own contribution in measuring the degree of success of JVs. The main objective of the step was the development of a model that can predict the success rate of JVs in the oil and gas industry by evaluating the involved strategic risk factors and their relationships with success measurements. As a result, organizations can evaluate the success of a JV before entering the deal; this prior evaluation can result in improving the overall success rate of JVs.

This step used quantitative research methods in order to ensure the accuracy of the research. A pilot study was done to obtain more information regarding the problems and implications of entering into JV deals. A well-constructed questionnaire was deployed, targeting different companies and individuals. Open- and closed-ended questions were used. Consequently, a predictive model concerning the success rate of JV was developed. In the final stage of the research, the model was applied to real JVs in order to test its validity.

The model was developed using a multiple regression statistical tool, which helped in elucidating the relationships between risk factors and their ability to predict the success rate.
Three risk factors were included in the model based on their strength in predicting the success rate of JV.

1.5.4 Sampling Identification

From the beginning, the researcher has understood the issues and their importance. The process of sample identification depends on several elements such as research methods and sample minimum requirement.

- Phase one:

  In this phase, the author searched the available literature on the topic including academic papers and books, private and public reports, and JV agreements. This step allows the researcher to understand the problem and, consequently, identified the involved factors: authors, key people, companies, and associations. Based on the contribution, experience, accessibility, and availability of each one the four factors, researcher was able to identify the study sample.

- Phase two:

  A qualitative method was the main theme of this phase. Based on the pervious phase, several people were contacted to conduct interviews about the topic and, if possible, obtain documents. They were then asked to provide information about other potential interviewees (snow ball sampling). At each one these interviews, contact information was collected.

Phase three:

The quantitative method was applied in this phase. Based on the information from the previous step, a questionnaire was developed. Several measures and filters were used to
ensure the liability of the questionnaires including demographic information, consistency validation, blind identification, and easiness. The questionnaire was then sent electronically to key people in oil and gas companies, service firms, universities, and regulators; asked that the questionnaire be randomly sent to personnel involved in JVs.

In summary:
Several details were used to identify the sample and ensure its usefulness:

- Relationship of the participants to the topic
- Experience and contributions on both individual and corporate levels
- Type of research methods and their satisfactory limits
- Integrity and consistency test and validation
- Demographic criteria including industry, number of JVs, number of years, positions, and level of education

1.6 Thesis Structure

The entire thesis as a whole serves as one process to achieve the main objective of this study. This research was conducted in three steps. The structure of the thesis is detailed in the following paragraphs.

Chapter One provides the research background. It lays out the foundation of the research and its intent. The objectives and a brief of the research methodology are also presented. Chapter Two discusses the first step of the research, which established and evaluated the success measures and their ability to measure the JV degree of success.
Chapter Three describes the second step: the identification and examination of the strategic risk factors of joint ventures in the oil and gas industry. The relationships among the risk factors, success measures, and JV phases are also presented. Chapter Four provides an in-depth analysis and discussion of the relationships between risk factors and success measures. The development process of this research model is also illustrated.

Chapter Five presents the overall conclusions of the research. It shows the main outcomes for each step and summarizes the overall findings.
CHAPTER TWO: ESTABLISHING SUCCESS MEASUREMENTS OF JOINT VENTURE PROJECTS IN THE OIL AND GAS INDUSTRY

2.1 Introduction

One of the most crucial and complex industries in the world is oil and gas. The contributions from this industry to the world’s economy are large and impact everyone’s lives. The oil and gas industry has direct relationships with other major industries such as manufacturing, transportation, petrochemical and many more industries. This industry has seen unprecedented activity and has had to be highly adaptive in its efforts to meet the prediction that the global demand for energy resources will increase by 30-40% by 2030 (Sieminski, 2014; International Energy Agency [IEA], 2014; Inkpen & Moffett, 2011).

Due to an ever-growing population and their desire for modern conveniences, such as accessibility to energy resources, companies and governments have to meet the demand by sanctioning more projects and exploring more opportunities. Energy companies, especially in the oil and gas sector, are developing new projects and adapting effective approaches. As a result, exploration and production activities (also known as upstream projects) have been growing (Jelinek & Pettit, 2012). However, these projects are often associated with many obstacles and barriers that companies do not wish to face alone (McKenna, Wilczynski, & VanderSchee, 2006). Circumstances, such as extensive capital costs or high risk, motivate some companies to seek effective ways to execute these projects, which often means oil and gas companies will collaborate in order to execute certain types of projects (Jelinek & Pettit, 2012;
Mergers, acquisitions and joint ventures (JVs) are some of the ways in which companies collaborate on projects, with JVs being the preferred method by oil companies (Jelinek & Pettit, 2012; Grand, 2012). For example, in 2013, D. Bell said “the high cost of production, along with a significant risk of failure to produce, has resulted in the establishment of many joint ventures to share the risk” (Bell, 2013).

Statistics show that the total number of deals, including mergers, acquisitions and JVs, in the global oil and gas industry was almost 300 in the first half of 2014. The United States and Canada accounted for more than 60% of these projects. There was a 13% increase in upstream deals, leading to a total of 231 deals compared to 205 in 2013 (Deloitte Center for Energy Solutions, 2014).

As the statistics indicate, the activities of JVs in upstream petroleum projects have been on the rise (Vanderklippe, 2012), but even with this increase, companies seem to struggle to succeed. The task of establishing and maintaining JVs has been a barrier to achieving many company goals. The degree of success has been difficult to measure due to the many factors that play roles in assessing a JV’s success.

The history of utilizing JVs in the oil and gas industry, particularly in exploration and production projects, is long. Similarly, mega projects in the midstream part of the oil and gas industry, such as pipelines, and projects in renewable energy have commonly used JV methodology. While the JV is regularly used in the industry, some JV deals are unprecedented
Table 2.1 shows just a few examples of JVs in the oil and gas industry.

Table 2.1: Examples of some joint ventures (Grant, 2012)*

<table>
<thead>
<tr>
<th>Parents (Participant companies)</th>
<th>Announced Date</th>
<th>Value in $ Billions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tourmaline and CNOR</td>
<td>2014</td>
<td>More than 1.0</td>
</tr>
<tr>
<td>Shell, ConocoPhillips and Suncor Energy</td>
<td>2014</td>
<td>More than 1.0</td>
</tr>
<tr>
<td>Encana Corporation and Toyota Tsusho Corporation</td>
<td>2012</td>
<td>More than 1.8</td>
</tr>
<tr>
<td>Encana Corporation and Mitsubishi Corporation</td>
<td>2012</td>
<td>More than 7</td>
</tr>
<tr>
<td>Suncor Energy Inc. and Total E&amp;P Canada</td>
<td>2010</td>
<td>More than 13.5</td>
</tr>
</tbody>
</table>

*See references for more information

Like any other process, the performance of a joint venture needs to be evaluated with respect to how well it achieves its goal. Similar to any other formation, a JV has unique performance measures. Performance indicators are different for each process depending on many factors, such as the industry and environment. The unification of performance measures is not appropriate for all types of collaborations; for example, contractual JVs in the oil and gas industry have their own set of measures. Therefore, performance indicators and their contribution in measuring the degree of success tend to be different.

One of the most noted obstacles of JV projects in the oil and gas industry is the evaluation of its performance and measurement of its degree of success (Anderson, 1990; Geringer & Hebert,
Although JVs and their performance have been discussed heavily in academia, there is a lack of thorough research regarding JVs with respect to the oil and gas industry. Most of the studies only investigated JVs in a general way or in very specific areas with the manufacturing and automobile industries. Moreover, most studies investigated JV performance data from other industries rather than oil and gas. This study, therefore, aims to study JV performance indicators in the oil and gas industry with respect to their contribution in measuring a JV’s degree of success. Then, established the success measures for joint ventures.

This study introduces a research study that is intended to assist the oil and gas industry establish more successful JV projects by establishing the success measures for JV in the oil and gas industry. Various performance indicators have been evaluated to identify the proper measure that can be used to quantify a JV’s success. This research discusses many criteria for JVs that were collected and tested using a literary review, interviews, contract agreements and questionnaires. An in-depth analysis of the collected indicators and their importance in measuring the degree of success of JVs is presented. These indicators are discussed empirically and reported on using organized instruments.

The first section presents a descriptive analysis of the measures and their relationship to the degree of success of JVs. A data extraction method was used first to prioritize the measures and then to categorize them into more common criteria. To ensure the validity of the data analysis result, different tests were conducted, including reliability and internal consistency. A structural equations model (SEM) was used following the extraction method to validate its results and the
correctness of the model. The research analysis was executed using version 21 of the SPSS package.

2.2 Background

Similar to other industries, oil and gas utilizes JVs. The term ‘joint venture’ often covers a wide range of structures, ranging from short-term to more comprehensive, long-term projects. It has been said that defining joint venture is an art (Highbeam Business, 2006; Grand, 2012); however, a helpful definition of this term has been offered by the Black Law Dictionary (2009): “[a joint venture is a] business undertaking by two or more persons engaged in a single defined project. The necessary elements are: (1) an express or implied agreement; (2) a common purpose that the group intends to carry out; and (3) shared profits and losses.”

The trend of using JVs in the oil and gas industry will not disappear soon (Grand, 2012; Ernest& Young, 2012). Many studies suggest that the use of JVs will increase; therefore, there is a tremendous need to conduct research on the subject. However, JVs can be very complicated and difficult to establish and maintain. Although JVs are preferable, they need to be carefully established (Inkpen & Moffett, 2011; Bamford, et al., 2004).

2.2.1 Joint Venture Types

JVs come in different types and structures, as shown in Table 2.2; however, there are two established forms, which are discussed as detailed by Grant (2012) in the following subsections.
A. Joint Venture Corporation

A joint venture corporation involves the development of a separate entity and is defined as follows: “when joint ventures incorporate a corporation where the joint ventures are the shareholders. The joint ventures contribute assets to the corporation which then owns and controls the assets”. This type necessitates that the parents (participant companies) create a separate legal entity, such as a new company to run the joint venture corporation.

B. Contractual Joint Venture

“In a contractual joint venture, a contract governs the relationship between joint ventures where no separate legal entity is created. Unlike other forms, contractual joint venture is completely a creature of contract without the necessity of meeting any formal requirement” (Grant, 2012). In this form, participants have the choice to customize the structure of the JV as they deem appropriate.

<table>
<thead>
<tr>
<th>JV Type</th>
<th>Main Feature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Joint Venture Corporation</td>
<td>Requires a separate legal entity to be created, such as a company.</td>
</tr>
<tr>
<td>Contractual Joint Venture</td>
<td>All elements of the JV are governed by the contract between the parents. Does not require a separate entity to be formed.</td>
</tr>
</tbody>
</table>
Each of these joint venture forms has its own features and uses. This particular research focuses on the contractual JV, since this type has been the focus of oil and gas companies.

2.2.2 Performance of joint ventures

The subject of performance in joint ventures has been thoroughly discussed in academia. For more than thirty years, authors have researched this topic from different perspectives and its contribution to businesses. Beamish and Lupton (2009) published a paper that summarized more than twenty years of research covering different aspects of JVs, including performance. According to their work, JV performance can be described as “the outcome of the strategies implemented by managers and employees” (Beamish & Lupton, 2009). Defined as such, what creates a suitable performance measure and how it differs among industries is open to interpretation (Griffith, Cavusgil & Xu, 2008).

There are two major performance measurers of a JV: subjective and objective measures. While subjective measures are based on the opinions and satisfactions of JV managers, objective measures are based on independent data that can be obtained from third parties; such data can be in regards to survival, longevity, stability and profitability. (Geringer & Hebert, 1991). There are arguments on the appropriateness of these two measures in evaluation of JV performance (Beamish & Lupton, 2009). One author suggested that subjective measures are the more important measures to use due to the fact that the goals of JVs differ from one project to another and because subjective measures capture the opinions of the involved managers (Anderson, 1990). However, other authors argued that subjective measures are biased and that limits their
ability to effectively evaluate JV performance (Julian, 2005).

Another perspective is that subjective and objective measures are related and it is irrelevant as to which one is used since they lead to the same result (Geringer & Hebert, 1991; Glaister & Buckly, 1998). Earlier studies adapted financial measures, such as profitability and growth (Tomlinson, 1970; Lecraw, 1983). Others used objective indicators, such as longevity, survival and stability (Franko 1971; Killing, 1983; Geringer, 1991; Harrigan, 1986; Kogut 1988). Furthermore, others used subjective measures in their studies (Anderson, 1990). Geringer & Hebert (1991) used both measures in their research and concluded that JVs tend to be more successful in the perspective of its parents views if it remains in operation.

There has been a lot of research conducted on the performance measures of JVs and their reported differences (Anderson, 1990; Beamish & Delios, 1997; Geringer & Hebert, 1991; Julian, 1998). In general, financial gain seems more intuitive as the main goal of a JV; therefore, financial measures seem appropriate as a way to measure the success of a JV. Financial measures, however, do not capture the whole process and, consequently, are incapable of evaluating performance on their own (Geringer & Hebert, 1991; Robson, Leonidou, & Katsikeas, 2002). Measuring the performance of a JV should be more comprehensive and incorporate different perspectives and elements (Anderson, 1990; Geringer & Hebert, 1991; Mjoen & Tallman, 1997; Julian, 1998; Berdrow & Beamish, 1999; Yan & Zeng, 1999; Das & Teng, 2000).
Objective measures, including financial ones, may fail to reflect on the level of achievement of short- and long-term goals (Blodgett 1992; Artisien & Buckley 1983). Other qualitative factors should be included in measuring the performance of a JV and its degree of success. Poor financial results do not completely reflect a lack of success of a JV, because a JV may be meeting or even exceeding parent companies’ goals and would, thus, be considered successful (Jain & Jain, 2003).

One study concluded that there were relationships between the managers’ satisfaction and financial measures; it was found that it is unlikely managers would be dissatisfied with excellent financial indicators (Johnson, Black, & Sakano, 1993). A previous study by Dess and Robinson’s (1984) concluded that there was a positive correlation among subjective and objective measures, and this result was empirically supported by Geringer and Hebert (1991).

Many researchers have since used several performance measures, depending on the nature in which the JV was created. All of these studies proved that determination of the appropriate measures depends on the business environment of the JV. Mutable measures of performance should be implemented in order to reflect different dimensions (Hill & Hellriegle 1994; Beamish & Lupton, 2009). In 2000, Barringer and Harrison used technology transfer and market access as performance measures; whereas, in 1995, Beamish and Lee used the level of parent company satisfaction as the performance measure.
2.3 Research Methodology

Both qualitative and quantitative research methods were used to improve the accuracy and quality of this study. A literary review was conducted, followed by a pilot study, which was intended to examine the current practices, as well as help construct further steps (Prescott and Soeken, 1989).

It has been established that the oil and gas industry is relatively conservative in providing data and information to independent researchers. Consequently, authors embraced the snowball sampling method, which is a technique where current participants of the research recruit future ones from their colleagues and acquaintances. Thus, the sample is likely to grow like a snowball (Goodman, 1961).

Three steps were used to collect data: 1) document collection, 2) interviews, and 3) questionnaires. Steps one and two were considered secondary data, while the questionnaire was the primary data collection method. Descriptive and inferential statistical methods were used to interpret the results and reach conclusions. Figure 2.1 illustrates the detailed process of the research methodology.

2.3.1 Literature review

A literary review of related subjects concerning joint ventures in general, and specifically those in the oil and gas industry, was thoroughly conducted. A review of the JV measure criteria
and their contributions to the measurement of the degree of success was also investigated. The subject of the research affects a variety of organizations and companies; and, as a result, plenty of studies have been conducted by both academic and private agencies. Thus, academia, public and private agencies were taken into consideration during the literary review phase; these agencies included management consultants, law firms, and government regulators. Documents including JV contracts, operation agreement, performance assessments, and success measurements were collected and reviewed as well.
Figure 2.1: Detailed research methodology steps
2.3.2 Interviews

The structure of the interviews was developed carefully and tested before performing the real ones. Well-constructed interviews were conducted with oil and gas companies and consulting companies with an emphasis on understanding the JV process; the answers assisted in the construction of the questionnaires. The number of interviews depends on the different factors, such as the subject and culture; however, many studies suggested that it should not be less than six. In addition, a saturation point must be met in order to draw helpful conclusions (Creswell, 2012; Mason 2010; Morse, 1995). As a result, more than eight interviews over a period of two months were conducted over the phone and face-to-face to reach the saturation point where more interviews would not provide more useful data.

Different levels of management, such as chief executive officers, partners and project managers, participated in these interviews. The majority of the interviews consisted of open-ended questions, with a small percentage of close-ended ones. Discussion of JV success measures in the oil and gas industry and their contribution in measuring the degree of success was the main focus of the interviews.

As a result of the literature review and interview, 11 measures of the degree of success of joint ventures in the oil and gas industry were identified and summarized, as shown in Table 2.3. These measures were identified based on the outcome of the interviews as well as the holistic review of academic, public and private publications. Each one of these measures had its own purpose and criteria and are defined based on their relationships to JV as seen in Table 2.3.
### Table 2.3: Summary of JV measures

<table>
<thead>
<tr>
<th>Measures</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Profitability</td>
<td>Indicates the influence of the JV on the profit of the parents (the JV participants). It measures whether the JV improves the financial performance of the parents.</td>
</tr>
<tr>
<td>Reputation</td>
<td>Indicates how the JV affects the reputation of the JV’s participants. Usually, oil and gas companies face challenges in explaining their projects and this may impact their reputation.</td>
</tr>
<tr>
<td>Environmental influence</td>
<td>Indicates how the JV influences the environmental performance of the parents, such as regulatory compliance. Oil and gas joint ventures suffer from lack of environmental compliance with the regulatory agencies. This endangers the success of a JV in many ways.</td>
</tr>
<tr>
<td>Longevity/age</td>
<td>The duration of the JV since it started.</td>
</tr>
<tr>
<td>Growth</td>
<td>Indicates whether the JV would result in a growth of the parents, implying the capability of the JV’s parents and their strength.</td>
</tr>
<tr>
<td>Stability</td>
<td>Indicates changes in the JV changes over the time. Changing the structure of the JV may be a sign of not achieving its goal.</td>
</tr>
<tr>
<td>Dispute resolution</td>
<td>The number and magnitude of the disputes and their effect on the participants. The more the disputes, the more likely the JV is to fail. This is an excellent measure to monitor a JV’s success.</td>
</tr>
<tr>
<td>Community alignment</td>
<td>The influence of the JV on the community and on the parents.</td>
</tr>
<tr>
<td>Access new markets</td>
<td>The ability of the JV to access new markets. It recognizes whether the JV offers its parents entry into new markets.</td>
</tr>
<tr>
<td>Market share</td>
<td>Indicates whether the JV influences the market share of the parents.</td>
</tr>
<tr>
<td>Manager satisfaction</td>
<td>Indicates the level of satisfaction of the JV’s managers.</td>
</tr>
</tbody>
</table>
2.3.3 Questionnaire

The survey portion of the research was developed using the information in the previous steps (interviews and literature reviews). The questionnaire consisted of two elements: demographics and JV questions, as seen in Appendix B. While the demographic part was concerned with company type, title type, years of experience, number of JVs, and role within the JV, the second part was interested in JV measures and their relationships with success. The questionnaire was created online, using the SurveyMonkey platform; and, most of the questions were multiple choice with an option to add comments. A Likert scale ranging from one to ten, where one indicated a low rating and ten a high rating, was used by participants to rate the contributions of measures in measuring the degree of success in JVs. Also, participants were asked to rate the overall success of the JV which they provided information about.

A set of requirements was used to qualify participants, including years of experience in JVs, number of JVs, and their positions within JVs. The survey was distributed via electronic mail, and the participants were asked to fill in the questionnaire and then forward it to any of their colleagues who fit the requirements. The response rate was 25%, which resulted in 55 responses of qualified people who received the original email. The 55 participants fulfilled the data requirements of 3 cases per variables (3 responses per measure). In this case, there were almost 5 respondents for each measure, which allowed for the use of data extraction methods (Phillips, Gauthier, & Thurimella, 2010). All 55 responses were used in the analysis and discussion steps.
2.3.4 Analysis

Descriptive and inferential statistical methods were used to analyze the data. Descriptive analysis consisted of calculating means and standard deviations, prioritizing the measures and preparing them for extraction. Inferential analysis consisted of using a correlation matrix and the principal component analysis (PCA) extraction method, in order to reduce the number of the indicators and to identify the homogeneous factors (Jolliffe, 2002). PCA was selected, since the researchers expected to have a strong correlation among measures.

In order to validate the results of the PCA, structural equation modeling (SEM) was done to confirm the relationship among measures (Ullman & Bentler, 2003). Reliability and consistency validations were administered as well using Cronbach’s α (alpha), which validated the consistency of the results. It is considered acceptable if the alpha is higher than 0.7 (Nunnaly & Bernstein, 1994). SPSS software package number 21 was utilized to conduct both types of analysis.

2.4 Findings and Results

2.4.1 Descriptive analysis

2.4.1.1 Respondent’s Profile

The questionnaire focused on the eleven performance indicators obtained from the interviews and literature review. The snowball sampling method was used to distribute the survey. Tables 2.4 and 2.5 summarize the profiles of the respondents. More than half of the participants were
from the oil and gas industry, and the others were from different organizations, such as legal, financial and academic agencies. More than 25 of these respondents were in high-ranking positions within their organizations. A high percentage of people with many years of experience with JVs participated in the survey. The demographics suggested that the study included most possible perspectives were covered in the research.

Table 2.4: Organization type and position type of each participant

<table>
<thead>
<tr>
<th>Type of organization</th>
<th>Person</th>
<th>Position</th>
<th>Person</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oil and Gas</td>
<td>27</td>
<td>Chief Executives</td>
<td>12</td>
</tr>
<tr>
<td>Service (Financial, Legal, Consulting)</td>
<td>15</td>
<td>Middle Management</td>
<td>18</td>
</tr>
<tr>
<td>Academia</td>
<td>8</td>
<td>Entry-level</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Management</td>
<td></td>
</tr>
<tr>
<td>Government (Regulatory)</td>
<td>5</td>
<td>Professional/Technical</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Senior Management</td>
<td>14</td>
</tr>
</tbody>
</table>

Table 2.5: Experience level of and number of JV projects for each participant

<table>
<thead>
<tr>
<th>Experience in years</th>
<th>Person</th>
<th>Number of JVs</th>
<th>Person</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 or less</td>
<td>7</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>6-10</td>
<td>18</td>
<td>2-4</td>
<td>12</td>
</tr>
<tr>
<td>11-15</td>
<td>15</td>
<td>5-8</td>
<td>14</td>
</tr>
<tr>
<td>16-20</td>
<td>7</td>
<td>9-12</td>
<td>22</td>
</tr>
<tr>
<td>More than 20</td>
<td>8</td>
<td>More than 12</td>
<td>4</td>
</tr>
</tbody>
</table>
2.4.1.2 Basic Descriptive Analysis

The eleven shortlisted performance indicators are described in Table 2.6, where the indicators have been prioritized based on the mean score of their contribution in measuring the degree of success of JVs. Table 2.6 shows many basic descriptive statistical measures, including mean, and standard deviations. Also, the data was tested in regards to their normality and as result, the data fell within the acceptable range of normality.

The mean is the most important statistical parameter for the measures and their contribution in determining the degree of success of JVs. Profitability was the highest contributor to the measurement of the degree of success of JVs in the oil and gas industry; it received a mean score of 7.8. Reputation and environmental influence ranked second with score of 6.6 and 6.5 respectively. Profitability was not only most important among non-financial indicators, but also the most vital when compared to other financial indicators, such as growth and market share, which scored 6.2 and 5.4, respectively.
### Table 2.6: Descriptive statistical analysis of measures

<table>
<thead>
<tr>
<th>Measures</th>
<th>Mean</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Profitability</td>
<td>7.8</td>
<td>1.3</td>
</tr>
<tr>
<td>Reputation</td>
<td>6.6</td>
<td>1</td>
</tr>
<tr>
<td>Environmental performance</td>
<td>6.5</td>
<td>2.0</td>
</tr>
<tr>
<td>Longevity</td>
<td>6.3</td>
<td>1.6</td>
</tr>
<tr>
<td>Growth</td>
<td>6.2</td>
<td>1.6</td>
</tr>
<tr>
<td>Stability</td>
<td>6.1</td>
<td>1.4</td>
</tr>
<tr>
<td>Dispute resolution</td>
<td>5.8</td>
<td>2.1</td>
</tr>
<tr>
<td>Community alignment</td>
<td>5.8</td>
<td>2.2</td>
</tr>
<tr>
<td>Access new markets</td>
<td>5.5</td>
<td>2</td>
</tr>
<tr>
<td>Market share</td>
<td>5.4</td>
<td>1.9</td>
</tr>
<tr>
<td>Manager satisfaction</td>
<td>3.9</td>
<td>1.0</td>
</tr>
</tbody>
</table>

Longevity ranked fourth and stability sixth. The JV managers’ satisfaction measure was shown to be the least important of these indicators, which was not expected. Several measures had a mean score in the range of six, others in five, but only profitability had a mean over 7, as shown in Figure 2.2.
2.4.2 Analysis

After the preparation of the data from the descriptive analysis, several statistical analyses were conducted. The descriptive analysis concluded that profitability was the most important measure contributing to the measurement of the degree of success of JVs. Since there were several measures, the following analysis was administered to reduce the number of measures in order to obtain a more quantifiable count and also to discover the underlying component that could be extracted. A correlation matrix and PCA was used to conduct the analysis. A detailed diagram of the analysis process and PCA are presented in Figure 2.3. A reliability test was then done, followed by the SEM test to validate the results from the PCA.
Figure 2.3: Detailed diagram of the data analysis process

1. Prepare the data
2. Perform descriptive analysis. Table 2.6
3. Correlation matrix and its coefficient (R) (Table 2.7)
   - **R** > 0.5
   - Remove uncorrelated items
4. Perform data reduction using PCA
5. Examine the Eigenvalue (EV) (Table 2.8)
   - **EV** > 1.0
   - Reject the components (Table 2.8, Figure 2.4)
   - Accept the component (Table 2.9)
2.4.2.1 Principal Component Analysis (PCA)

PCA was used as the extraction method. This method allowed the researchers to discover the underlying component and explore how various indicators could measure a common construct, as presented in Appendix C. This Appendix shows the process of PCA for this research. This analysis not only helped in making meaningful connections among measures, but also identified a weak one, so that it could be eliminated. As a part of the PCA, a correlation matrix was utilized to reveal inside relationships among the measures and the level of contribution of JV measures in measuring the degree of success. It then established connections among the measures, as shown in Table 2.7.

The correlation matrix revealed that 10 out of the 11 measures were strongly correlated as the correlation coefficient (r) was higher than 0.5. The correlation coefficient ranges from -1 to +1; and, in order for a correlation to be considered, it should have an r value that is equal to or more than 0.5 (Field, 2009). As a result of the strong correlation among measures, PCA was used as the extraction method.

The managers’ satisfaction” measure had a low contribution in determining the degree of overall success; therefore, this measure was removed from the analysis for two reasons: 1) a low mean score indicated a low contribution in measuring the degree of success of JVs; and, 2) it had a low correlation among the rest of the measures as the correlations matrix shows. To include this indicator in the analysis would jeopardize the integrity of the data structure. All other measures had strong correlations with at least one or more measures.
Table 2.7: Weight of the correlation among measures

<table>
<thead>
<tr>
<th>Measures</th>
<th>Longevity</th>
<th>Stability</th>
<th>Community alignment</th>
<th>Environmental performance</th>
<th>Dispute resolution</th>
<th>Profitability</th>
<th>Access new markets</th>
<th>Growth</th>
<th>Reputation</th>
<th>Market share</th>
</tr>
</thead>
<tbody>
<tr>
<td>Longevity</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stability</td>
<td>0.705</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Community alignment</td>
<td>0.742</td>
<td>0.664</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Environmental performance</td>
<td>0.673</td>
<td>0.606</td>
<td>0.726</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dispute resolution</td>
<td>0.530</td>
<td>0.536</td>
<td>0.577</td>
<td>0.457</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Profitability</td>
<td>0.187</td>
<td>0.322</td>
<td>0.278</td>
<td>0.282</td>
<td>0.396</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Access new markets</td>
<td>0.150</td>
<td>0.274</td>
<td>0.462</td>
<td>0.221</td>
<td>0.364</td>
<td>0.727</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Growth</td>
<td>0.156</td>
<td>0.431</td>
<td>0.649</td>
<td>0.483</td>
<td>0.499</td>
<td>0.541</td>
<td>0.691</td>
<td>1.000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reputation</td>
<td>0.257</td>
<td>0.365</td>
<td>0.475</td>
<td>0.418</td>
<td>0.490</td>
<td>0.584</td>
<td>0.566</td>
<td>0.805</td>
<td>1.000</td>
<td></td>
</tr>
<tr>
<td>Market share</td>
<td>0.099</td>
<td>0.334</td>
<td>0.476</td>
<td>0.278</td>
<td>0.260</td>
<td>0.646</td>
<td>0.728</td>
<td>0.752</td>
<td>0.713</td>
<td>1.000</td>
</tr>
</tbody>
</table>
As it can be seen in Table 2.7, there were measures more correlated with other than the rest of the measures. It can be noticed that the upper left corner of the table, there were strong correlations among longevity, stability, and environmental performance. Likewise, the lower right corner depicts highly correlated measures. Moderately correlated measures can also be seen throughout the table. However, this analysis was reached by just by looking at these correlation individually, without including all of the measures at once.

Table 2.7 does offer an idea of how the PCA would determine the number of components and associated measures, by looking for the all measures together and trying to determine the most appropriate clusters and measures. The PCA can then try to determine not only the clusters of measures with high correlations but also the clusters that explain the most variation the data set.

PCA basically analyzed the data set to determine the components that account of the most variance and then determine the loading value between extracted component and measures. These values of variance were then represented by the eigenvalues, as presented in Table 2.8, and loading values, which represent the eigenvector among components and measures, as shown in Table 2.9.

The total variance, in percentages of variance and accumulation, was arranged using PCA. In order to determine the components that were suitable, eigenvalues had to be examined. An eigenvalue is the percentage of the total explained variance in variables for which each component is responsible. If an eigenvalue (EV) is low, the importance of the component is also
low. Eigenvalues must be greater than one in order to be considered as a suitable component (Field, 2009). As a result, only two components were extracted through PCA that had eigenvalues of 1.0 or higher, as shown in Figure 2.4 and Table 2.8.

### Table 2.8: Total Variance for JV Performance Measures

<table>
<thead>
<tr>
<th>Component</th>
<th>Extraction Sums of Squared Loadings</th>
<th>Rotation Sums of Squared Loadings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>EV</td>
<td>% of Variance</td>
</tr>
<tr>
<td>1</td>
<td>5.297</td>
<td>52.971</td>
</tr>
<tr>
<td>2</td>
<td>1.552</td>
<td>15.521</td>
</tr>
<tr>
<td>3</td>
<td>0.83</td>
<td>8.3</td>
</tr>
<tr>
<td>4</td>
<td>0.76</td>
<td>7.6</td>
</tr>
<tr>
<td>5</td>
<td>0.53</td>
<td>5.3</td>
</tr>
<tr>
<td>6</td>
<td>0.44</td>
<td>4.4</td>
</tr>
<tr>
<td>7</td>
<td>0.31</td>
<td>3.1</td>
</tr>
<tr>
<td>8</td>
<td>0.13</td>
<td>1.3</td>
</tr>
<tr>
<td>9</td>
<td>0.076</td>
<td>0.76</td>
</tr>
<tr>
<td>10</td>
<td>0.041</td>
<td>0.41</td>
</tr>
</tbody>
</table>

Extraction Method: Principal Component Analysis
The results from Table 2.8 and Figure 2.4 show that there were only two components that could be extracted which has an EV greater than 1. It can be seen that the first and second components could be accepted as their EV was greater than one. The remaining eight components were rejected as their EV values were lower than one. Consequently, the two accepted components were considered to be rotated in order to finalize the coefficient values.

The first two components together explained 68.49% of the total variation of the data set. This high percentage of variance suggested that the 10 measures could be grouped into two
extracted components. While each component was responsible for 52.9% and 15.5% of the variance before the rotation, each accounted for almost the half of total variance, 68.49%, after the rotation. As shown in Table 2.8, two components extracted, each explaining 37% and 30% of the total variance which indicates that the components would probably have the same number of measures. The rotation increased the EVs, although the total variance explained the same. However, the variance explained by each component was different after the rotation. Varimax was used as the rotation method, which attempted to assign each competent with the high loading variables that were associated with the component.

In summary, the above results indicate that the 10 measures could be grouped by the two extracted components. Several measures were grouped together to form a component based on their correlation coefficients, as detailed in Figure 2.5.

Table 2.9 shows the two extracted components and measure matrix with respect to the component loading weight. The component values signify the loading weight between the component and measures.

As the results show, two components were extracted, and each one had five different strong measures. Each component was related to five measures with coefficient values of more than 0.5. Measures that were related to the same component were combined together and labelled depending on their nature. The ten measures were responsible for measuring the two components. Therefore, two components were derived from the PCA; both components would measure the degree of success of JVs. Each one of these components is presented and discussed.
in the following subsection.

Figure 2.5: Detailed diagram of the data analysis process
Table 2.9: Accepted components and their loading weight

<table>
<thead>
<tr>
<th>Measures</th>
<th>Component 1</th>
<th>Component 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Access new markets</td>
<td>.863</td>
<td>0.08</td>
</tr>
<tr>
<td>Market share</td>
<td>.879</td>
<td>0.07</td>
</tr>
<tr>
<td>Growth</td>
<td>.836</td>
<td>0.3</td>
</tr>
<tr>
<td>Reputation</td>
<td>.690</td>
<td>0.4</td>
</tr>
<tr>
<td>Profitability</td>
<td>.734</td>
<td>0.2</td>
</tr>
<tr>
<td>Longevity</td>
<td>-0.07</td>
<td>.830</td>
</tr>
<tr>
<td>Stability</td>
<td>0.3</td>
<td>.627</td>
</tr>
<tr>
<td>Community alignment</td>
<td>0.4</td>
<td>.693</td>
</tr>
<tr>
<td>Environmental performance</td>
<td>0.1</td>
<td>.809</td>
</tr>
<tr>
<td>Dispute resolution</td>
<td>0.3</td>
<td>.629</td>
</tr>
</tbody>
</table>

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

2.4.2.1.1 First component

This component had loading coefficients greater that 0.5 with five measures. They are arranged in descending order, based on the coefficient values, as shown in Table 2.8.

A. Market share
B. Access to new markets
C. Growth
D. Profitability
E. Reputation

2.4.2.1.2 Second component

This component also had loading coefficients greater that 0.5 with five measures. They are arranged in descending order, based on the coefficient values, as shown in Table 2.8.
A. Longevity  
B. Environmental influence  
C. Community alignment  
D. Stability  
E. Dispute resolution  

2.4.2.2 Reliability Tests for Components  

A discussion of the components and their statistical importance is presented in this subsection. Each component was tested and analyzed regarding its reliability using Cronbach’s alpha. Cronbach’s alpha can also validate the internal consistency of the components, thereby assist in confirming that the two extracted components are valid and can be used to measure the degree of success of JVs.  

2.4.2.2.1 First component  

Table 2.10 shows the measures associated with the first component and the total correlation. It also shows the value for Cronbach’s alpha, the coefficient value (Table 2.9) and the mean (Table 2.6). Within the component, the market share, access to new markets and growth had the highest loading values (0.87, 0.86 and 0.83, respectively) on the component value, while profitability and reputation had values of 0.73 and 0.69, respectively. This result suggested that market share, access to new markets and growth were the major measures related to the degree of success of JVs in the oil and gas industry.
As indicated by the mean score of each of these measures, profitability was still important, but was not the most crucial measure. According to the PCA, market share, which had a mean of 5.3 (Table 2.6), had the highest value in this component. This result indicated that this item was vital. Nevertheless, all these five measures had strong loading values with the component and were, thus, vital parts of this component.

### Table 2.10. First Component Reliability Test

<table>
<thead>
<tr>
<th>Measures</th>
<th>Mean</th>
<th>Loading value</th>
<th>Cronbach’s alpha if measure deleted*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Profitability</td>
<td>7.8</td>
<td>0.73</td>
<td>.893</td>
</tr>
<tr>
<td>Reputation</td>
<td>6.5</td>
<td>0.69</td>
<td>.883</td>
</tr>
<tr>
<td>Growth</td>
<td>6.2</td>
<td>0.83</td>
<td>.861</td>
</tr>
<tr>
<td>Access to New Markets</td>
<td>5.4</td>
<td>0.86</td>
<td>.873</td>
</tr>
<tr>
<td>Market share</td>
<td>5.3</td>
<td>0.87</td>
<td>.872</td>
</tr>
</tbody>
</table>

* Overall Cronbach’s alpha value was 0.89

The overall internal consistency reliability of this component was solid; thus, the alpha was higher than 0.7 (Nunnaly & Bernstein, 1994). The alpha was 0.89 and 0.88, respectively. All five of the measures were excellent, as the alpha values were almost the same, even if a measure was omitted. These results proved that this component can represent the five measures.

The results presented in this subsection suggest that financial measures were still strongly considered when measuring the degree of success of JVs. Four out of five variables in this section were somewhat directly related to financial measures. Furthermore, the top four, with respect to their loading values, were considered financial. It was concluded that there were indirect relationships between the four financial measures and reputation; therefore, an excellent
financial record reflected on the reputation of an organization. As a result, this component was called financial satisfaction.

2.4.2.2 Second component

This component encompassed five measures: two had very similar loading values and the other three had a span of 0.6, as shown in Table 2.11. Longevity and environmental influence were the most important items, as indicated by their loading values of 0.83 and 0.81, respectively. Since they were the most vital measures to quantify this component, they are important for determining the degree of success of JVs. The other three measures were also important, as they also had relatively high loading values with the component. Community alignment, dispute resolution and stability had values of 0.69, 0.63 and 0.62, respectively. The results showed that, although there were relatively large differences in the loading values, the measures had close mean values (Table 2.6). This result indicated that each one of these measures was important to the component.

### Table 2.11: Second Component Reliability Test

<table>
<thead>
<tr>
<th>Measures</th>
<th>Mean</th>
<th>Correlation coefficient (r)</th>
<th>Cronbach’s Alpha if item deleted*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental influence</td>
<td>6.5</td>
<td>0.81</td>
<td>.796</td>
</tr>
<tr>
<td>Longevity</td>
<td>6.3</td>
<td>0.83</td>
<td>.808</td>
</tr>
<tr>
<td>Stability</td>
<td>6.1</td>
<td>0.62</td>
<td>.800</td>
</tr>
<tr>
<td>Community Alignment</td>
<td>5.7</td>
<td>0.69</td>
<td>.765</td>
</tr>
<tr>
<td>Dispute Resolution</td>
<td>5.7</td>
<td>0.63</td>
<td>.801</td>
</tr>
</tbody>
</table>

* Overall Cronbach’s alpha value was 0.81
The overall Cronbach’s alpha value for the second component was 0.81, which indicated that the internal consistency and reliability of the component was acceptable (Nunnaly & Bernstein, 1994). If the community alignment measure was omitted, the alpha value was reduced the most. However, it was ranked fourth in terms of the loading value; and, if community alignment was omitted from the calculation, the alpha value fell within range.

It was determined that this component passed the test for reliability and was a good fit for representing the measures. It was then concluded that, due to these measures, the component had a direct relationship with the sustainability of a JV. The longevity and stability of a JV connect this component to sustainability. According to a study by Beamish and Lupton (2009), the longer the JV’s duration, the more likely it will be successful and can be used as a success measure.

Information, as displayed in Table 2.11, supports the strong relationship between the component and the remaining three items – community alignment, environmental influence and dispute resolution – which are all vital to the component and imply a connection to JV management. The overall consistency and reliability of the component were excellent. Consequently, the component was called sustainability satisfaction.

2.4.3 Structural Equation Modeling

Structural equation modeling (SEM) was a tool used to determine and assess the relationships that resulted from the previous step. PCA produced a relatively complex relationship model, and SEM tested its integrity and accuracy. It scanned the model of PCA and
then determined relationships among the observed variables and underlying construct. In order to continue with the SEM, measures must be assigned. Therefore, the observed variables were the two extracted components of JVs, and the latent variable was the overall contribution for measuring the degree of success. Analysis of moment structure (AMOS), with the assistance of SPSS, was used to conduct the analysis.

The output from the PCA, as previously discussed, was the input in this analysis. The measured and underlying variables were used to develop the structural model for JVs in the oil and gas industry. Financial measure and sustainability measure were the two observed variables. The unobserved variable in the model was the measure of the degree of success of JVs in the oil and gas industry. Figure 2.6 shows the model and its parameters.

In Figure 2.6, the weight of each measure was 0.72 and 0.64 for sustainability and financial measures, respectively. The regression value indicated that not only were these measures positively related, but they were also strongly connected as the values were higher than 0.5.

All of these results indicated that the model was a good fit and was acceptable. Consequently, the result from the PCA was valid; and, as a result, the sustainability and financial measures were fit to measure the degree of success of JVs in the oil and gas industry.
Figure 2.6: Model between observed and uncovered variables

2.5 Conclusion

JVs in the oil and gas industry will not be disappearing anytime soon; indeed, the number of JVs is expected to increase in the near future as the global demand for energy resource increases. JVs need to be measured correctly in order to properly assess their potential for success. This chapter presents the study of several measures with respect to their contribution in measuring the degree of success of JVs in this industry. This research was supported by a variety of academic and privately studies spanning several years, with the aim of explaining the importance of using JV measures to measure the degree of success of JVs.
Two measures were extracted from a list of JV indicators, using data collection via interviews and questionnaires. As a result, sustainability satisfaction and financial satisfaction were the two extracted success measures. The two factors were extracted using a principal component analysis (PCA). Each component consisted of several related variables. The sustainability satisfaction component encompassed five measures: longevity, stability, community alignment, environmental influence and dispute resolution. Financial satisfaction consisted of five measures: profitability, market share, access to new markets, growth and reputation.

Each component was tested in regards to its reliability and consistency and both fell within the acceptable range. Furthermore, structural equation modeling (SEM) was used to test the integrity of the components. The strengths of the relationships determined by SEM were 0.72 and 0.64 for the sustainability and financial measures, respectively. Overall, the relationships between the degrees of success measured and the two components tested using SEM determined that the two components were excellent fits and could be used to measure the degree of success of JVs in the oil and gas industry.

The results also suggested that profitability was the most important measure with regard to the mean score. With respect to the correlation coefficient values, market share and longevity were the most correlated to the financial and sustainability satisfaction components, respectively. Finally, the results indicated that sustainability satisfaction and financial satisfaction could be utilized to measure the degree of success in JVs in the oil and gas industry. Researchers, as well as studies conducted by private organizations in the oil and gas industry, could use the above
extracted measures to determine the degree of success of a JV. Figure 2.7 shows a summary for the main conclusion of this research.

Figure 2.7: A summary of the relationship among measures
CHAPTER THREE: ANALYSIS OF STRATEGIC RISK FACTORS IN JOINT VENTURES IN THE OIL AND GAS INDUSTRY

3.1 Introduction

The current situation in the oil and gas industry and its projected future present many investment opportunities, especially with the global demand for energy is increasing (IEA, 2014). The opportunities available in this field entice many oil and gas companies to make investment deals. Several companies enter into investment agreements, but they encounter obstacles and barriers, such as massive capital costs, and high risk, that affect their projects financially and economically (McKenna Wilczynski & VanderSchee, 2006; Troy, 2015). Therefore, companies are considering joint ventures (JVs) as tools to overcome these obstacles and execute projects (Vandeklippe, 2012).

The use of joint ventures is increasing in the oil and gas industry (Grant, 2012; Vandeklippe, 2012). The increase in number is significant; consequently, if JVs fail, the economy could be negatively impacted. Despite the increase in JV deals, the rate of success is not promising, particularly in the oil and gas industry. A study by KPMG (2011) concluded that more than 80% of JVs did not meet the goal for which they were created. Additional research showed that JVs either struggled in achieving their goals from the outset (McKenna et al., 2006) or that they succeeded and performed well or moderately well, but then broke down (Jain & Jain, 2004).
JVs have not been executed in an effective way, and the involved companies failed to evaluate the associated strategic risk factors, which resulted in many unsuccessful JVs. The success rate of JVs negatively affects future JV projects, as many investment opportunities in the oil and gas industry are waiting to be executed and utilized (McKenna et al., 2006). As stated by Bamford et al. (2004), “Joint ventures can deliver more shareholder value than mergers and acquisitions, but getting them off the ground can trip you in unpredictable ways.”

As previously mentioned, JVs have several risk factors that need to be examined in order to help their success. Lack of commitment, inadequate communication, poor governance strategies, insufficient parent (i.e. JV participant) involvements are examples of JV risk factors. Differences among the involved parties in terms of culture, management style, work environment and values should also be considered when entering into a JV. In addition, risks can also arise as a result of poor decision-making, and these risks can contribute to the lack of success of JV projects. These risk factors need to be examined at the beginning, in order to establish a successful JV; and, failure to do so will likely endanger the entire project and decrease the chance for success. (Beamish & Lupton, 2009; Graff, et al., 1998)

In this research, current and past joint ventures in the oil and gas industry were evaluated, and key factors in assessing the risks involved when oil and gas companies’ engage in JV decision-making processes were considered. In particular, this investigation aimed at supporting the oil and gas industry in evaluating the risks of JVs and enabling their successful execution.
There is a lack of research conducted on the subject of identifying and examining major strategic risk factors of JVs in the oil and gas industry. Private consulting agencies have discussed the issue, but they have not provided solid and thorough research. A few previous studies investigated this matter, but only as a minor focus; and, the studies failed to present the big picture. The aim of this research was the presentation of the issue in a holistic way by considering the major risk factors and their impact on different elements of JVs, such as phases and success measurements. The study was expected to answer the following questions:

- What are the major strategic risk factors in oil and gas JVs that affect success?
- How are these factors correlated and what construct are they measuring?
- How are the risk factors related to the JV phases?
- What is the relationship between the risk factors and the success measures?

This research investigated contractual JVs in the oil and gas industry, which Grand (2012) defined as “a contract governs the relationship between joint ventures where no separate legal entity is created”, with respect to their risk factors that affect the level of JV success. The overall aim was the provision of a tool to help the industry establish successful JV projects by identifying the factors, examining their importance, and exploring their correlations.
3.2 Literature Review

3.2.1 Background

The Oxford English dictionary defines a joint venture as a business enterprise in which two companies or more enter into a temporary partnership. According to Culpan (2002), two or more organizations collaborate together in order to create an independent business through the sharing of their resources. Wallace (2004) defines a JV as two or more firms coming together to accomplish specific goals that would not be achievable by one firm alone. Hebert (1996) defines a JV as “… a shared-equity and decisions making arrangement involving two or more firms (parents).” It is implied that parents (participants of a JV) must have mutual goals and a sense of collaboration and that multiple independent players come together in a time constrained task to achieve common goals.

JVs can take different forms or sizes, depending on the needs of the involved participants. Generally, JVs involve two companies; however, occasionally, due to business circumstances and the scale of projects, the collaboration of more partners is required. The alliance of self-governing firms is a difficult task, due to their different management styles, cultures, vision, mission and values (Beamish & Lupton, 2009). These variances can create obstacles and barriers and should be addressed before entering into a JV (Wallace, 2004).

The level of interdependence among participants in JVs is crucial: this factor differentiates the JV from other strategic alliances. Each firm must understand that the main purpose of the JV is the successful achievement of a goal that one firm cannot accomplish alone. Based on this mutual understanding, the firms should act on the basis of mutual benefits and objectives to attain the
ultimate targets of the JV. Serving the mutual objectives and common goals will contribute to the success of a JV; otherwise, the joint venture will fail (Wallace, 2004).

JVs today face many risk factors that can be harmful or destructive; these risks include culture differences, incapable partners and weak management (Jelinek & Pettit, 2012; Beamish & Lupton, 2009). The absence of a clear method or model to govern JVs drives participants to act alone, which may result in the failure of a JV (Beamish & Lupton, 2009). The impact of the distribution of authority and decision-making processes needs to be considered relative to serving the common goals of the JV (Williamson, 1991; Williamson, 1996; Killing, 1983). To ensure success, firms should address the appropriate distribution of control of a JV (Hart, 1995; Beamish & Lupton, 2009).

Risks can be categorized into three types: 1) strategic risks, 2) operational risks, and 3) contextual risks. Each one of these types has its own definition and implications. This study concerns about the strategic risks which deals with the risks that are out of control of the JV’s team and need the involvement of the parents companies. It can be defined as “threats with a potential impact on project business objectives resulting from decisions made by corporate management” (Hetland, Jergeas, Rolstadås, & Westney, 2011).

3.2.2 Trends

High risks and high rewards are characteristics of the oil and gas industry, which is surrounded by fierce competition, especially in new and unconventional businesses. Oil firms try to survive by gaining competitive advantages through JVs (Devlin & Bleakly, 1988; Jelinek and Pettit, 2012; Bill,
In relatively new markets, the associated risks are high, due to operational complexities, and lead players to negotiate JVs. As a result, a significant number of oil and gas companies try to operate in today’s highly competitive market with sustainable competitive advantages (Ernst and Halevy, 2004; Inkpen & Moffett, 2011), which can be achieved through the utilization of JVs (Ward, 2001, Bill, 2013). With a noticeable increase in exploration and production in the oil and gas industry, substantial JV deals have been made. Exploration and production projects have more JVs than any other area in the industry, due their complexity and the involvement of high capital costs and risks (Ernst & Young, 2012; Inkpen & Moffett, 2011; Grant, 2012, Bill, 2013).

3.2.3 Joint Venture Phases

In general, the life cycle of a JV is divided into several stages (E & Y, 2011; Beamish & Lupton, 2009), as presented in the following subsections

3.2.3.1 Joint Venture Planning and Initiation

The initiation stage is one of the most important stages of the JV process. It is the foundation of the JV and is usually responsible for a successful JV. A business structure should be implemented, and the goals and scope of the project should be defined during this stage. Research indicates that this stage is where decision-making matters the most; however, the following phases are just as important. The strategic gain of the creation of a JV should be clear before continuing to the other phases.
3.2.3.2 Joint Venture Formation and Negotiations

The formation phase follows the planning stages and depends on their outputs. Specific details should be negotiated, including the finance plan, logistics arrangements, the use of exclusive technologies and termination options. Partners should also agree on the mechanism of dispute settlements (Beamish & Lupton, 2009; E & Y, 2011)

3.2.3.3 Joint Venture Operation and Ongoing Management

In this stage, participants have already formed the JV team and negotiated the fine details of the agreement. It is crucial at this stage to ensure that the JV is performing as planned. The JV team should try to align the JV’s activities with those of the parent companies in all crucial decisions. The involvement of the right team with the right skills to steer a JV plays a key role in its success (Hetland et al., 2011)

3.2.3.4 Joint Venture Termination

Most JVs neglect this phase or do not devote much time and effort in planning the JV termination. Players should agree on the termination conditions and options. Each dissolution option should be Included. The three most likely options are 1) one party buys the JV, 2) the JV is sold to an outsider, and 3) the JV is split among the participants. The third option is generally very difficult to administer due to disagreements over how the JV will be split.
3.2.4 Summary

In conclusion, JVs will always be utilized in the oil and gas industry, and firms should embrace this fact. The high risk and capital costs of oil and gas projects are also driving companies to form JVs. However, JVs are complex and could have substantial implications if not implemented correctly (Badiru, & Osisanya, 2013). Identification of the risk factors of JVs in advance and evaluation of their impacts are crucial. Players should manage JVs by controlling their risk factors, such as governance issues and management style differences.

3.3 Research Methodology

A qualitative research method (descriptive) followed by a quantitative (numerical; exploratory design) method was used in the design of this study (Gay, Mills, & Airasian, 2011). The research process was divided into two steps based on their order in the design with respect to the data collection and analysis method. The results from the first step were used in the second step as Figure 3.1 shows.

Qualitative research was utilized first to collect more information about risk factors and their impact on the likelihood of JV success. Instruments were used such as documents review and interviews. Also, qualitative method was used to explore the topic and assist in developing the questionnaire. Then, quantitative method was utilized to collect specific information such as risk impacts.
Step one was the foundation of the research design. In the first step, the researchers reviewed the available literature in academia and private agencies that was related to strategic alliances and JVs, particularly in the oil and gas industry. Review of the literature was conducted on studies from 30 years ago to present day. A wide range of research was reviewed in order to achieve a comprehensive understanding of strategic alliances and JVs. For example, different agencies, ranging from small to big, public and private, were targeted and reviewed. The review of various organizational documentation, including that from managerial, financial, regulatory and law firms,

Figure 3.1: Illustration of the process of research methodology
took place during this step as well. This review helped the researcher to gather more information, explore the research problem and helped to establish research data collection instruments.

In order to apply the information obtained in the first step, two unique JV contracts were examined with respect to risk factors. The two JVs were unique based on their success and failure. The two JV contacts had a combined worth of more than $8 B. These contracts were examined in regards to several JV aspects, including the involved risk factors.

As a result, interview questions were developed with respect to the findings from the previous steps. Experienced people and several organizations in the oil and gas industry JVs were targeted as interviewees. More than 10 interviews were conducted face-to-face and by phone to reach to the saturation point where information redundancy was noted (Creswell, 2012; Gay et al., 2009; Mason 2010; Morse, 1995). Questions regarding JVs in the oil and gas industry, their complications and risk factors were asked in the interviews. Interviewees’ positions ranged from entry-level to high management, partners to associated personnel, professors and researchers; this diversity in positions held by the interviewees aided in understanding the topic from several perspectives. Consequently, a comprehensive list was obtained of the most crucial strategic risk factors that impact contractual JVs in the oil and gas industry. The information gathered was then used to craft the questionnaires, which were used in the second step of this research.

A list of the most critical strategic risk factors was the main output from step one. These risks are described in detail in the following points:
• **Risk 1:** The term ‘joint venture’ and its definition are not clearly defined and understood. The term joint venture should be clearly defined and understood by all parties. This term encompasses different aspects, including financial and legal perspectives that need to be addressed. Failure in any of the underlying elements of the term may jeopardize the entire process.

• **Risk 2:** Ignoring changes over the course of the JV for each party, The oil and gas industry tends to be unstable compared with other industries and their JVs. Parents may change during the course of the JV, harming the JV. These changes should be discussed and disclosed by parents to minimize their effect on JVs.

• **Risk 3:** No clear exit strategy and replacement procedures. Explaining the options for exit strategies is very vital to the success of JV. JV participants should discuss and agree on the options for a party to exit the agreement. This allows JVs to avoid any issues and problems that may rise during the duration of the JV. It protects the JV if a parent cannot continue as a member of the JV.

• **Risk 4:** Poor strategy on handling future investment of each party outside the JV. This risk must be taken very seriously and addressed in advance. Each parent should know their right to invest outside the JV. Ignoring this matter may have damaging consequence on JVs and result in its failure.

• **Risk 5:** Previous negative relationships among parent organizations, Sometimes a prior relationship may impact the establishment of a JV. Parents with bad experiences with each other may face problems in forming a JV. This risk could be very damaging if not addressed in advance. Parents should discuss this risk, determine its implication and try to minimize its impact.
• **Risk 6: Control of the JV split, regardless of each parent's expertise.** In many cases, the control of the JV is split with respect to the financial contribution of each parent. This results in ignoring the expertise of participants, which may be harmful to the JV. This risk should be addressed in advance by exploiting each parent’s area of expertise and allowing them to utilize their knowledge. Failing in doing so may undermine the entire purpose of the JV.

• **Risk 7: Government involvement is high and regulations frequently change.** One of the main risks is the government and its regulations. Parents should take this seriously and address it in the very early stages of the JV. Various levels of government impose extensive controls and regulations on oil and gas operations. Governments may regulate or intervene with respect to exploration and production activities, prices, taxes, royalties and the exportation of oil and gas. Changes to these controls and regulations may occur from time to time in response to economic or political conditions. Regulations, especially in the oil and gas industry, are very rigid. Parents should be able to work with these regulation and any changes.

• **Risk 8: Poor forecasting and handling of the global economy and political climate and their effect on commodity prices.** Oil and gas are the most watched commodities in the world; therefore, they are impacted by many economic and political issues around the globe. Prices for oil and natural gas are subject to large fluctuations in response to relatively any changes in the supply of and demand for oil and gas, market uncertainty and a variety of additional factors beyond the control of the JV. Any substantial and extended decline in the prices of oil and natural gas would have an adverse effect on a JV. Parents should acknowledge this and act accordingly. They should plan for any
changes and try to accommodate them. This risk is severe if not managed and may cause a JV to fail.

- **Risk 9: Poor governance strategy and ineffective involvement of parent companies in the JV:** The degree of the involvement of the parents in the JV governance process is very crucial. Parents should acknowledge this and act accordingly. Whether it is a fixable or rigid involvement, parents should agree on the governance style and maintain it. This would affect the entire process of the JV, especially in decision-making elements.

- **Risk 10: Parent companies try to outpace each other’s learning to gain competitive advantage over each other by controlling valuable knowledge transfer (inadequate knowledge management practices).** This risk can be very harmful to a JV and result in its failure. The terms of the agreement should clearly define this risk and its boundaries. Parents should not feel threatened to share information with each other. In fact, they should be very open and put the JV’s interests ahead of their own.

- **Risk 11: Parent companies are in different stages of the value chain (size).** Differently sized parent companies can create a problematic risk when establishing a JV, if not managed correctly. Parents should acknowledge this risk and discuss its implication in detail.

- **Risk 12: Ignoring national and organizational cultural differences in communication, management style, time zone, decision-making and managing personnel.** The impact of cultural differences in establishing JVs should be considered at the very beginning, as they can be harmful. Differences at national and/or organizational levels should be addressed. The importance of this risk must be acknowledged and
discussed in detail among parents. Poor communications and inadequate decision-making processes are just examples of the implication of this risk on JVs.

- **Risk 13: Absence of cultural differences training, such as observing each parent's work environment, and lack of the cultural awareness.** Acknowledgement of cultural differences is a risk that’s impact must be minimized. Many parents admit to these differences, but fail to offer any solutions to minimize them. Parents should offer many ways, such as training and observation, to handle this risk.

- **Risk 14: Protection of the proprietary information or technologies has not been addressed upfront, especially those created by the JV.** New technologies and methods may be developed over the course of JVs. Parents should be able to discuss the rights of the new methods/technologies in detail. They should also outline and agree on their utilization within and external to the JV. Ignoring this risk cannot only cause the JV to fail, but also opens the door to lawsuits.

- **Risk 15: JV drivers and motives of parents are different.** The motives of establishing a JV should be disclosed and discussed by each parent. Having different motives may not cause any major problems, unless they are not disclosed. Each parent should know the intents of all JV parties.

- **Risk 16: Control and resolution mechanisms were not developed properly and effectively resulting in delays.** When two or more companies come together to form a JV, problems can definitely occur and need to solved in a timely manner. Failing in dissolving the problems quickly can be very harmful. The JV should follow an effective strategy to control and solve any problems that may rise.
• **Risk 17: Insufficient willingness of one or all of the parents to provide a long-term/short-term commitment to the JV or share resource.** The level of commitment among the JV parties should be defined clearly. Parents should outline their understanding of the commitment to the JV and provide the necessary information about it. Each parent should discuss their level of willingness in advance. Ignoring this risk can result in misunderstandings among parties, which can cause of a JV’s failure.

• **Risk 18: Ineffective process for performance and responsibility measurements of a JV and its personnel.** Maintaining JVs is a very difficult task, especially in the oil and gas industry. Performance measures of JVs should be discussed and understood by each parent. This allows parties to assess the JV’s progress and make informative decisions.

• **Risk 19: Poor communication plans among parent organizations and JV personnel, including the main objective and the expectations of the JV.** Communication is essential for JVs and needs to be included in the planning stage. It needs to be planned at the very beginning of the JV. Poor communications is one the leading causes of failures of joint ventures in the oil and gas industry. Communication plans should take in consideration many factors, such as cultural differences. Communications is not only necessary for easing the process of forming JVs, but also for maintaining them.

• **Risk 20: Participants’ contributions are not clearly outlined, documented, expected and understood.** Each parent should know their rights and contributions. Understanding them is very beneficial in helping JVs achieve their goals. Poor handling of this risk can easily shift a JV’s priorities, which disturbs the stability of JVs. Parents should be very clear from the beginning about their contributions to a JV.
• Risk 21: Ignoring the forming of social ties among parents and developing shared values and relationships. Building relationships among JV’s parents starts in establishing social ties among their personnel. This process is very effective in easing the forming of JVs. Failure to acknowledge its importance can affect a JV in many ways, such as in the decision-making process. Parents should plan to strengthen the relationships among JV’s personnel.

• Risk 22: Financial difficulties for parents due to cost escalation and inflation. This risk should be included in the steps of the formation of a JV. Each parent must be very clear regarding their financial situation. Parties should agree on the strategies of handling this risk if it occurs. It is important for parents to acknowledge this risk and its implication, which can destroy JVs.

• Risk 23: Insufficient understanding and compliance of environmental policies. One of the most crucial regulations in the oil and gas industry is environmental compliance. Failure to meet the requirements of regulations would be very damaging to a JV. All phases of the oil and gas business present environmental risks and are subject to environmental regulation. Compliance with such legislation can require substantial cost, and a breach may result in the imposition of fines. Parents should study these regulations and their details very carefully, in order to avoid adversely effects that would jeopardize the success of a JV.

In step two, the researchers utilized a quantitative method in data collection and analysis in order to determine the relationships and correlations among the identified strategic risk factors with the help of statistical tools. To simplify the process of filling in the questionnaires, the questionnaires
were developed online using a readily available platform (Survey-Monkey) and distributed by electronic mail. The questionnaire was sent to several organizations, including oil and gas companies and associations, managerial, financial, and law agencies, and independent researchers through their representatives. The response rate was more than 28%, or a total of 140 responses. This qualified the 140 participants to fulfill data requirements of 3 cases per variables (3 responses per factor). In this case, there were more than 5 respondents for each factor, which allowed for the use of data extraction methods (Phillips, Gauthier, & Thurimella, 2010).

The questionnaire encompassed two parts: demographics and risk factors, as presented in Appendix D. Most of the questions were closed ended. In the first part, participants are asked for basic information, including their industry, service, experience, number of JVs, and positions. In the second part, a list of the risk factors was provided; and, the participants were asked to associate each risk factor with risk impact, success measures and JV phase. Participants had to assign each risk a degree of impact on the success of JVs, and the relationship and importance to the success measures and JV phases. Participants were also asked to rate the overall success of JVs and measures and offered the opportunity to justify their responses.

The different sections in the questionnaire had their own measurement scales:

- For the overall rating for the JV success and the success measures (financial and sustainability), a Likert scale ranging from 1 to 10 was used, where 1 indicated a high rating and 10 meant a low rating.
- For the impact of the risk factors, a Likert scale ranging from 1 to 10 was also used; however, 1 indicated a low rating, and 10 meant a high rating.
For the relationships between the risk factors and the success measures, a Likert scale ranging from 0.1 to 1 was used, where 0.1 indicated a low rating and 1 meant a high rating.

Statistical methods were used to analyze the data and reach conclusions. Normality, reliability and consistency tests were completed. A descriptive analysis, including means and standard deviations, was then conducted on the risk factors with respect to their impact in order to prepare the data for the next step. A correlation matrix was examined; and, the principal component analysis (PCA) extraction method was then administered to categorize the factors, find an underlying structure and identify the common factors. PCA was conducted to reduce the number of factors for easier exploration.

The relationships between JV phases and risk factors were also tested, as well as those between risk factors and success measures, including financial and sustainability satisfaction measures. Figure 3.2 shows a detailed road map for the research. These tests were administered using SPSS software package version 21.
Figure 3.2: Detailed research methodology steps
3.4 Data Analysis and Discussion

Respondents of the survey were profiled according to their position, organization, experience and number of JVs. The data were prepared to conduct inferential statistical analysis. The list of 23 strategic risk factors was developed, and PCA was performed. The results of this analysis were used to discover meaningful relationships among the extracted factors and success measure components. The relationships among extracted factors and JV phase were also examined. Figure 3.3 details the steps of the statistical analysis of this study.

3.4.1 Data preparation

As previously mentioned, several organizations were targeted, including oil and gas companies, consultation agencies, regulators and academic institutions. More than half of the participants represented oil and gas companies and 65% of these participants held executive and senior positions. Forty-five percent of the respondents had at least 15 years of experience and had been involved in more than five JVs in the oil and gas industry.
Figure 3.3: Detailed flowchart of the data analysis process
The statistics showed that the survey captured a wide range of perspectives, due to the diversity of the participants. A normality test was then administered based on the data collected. The results indicated that almost all risks were within an acceptable range; and, as a result, the data were considered satisfactory for normality (Tabachnick & Fidell, 2001).

3.4.2 Data analysis

PCA is a statistical tool used for many purposes in this study. PCA was used to reduce the number of risk factors and to explore latent components (Field, 2009). The main goals were discovery of clusters and categorization and grouping of risk factors. This tool allowed the researchers to group and categorize risk factors and find common constructs where several variables could be combined. PCA consisted of the following steps: 1) calculation of the correlation matrix among factors, 2) factor extraction, and 3) reliability test for the extracted variables.

3.4.2.1 Correlation Matrix

The correlation matrix in PCA was conducted using the Pearson r correlation method, which studies the strength and direction of the correlation among risk factors, as shown in Table 3.1. The correlation value (r) can range from +1 to -1, where the number denotes the strength and the sign indicates the direction. It was established that moderate and strong correlations occurred when the value of r was larger than 0.5 and 0.7, respectively. An r value of zero signified that there was no correlation between the variables. A plus sign indicated that the two risks were positively correlated, and a minus sign implied negative correlations (Field, 2009).
For this study, the results of the correlation matrix indicated that each one of the 23 risk factors was correlated with at least three other factors. Almost all of the 23 factors were strongly and moderately correlated among each other, and this result suggested that the data were suitable for PCA.

It was expected that the highly correlated risks would cluster and form a component. By looking at the correlation each factor with other individual factors, it could be noticed that some factors were more correlated than others. For instance, Risk 1 was highly correlated with Risks 3, 5 and 6, and it was expected that they could be grouped together. However, the correlation matrix alone was not able to determine the number of components and their associated factors. Therefore, PCA was used to determine the components in much more robust way.
Table 3.1: Weight of the correlation coefficient among risk factors (where R refers to Risk)

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<td>.433</td>
<td>.956</td>
<td>.497</td>
<td>.873</td>
<td>.674</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R11</td>
<td>.332</td>
<td>.260</td>
<td>.422</td>
<td>.336</td>
<td>.414</td>
<td>.683</td>
<td>.474</td>
<td>.686</td>
<td>.714</td>
<td>.746</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>R15</td>
<td>.375</td>
<td>.361</td>
<td>.487</td>
<td>.409</td>
<td>.383</td>
<td>.874</td>
<td>.475</td>
<td>.796</td>
<td>.665</td>
<td>.878</td>
<td>.802</td>
<td>1.000</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R16</td>
<td>.275</td>
<td>.309</td>
<td>.342</td>
<td>.404</td>
<td>.442</td>
<td>.843</td>
<td>.404</td>
<td>.869</td>
<td>.769</td>
<td>.915</td>
<td>.821</td>
<td>.927</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R17</td>
<td>.532</td>
<td>.409</td>
<td>.402</td>
<td>.408</td>
<td>.456</td>
<td>.893</td>
<td>.390</td>
<td>.805</td>
<td>.652</td>
<td>.884</td>
<td>.864</td>
<td>.915</td>
<td>.836</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R7</td>
<td>.378</td>
<td>.231</td>
<td>.279</td>
<td>.276</td>
<td>.470</td>
<td>.428</td>
<td>.209</td>
<td>.169</td>
<td>.133</td>
<td>.311</td>
<td>.255</td>
<td>.384</td>
<td>.307</td>
<td>.325</td>
<td>.605</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R20</td>
<td>.280</td>
<td>.041</td>
<td>.217</td>
<td>.197</td>
<td>.407</td>
<td>.560</td>
<td>.412</td>
<td>.389</td>
<td>.145</td>
<td>.439</td>
<td>.479</td>
<td>.470</td>
<td>.458</td>
<td>.497</td>
<td>.467</td>
<td>.829</td>
<td>.637</td>
<td>.663</td>
<td>.766</td>
<td>.768</td>
<td>.803</td>
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</tr>
<tr>
<td>R23</td>
<td>.339</td>
<td>.407</td>
<td>.252</td>
<td>.411</td>
<td>.315</td>
<td>.784</td>
<td>.316</td>
<td>.361</td>
<td>.428</td>
<td>.422</td>
<td>.499</td>
<td>.554</td>
<td>.739</td>
<td>.437</td>
<td>.561</td>
<td>.663</td>
<td>.595</td>
<td>.735</td>
<td>.822</td>
<td>.665</td>
<td>.682</td>
<td>.721</td>
<td>1.000</td>
</tr>
</tbody>
</table>

87
3.4.2.3 Principal Component Analysis (PCA)

As previously mentioned, the data were appropriate for PCA. The PCA technique attempts to identify the components that account for the most variation in a data set among risk factors. It analyzes the data set by trying to explain all the variances through the determination of the components and their factor loading. This tool calculates eigenvalues and eigenvectors for the data set, in order to determine the amount for variance that can be explained, and then the loading values between the risks and the components.

The factor extraction was conducted and was dependent on the total explained variance and the eigenvalues (EV). Each extracted factor with an EV greater than 1 was considered a suitable factor and was extracted (Field, 2005). Table 3.2 and Figure 3.4 present the number of extracted factors that fit the requirement of having an EV larger than one.

Three components could be extracted from this data. Table 3.2 shows that the EVs before rotation in each component were 15, 3.2 and 1.8 in components one, two and three, respectively. However, after rotating the components using the Vimarix method, which assisted in testing the strength of the number of variables (risks) with respect to the extracted components, the EV of each factor was similar. The total explained variance by each factor was almost the same after rotation. The total explained variance was 87.57%; only 12% of variance was not explained. This indicates that the three extracted components were excellent in representing the risks. In other words, the 23 risks were grouped into three categorizations.
Three components were extracted from the data, and each one had its own loading with the risks. In order to assign each risk to the most suitable factors, a matrix among factors and risks was developed, as presented in Table 3.3. Each extracted coefficient value between the risks and the components was relatively high: more than 75% of the risks had a high loading value with more than 0.7. Only 5 risks out of 23 were between 0.5 and 0.7. Out of the 23 risks, the first component had 7 risks with high loading values. The other two components had eight risks with high loading values.

Table 3.2: Total explained variance

<table>
<thead>
<tr>
<th>Factors</th>
<th>Extraction Sums of Squared Loadings</th>
<th>Rotation Sums of Squared Loadings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total (EV)</td>
<td>% of Variance</td>
</tr>
<tr>
<td>1</td>
<td>15.069</td>
<td>65.518</td>
</tr>
<tr>
<td>2</td>
<td>3.231</td>
<td>14.048</td>
</tr>
<tr>
<td>3</td>
<td>1.843</td>
<td>8.011</td>
</tr>
<tr>
<td>4</td>
<td>0.783</td>
<td>3.4</td>
</tr>
<tr>
<td>5</td>
<td>0.576</td>
<td>2.5</td>
</tr>
<tr>
<td>6</td>
<td>0.435</td>
<td>1.89</td>
</tr>
<tr>
<td>7</td>
<td>0.381</td>
<td>1.65</td>
</tr>
<tr>
<td>8</td>
<td>0.262</td>
<td>1.13</td>
</tr>
<tr>
<td>9</td>
<td>0.157</td>
<td>0.681</td>
</tr>
<tr>
<td>10</td>
<td>0.134</td>
<td>0.581</td>
</tr>
</tbody>
</table>
Figure 3.4: Eigenvalues with the number of extractable factors

Table 3.3: Factor loading matrix among factors and risks

<table>
<thead>
<tr>
<th>#</th>
<th>Strategic risk factors</th>
<th>Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>R1</td>
<td>The term ‘joint venture’ and its definition are not clearly defined and understood</td>
<td>.833</td>
</tr>
<tr>
<td>R3</td>
<td>No clear exit strategy and replacement procedures</td>
<td>.924</td>
</tr>
<tr>
<td>R5</td>
<td>Previous negative relationships among parent organizations</td>
<td>.867</td>
</tr>
<tr>
<td>R6</td>
<td>Control of the JV split, regardless of each parent's expertise</td>
<td>.789</td>
</tr>
<tr>
<td>R10</td>
<td>Parents try to outpace each other’s learning to gain competitive advantage over each other by controlling valuable knowledge transfer (inadequate knowledge management practices)</td>
<td>.737</td>
</tr>
<tr>
<td>R12</td>
<td>Ignoring national and organizational cultural differences in communication, management style, time zone, decision-making and managing personnel</td>
<td>.598</td>
</tr>
<tr>
<td>R22</td>
<td>Financial difficulties for parent due to cost escalation and inflation</td>
<td>.536</td>
</tr>
<tr>
<td>R2</td>
<td>Ignoring changes that happen over the course of the JV for each party</td>
<td>.775</td>
</tr>
<tr>
<td>R4</td>
<td>Poor strategy on handling future investment of each party outside the JV</td>
<td>.895</td>
</tr>
<tr>
<td>R9</td>
<td>Poor governance strategy and ineffective involvement of parent companies in the JV</td>
<td>.670</td>
</tr>
<tr>
<td>R11</td>
<td>Parents are in different stages of the value chain (size)</td>
<td>.856</td>
</tr>
<tr>
<td>R15</td>
<td>JV drivers and motives of the parents are different</td>
<td>.655</td>
</tr>
<tr>
<td>R16</td>
<td>Control and resolution mechanisms were not developed properly and effectively, resulting in delays</td>
<td>.770</td>
</tr>
<tr>
<td>R17</td>
<td>Insufficient willingness of one or all of the parents to provide a long-term/short-term commitment to the JV or share resources</td>
<td>.707</td>
</tr>
<tr>
<td>R21</td>
<td>Ignoring the forming of social ties among parents and developing shared values and relationships</td>
<td>.833</td>
</tr>
<tr>
<td>R7</td>
<td>Government involvement is high and regulations frequently change</td>
<td>.893</td>
</tr>
<tr>
<td>R8</td>
<td>Poor forecasting and handling of the global economy and political climate and their effect on commodity prices</td>
<td>.812</td>
</tr>
<tr>
<td>R13</td>
<td>Absence of cultural differences training, such as observing each parent's work environment, and lack of the cultural awareness.</td>
<td>.598</td>
</tr>
<tr>
<td>R14</td>
<td>Protection of the proprietary information or technologies has not been addressed upfront, especially those created by the JV</td>
<td>.656</td>
</tr>
<tr>
<td>R18</td>
<td>Ineffective process for performance and responsibilities measurements of JV and its personnel</td>
<td>.835</td>
</tr>
<tr>
<td>R23</td>
<td>Insufficient understanding and compliance of environmental policies</td>
<td>.842</td>
</tr>
<tr>
<td>R19</td>
<td>Poor communication plans among parent and JV personnel, including the main objective and expectations of the JV</td>
<td>.920</td>
</tr>
<tr>
<td>R20</td>
<td>Participants’ contributions are not clearly outlined, documented, expected and understood</td>
<td>.861</td>
</tr>
</tbody>
</table>
3.4.3 Components reliability

Each of these extracted groups was tested with respect to its reliability and consistency using Cronbach’s alpha ($\alpha$). If the alpha was greater than 0.7, the factor reliability was satisfactory (Field, 2009). This suggests that the factor and its risks are strongly correlated; in fact, the extracted components can represent its risks. It also indicates that the internal consistency among components and their risks is acceptable.

3.4.3.1 First Group of Factors

Variables (risks) that were related to the first component are sorted in Table 3.4 based on their correlation coefficient. The results show that the first factor had a high level of satisfaction as reflected in the overall alpha value of 0.957. Each risk, such as Risks 1, 3, 5, 6, 12 and 22, had a high correlation and a similar alpha value, which indicated all risks were vital to the component. The total corrected correlation of each risk and the rest of the risks was excellent. When Risk 3 was removed, the alpha number improved slightly; however, it had a very high correlation value of 0.92, which could not be ignored.

Risk 3 (no clear exit strategy and replacement procedures) was the most important factor in this component and had a loading value of 0.92. Risk 1 (the term ‘joint venture’ and its content are not clearly defined and understood) and Risk 5 (a previous negative relationships among parent organizations) ranked in the third and second places, respectively, in terms of importance with loading values of 0.83 and 0.86, respectively. Control of the JV split, regardless of each parent
organization's expertise (Risk 6) and inadequate knowledge management practices (Risk 10) had almost similar loading values and ranked fourth and fifth, respectively. These results proved that this component and its risks passed the reliability test and could be considered for this research. These risks and their importance indicate the boundaries of a JV; therefore, this component has termed ‘the JV boundary factor’.

Table 3.4: Statistical characteristics of joint venture boundary component

<table>
<thead>
<tr>
<th>Risk</th>
<th>Loading</th>
<th>Corrected Item-Total</th>
<th>Cronbach's Alpha if Risk Deleted*</th>
</tr>
</thead>
<tbody>
<tr>
<td>R3</td>
<td>.924</td>
<td>.755</td>
<td>.958</td>
</tr>
<tr>
<td>R5</td>
<td>.867</td>
<td>.937</td>
<td>.944</td>
</tr>
<tr>
<td>R1</td>
<td>.833</td>
<td>.929</td>
<td>.944</td>
</tr>
<tr>
<td>R6</td>
<td>.789</td>
<td>.858</td>
<td>.950</td>
</tr>
<tr>
<td>R10</td>
<td>.737</td>
<td>.874</td>
<td>.949</td>
</tr>
<tr>
<td>R12</td>
<td>.598</td>
<td>.832</td>
<td>.952</td>
</tr>
<tr>
<td>R22</td>
<td>.536</td>
<td>.792</td>
<td>.956</td>
</tr>
</tbody>
</table>

* Overall Cronbach’s alpha value was 0.957

3.4.3.2 Second Group of Factors

As Table 3.5 shows, the overall alpha value was 0.97 for the second component, which suggested that the consistency and reliability of this factor was acceptable. The total corrected correlation, which measures each risk’s correlation with the other risks, indicated that all risks had a
value larger than 0.85, with the exception of Risk 4 (poor strategy on handling future investment of each party outside the JV), which had a value of 0.71. However, Risk 4 had the highest loading value to the component compared to the other risks. All risks were within the acceptable range of alpha values.

Table 3.5: Statistical characteristics of compatibility and governance component

<table>
<thead>
<tr>
<th>Risks</th>
<th>Loading</th>
<th>Corrected Item-Total Correlation</th>
<th>Cronbach’s Alpha if Item Deleted</th>
</tr>
</thead>
<tbody>
<tr>
<td>R2</td>
<td>.775</td>
<td>.873</td>
<td>.967</td>
</tr>
<tr>
<td>R4</td>
<td>.895</td>
<td>.719</td>
<td>.975</td>
</tr>
<tr>
<td>R9</td>
<td>.670</td>
<td>.900</td>
<td>.964</td>
</tr>
<tr>
<td>R11</td>
<td>.856</td>
<td>.862</td>
<td>.967</td>
</tr>
<tr>
<td>R15</td>
<td>.655</td>
<td>.921</td>
<td>.963</td>
</tr>
<tr>
<td>R16</td>
<td>.770</td>
<td>.951</td>
<td>.962</td>
</tr>
<tr>
<td>R17</td>
<td>.707</td>
<td>.899</td>
<td>.965</td>
</tr>
<tr>
<td>R21</td>
<td>.833</td>
<td>.953</td>
<td>.961</td>
</tr>
</tbody>
</table>

Overall Cronbach’s Alpha 0.97

Most of the risks in this component had loading values of more than 0.7, which suggested these risks were very possibly correlated with the component. Only two risks, Risk 9 (poor governance strategy and ineffective involvement of parent companies in the JV) and Risk 15 (JV drivers and motives of parent companies are different) had loading values of less than 0.7, but they were still a part of the factors and could not be ignored. The major risks in this component dealt with
compatibility and governance; therefore, the component was called “The compatibility and governance factor.”

### 3.4.4.3 Third Group of Factors

As Table 3.6 indicates, Risks 7 (high government involvement and frequent change in regulations), 19 (poor communication plans among parent and JV personnel including the main objective and expectations of the JV) and 20 (participants’ contributions are not clearly outlined, documented, expected and understood) were the most important items with respect to their loading values with the third component. They were also considered the major risks in defining this component. Risks 8 (poor forecasting and handling of the global economy and political climate and their effect on commodity prices, 18 (ineffective process for performance and responsibilities measurements of JV and its personnel and 23 (insufficient understanding and compliance of environmental policies) were less vital. However, the three risks had strong loading coefficients with the component. This component was called the external and communication component based on the nature of the involved items.

The alpha value was again more than 0.7 and was within the acceptable value range. The individual alpha value if a risk was deleted was almost the same, indicating the integrity of the factor. As a result, the internal correlation among the items was excellent.
Table 3.6: Statistical characteristics of the external and communication component

<table>
<thead>
<tr>
<th>Risks</th>
<th>Loading</th>
<th>Corrected Item-Total Correlation</th>
<th>Cronbach's Alpha if Item Deleted*</th>
</tr>
</thead>
<tbody>
<tr>
<td>R7</td>
<td>.893</td>
<td>.800</td>
<td>.955</td>
</tr>
<tr>
<td>R8</td>
<td>.812</td>
<td>.821</td>
<td>.954</td>
</tr>
<tr>
<td>R13</td>
<td>.598</td>
<td>.797</td>
<td>.955</td>
</tr>
<tr>
<td>R14</td>
<td>.656</td>
<td>.837</td>
<td>.953</td>
</tr>
<tr>
<td>R18</td>
<td>.835</td>
<td>.879</td>
<td>.951</td>
</tr>
<tr>
<td>R23</td>
<td>.842</td>
<td>.845</td>
<td>.952</td>
</tr>
<tr>
<td>R19</td>
<td>.920</td>
<td>.900</td>
<td>.949</td>
</tr>
<tr>
<td>R20</td>
<td>.861</td>
<td>.865</td>
<td>.951</td>
</tr>
</tbody>
</table>

* Overall Cronbach’s alpha value was 0.95

After establishing and testing the three extracted risk components (JV boundary, compatibility, and external components), the following two sections were designed to take this further and examined their interaction with JV phases and JV success measures. As part of the survey, participants were asked to associate each risk with JV its most critical JV phases and JV measures. A detailed analysis of this interaction was presented in the rest of this chapter.

3.4.4 JV phase analysis

As a part of the survey, participants were asked to assign each risk factor to its most crucial phases in the JV life cycle. JVs were divided into four phases: planning, forming, operating and
terminating (Beamish & Lupton, 2009). Each phase is impacted by different factors. The main goal of this analysis was the determination of how risk factors affected JV phases and which factors were most important in each particular phase. This information should help organizations and companies to plan in advance and determine the exposure of a JV’s phases. This analysis simply represents the percentage of the respondents regarding their answers to the questions. First, each phase was analyzed individually based on the importance of the risk factors to the phase itself. The four phases, along with the three extracted risk components, were then analyzed based on the average weight of each individual phase.

3.4.4.1 Planning Phase

Figure 3.5 depicts the relationship of each risk factor in the planning phase. Specific risks are shown rather than components. This figure shows that Risks 1 (the term ‘joint venture’ and its definition are not clearly defined and understood), 20 (participants’ contributions are not clearly outlined, documented, expected and understood), and 21 (ignoring the forming of social ties among parents and developing shared values and relationships) were the most crucial in the planning phase, with almost 50% of participants considering them as critical. Companies should discuss JV plans and expectations; failure to do so may jeopardize the likelihood of success of the JV.
3.4.4.2 Formation and Negotiation Phase

In this phase, the JV boundary factor was the most important factor (Figure 3.6). The three most crucial risks (with percentages of 64, 57 and 49) belonged to the first component. More than half of the highly crucial risks were in the JV boundary component. Risk 5, “negative relationships among JV parties,” ranked as the most crucial risk and, therefore, it was the most important risk in the forming and negotiation phase. The next four important risks were risk 6 “control of the JV split, regardless of each parent's expertise,” risk 12 “ignoring national and organizational cultural differences,” risk 11 “parent companies are in different stages of the value chain (size),” and risk
13“absence of cultural differences training” with values of 57%, 49%, 415 and 41%, respectively. Two of these risks were connected to cultural differences and this connection demonstrated the importance of culture elements in forming and negotiating JV deals. Half of the risks were relatively crucial to this phase with more emphasis on the JV boundary factor. This result will help decision makers to focus on the important factors in the planning and negotiation phase of JVs.

![Graph showing importance of risk factors](image)

**Figure 3.6: Importance of each risk factor in the formation and negotiation phase**

### 3.4.4.3 Operation and Implementation Phase

As Figure 3.7 indicates, all the three components were very crucial to the operation and implementation phase. The extracted components had at least two associated risks that had high
importance values. The compatibility component was the most crucial, as it had two risks with values of 72 and 67%. More than half of respondents placed Risks 2 (ignoring changes may happen over the course of a JV), 9 (poor governance strategy and ineffective involvement of parent companies in the JV) and 18 (ineffective process for performance and responsibilities measurements of a JV and its personnel) as crucial for this phase. Risk 10 (inadequate knowledge management practices) was also important to this phase. In summary, Figure 3.7 shows that the compatibility and external components were more important in this phase than the JV boundary component. Therefore, in order to maintain a JV operation in good standing, these factors should be taken into consideration.
3.4.4.4 Termination Phase

The termination phase is very important, but often overlooked. JV deals occasionally fail to specify details of the termination of the project, exposing the JV to great risk. Most of the items had a low relationship values, but they were still important; and, if they were not considered, it could result in endangering a JV. However; seventy-six percent of the participants placed Risk 3 (no clear exit strategy and replacement procedures) as the most vital in this phase and that showed this risk was vital to the success of a JV during the termination phase.

3.4.4.5 Summary of the phases

Figure 3.8 shows each extracted component with respect to its importance in each phase. The
data presented here was simply the average risk factors in each component in a particular phase. The importance of each factor changes depending on the phase. In the planning phases, the JV boundary component was less crucial than the compatibility and external components, which were of similar importance during the planning phases. However, in the forming phase of JVs, the JV boundary was the most crucial components, followed by the compatibility and external components. Consequently, during the forming phase, the JV boundary was a high priority.

In the operating phase, the compatibility component became the most important, followed by the external component and then the JV boundary factor, which was the least important. In the last phase, all three factors were of similar importance. The data showed that compatibility and external components had very similar impacts in all phases. The JV boundary factor was the most crucial in the forming phase.

In summary, each phase has its own components that need to be examined. Although other factors may not be as important in the phases of a JV, they should not ignored. Formation and termination phases were more crucial to the JV boundary component. Compatibility and external components were more crucial in the formation and operation phases. The combination of the three extracted components were most important in the operation and implementation phase.
3.4.5 Relationship between extracted components and success measures

This analysis examined the importance as represented by the relationship coefficients among the three extracted components, including their risks and the previously established success measures. An earlier study conducted by the researchers concluded that there were two components that measure the degree of success in JVs in the oil and gas industry. The two measures were: 1) a financial satisfaction measure, which included profitability, growth, market share, access new market...
and reputation; and, 2) a sustainability satisfaction measure, which included longevity, stability, community alignment, environmental performance and dispute resolution.

As previously explained, participants were asked to assign a relationship coefficient between each risk factor and the two success measures. A Likert scale ranging from 0.1 and 1 was used, where 0.1 indicated a weak relationship and 10 meant a strong relationship. The following analysis depicted the average of the relationship coefficients for all respondents. The analysis of the extracted JV boundary, compatibility and external components are presented in the following subsections.

3.4.5.1. JV Boundary Component

The JV boundary component consisted of a set of seven risks as previously explained. As shown in Figure 3.9, this component was more related to the sustainability measure than to the financial measure. In order to make a JV more sustainable, this component and its associated risks should be taken into consideration. Specifically, Risk 22 (financial difficulties for parent companies due to cost escalation and inflation) had the highest average (0.8), which indicated that financial difficulties had the most impact on the sustainability of JVs. Risk 1 (the term ‘joint venture’ and its content are not clearly defined and understood) was the least related.

Risks 10 (inadequate knowledge management practices), 12 (ignoring national and organizational cultural differences in communication, management style, time zone, decision-making and managing personnel) and 3 (no clear exit strategy and replacement procedures) were similarly related in the two measures. The greatest difference in the relationship coefficients between the two
measures occurred with Risk 1, where the values were 0.69 and 0.51 in the sustainability and financial measures, respectively.

![Figure 3.9: Relationship between the JV boundary component and the two success measures](image)

3.4.5.2 Compatibility and Governance Component

Figure 3.10 depicts the average of the relationship coefficients between the success measures and the compatibility and governance component. As demonstrated by the data displayed in Figure 3.10, the vast majority of risks were highly related to the two measures with more emphasis on the financial measure; consequently, all risks were vital. The comparison of the relationship values of the risks, with respect to measures, showed that there were differences, such as Risk 15 (JV drivers and
motives of parent companies were different due to the risk being related more closely to sustainability than financial measure). Risk 4 (Poor strategy on handling future investment of each party outside the JV) had the most difference in the relation to the two measures. In general, this risk component was more related to the financial measure than the sustainability measure. Therefore, controlling this component and its risks will result in good financial performance.

![Figure 3.10: Relationship between the compatibility component and the two success measures](image)

3.4.5.3 External and communication component

The external and communication component consisted of eight risks; 50% of them had a high relationship with one of the measure (Figure 3.11). While Risks 8 (poor forecasting and handling of the global economy and political climate and the effect on commodity prices) and 14 (protection of the proprietary information/technologies) were highly related with the sustainability measure, Risks 13 (absence of cultural differences training and lack of the cultural awareness) and 19 (poor
communication plans among parent companies and JV personnel) were highly related with the financial measure. The risk that had largest difference in regards to the relationship value was Risk 19. Risks 18 (ineffective process for performance and responsibility measurements of a JV and its personnel), 20 (participants’ contributions are not clearly outlined, documented, expected and understood) and 23 (insufficient understanding and compliance of environmental policies) were evenly related with the two measures, which indicated that they were crucial for both the sustainability and financial success measures.

Figure 3.11: Relationship between the external component and the two success measures

Although all three extracted components had strong relationships with the two success measures, the external and communication component was the most important. The results showed that four risks of the external component had coefficient values of more than 0.8 with the success measures. However, the other two components were still important. The compatibility and governance
component was the most crucial in terms of the financial measure. Moreover, the JV boundary component had a large impact on the sustainability measure. In conclusion, all three extracted components were found to be critical in measuring the degree of success of JVs and were highly related with the measures. In other words, companies and organizations should consider these relationships in order to control and assess their performance against success measures.

3.5 Conclusion

The number of JV projects and deals has been increasing in the oil and gas industry, due to the discovery of new and unconventional oil and gas fields. However, these projects require significant capital and a high level of risk, and companies are unable to carry out the projects alone. Consequently, JV deals are created to allow two or more organizations to collaborate for a common purpose. There are many risks associated with JVs, and these risks need to be addressed in order to minimize the possibility of failure and to increase the likelihood of success.

Several strategic risk factors were identified by the researchers through data collection from primary and secondary sources. As a result, 23 risk factors were shortlisted and used to develop a survey. Three components were extracted using the principal component analysis (PCA) tool. These factors were constructed and named by combining the most highly correlated factors together as follows:

A. JV boundary factor
   - The term "joint venture" and its content are not clearly defined and understood
• No clear exit strategy and replacement procedures
• Previous negative relationships among parent organizations
• Control of the JV split, regardless of each parent’s expertise
• Inadequate knowledge management practices
• Ignoring national and organizational cultural differences
• Financial difficulties for parent due to cost escalation and inflation

B. Compatibility and governance factor
• Ignoring changes may happen over the course of the JV for each party
• Poor strategy on handling future investment of each party outside the JV
• Poor governance strategy and ineffective involvement of parent companies in the JV
• Parents are different in the stage of the value chain (size)
• JV drivers and motives of parents are different
• Control and resolution mechanisms were not developed properly and effectively resulting in delays
• Insufficient willingness of one or all of the parents to provide a long-term/short-term commitment
• Ignoring the forming of social ties among parents and developing shared values and relationships

C. External and communication factor
• Government involvement is high and regulations frequently changes
• Poor forecasting and handling of the global economy and political climate
• Absence of cultural difference training
Protection of the proprietary information or technologies has not been addressed upfront

Ineffective process for performance and responsibilities measurements of JV and its personnel

Insufficient understanding and compliance of environmental policies

Poor communication plans among parent and JV personnel including the main objective and the JV expectations

Participants’ contribution are not clearly outlined, documented, expected and understood

The extracted factors were analyzed with regards to its correlation to the two success measures – sustainability and financial measures. The results indicated that, while the JV boundary component tended to be more related to the sustainability measure, the other two components tended to be more important for the financial measure. The importance of each factor was examined in regards to the phases of JVs. The results showed that the planning and operation phases tended to be more affected by the factors of the compatibility and external components. The JV boundary factor was more crucial in the formation and termination phase.

The findings of this study suggest that, in order to improve the chance of JV success, these factors should be taken into consideration. The risks of “ignoring changes may happen over the course of the JV for each party,” “poor governance strategy,” “the term "joint venture" and its content are not clearly defined and understood,” and “no clear exit strategy and replacement procedures” were the most crucial individual risk factors. Nevertheless, each one of the extracted factors must be considered. A summary of the overall model that depicted the interaction among risk components, JV phases, and JV success measures is shown in Figure 3.12.
Figure 3.12: A summary among risk components, JV phases, and JV success measures
CHAPTER FOUR: A MODEL TO PREDICT THE SUCCESS RATE OF JV IN OIL AND GAS INDUSTRY THROUGH EVALUATING ITS RISK FACTORS

4.1 Introduction

The oil and gas industry is considered one of the largest economic drivers in the world and some experts consider it the largest and most important economic sector globally. This industry is responsible for the employment of millions of people and has revenues of billions of dollars. The complex nature of the industry has led companies to enter strategic alliances, particularly JVs, as approaches for project execution. It is anticipated that JVs will continue to be extremely important in the foreseeable future. In studies conducted, 52% of oil companies surveyed said that they were planning to establish new JVs in near future (Pwc, 2015; Troy, 2015). Although the number of JV deals is high, their success rate has not exceeded 55% in two decades (Bamford, Ernest and Fubini, 2004). In general, joint ventures have a high failure rate due to their complexity (Bleeke and Ernst, 1995; Klein and Zif, 1994; Stiles, 1994).

The volume of JVs in the oil and gas industry shows how crucial they are to companies’ process and growth. Knowing the major strategic risk factors and their impact on the success rate of JVs in advance would assist companies to make the right decisions. This study is aimed at examining the current JVs in the oil and gas industry and their associated strategic risks and subsequently developing a model to help companies make decisions regarding JVs. A statistical method was used to develop a model that can predict the success rate of JVs through evaluating its involved risk factors. This research uses the relationships between risk factors and success
measures to quantify the degree of success of JVs. A reliable framework will support oil and gas companies in the successful execution of JVs and allow them to enter more deals and initiate projects with confidence.

4.2 Research Methodology

For this study in this chapter, analytical approaches and quantitative statistical methods have been used. The study builds on the previous foundational chapters conducted. The study described in Chapter 2 established the success measures and their contribution in measuring the degree of success of JVs; and, the study in Chapter 3 focuses on examining, identifying and categorizing risk factors of JVs and exploring their relationship with the measurements. Statistical methods were used to establish the relationships among variables. This approach allowed researchers to develop a model for risk components that can then be used to understand their impact on the degree of success. The model is then validated by testing it on JVs.

The foundation studies used both qualitative and quantitative methods for data collection and analysis. First, success measures and their contributions in measuring the degree of success of JVs was established; next, the major risk factors were identified and categorized and their impact on the success of JVs was determined. Further, the risk factors’ relationship with measurements was explored and utilized in this research. In this chapter, the risk factors and their impacts are used to measure the degree of success.

A structured questionnaire was constructed in order to gather information. The questionnaire was divided into two parts: general and specific (Appendix E). In the general part, participants
were asked to select one JV and rate it in general regarding its degree of success, financial and
sustainability measures using a Likert scale, ranging from 1 to 10, where 1 indicated successful
and 10 represented unsuccessful.

In the specific part of the survey, the 23 previously identified strategic risk factors were the
main component. Participants were asked to rate these risks with respect to their impact on the
degree of success of JVs by using a Likert scale ranging from 1 to 10 (1 indicated low impact
and 10 indicated high impact) and then asked to rate the relationships of each risk factor to the
success measures (relationship coefficient) by using a Likert scale ranging from 0.1 to 1, where
0.1 meant minimally related and 1.0 was highly related. The survey was randomly distributed to
oil and gas companies and services agencies via email with the assistance of the SurveyMonkey
platform.

The identified risk factors contributed to measuring the degree of success of JVs. Based on
the strength of the relationships between the measures and the risk factors, each factor had a
contribution on the total degree of success. Therefore, the total degree of success of a JV was
calculated by adding the contribution for each factor.

The analysis phase was divided into several steps. The first step examined the relationships
between each risk component and its contribution weight in determining the degree of success.
The multiple regression method (Stolzenberg, 2004) was then used to develop a model that could
forecast the total degree of success and essentially predict the success rate. Finally, the model
was validated by testing on JVs that were external to the research.
4.3 Analysis and Model Development

4.3.1 Respondents profile

As previously mentioned, the survey was sent via email to oil and gas companies, government institutions and private agencies. The responses rate was 28%, which was considered acceptable to perform the analysis according to Field (2005). Out of the total respondents, 140 were considered applicable for the analysis, as they were complete responses without vague numbers. More than half of the participants represented oil and gas companies and 65% of these participants held executive and senior positions. Forty-five percent of the respondents had at least 15 years of experience and had been involved in more than five JVs in the oil and gas industry.

4.3.2 Conceptual model

In order to ease the development of the main model, a conceptual model was created. Since the aim of this study was the development of a model that can predict the success rate of JVs in the oil and gas industry through assessing the involved risk factors, two phases were established, as summarized in Figures 4.1 and 4.2, respectively.

The first phase concluded that the ten success measures could be divided into two components, with each components encompassing 5 of the measures. The first component was named the financial measure and consisted of profitability, market share, access to new markets,
growth and reputation. The second component was named the sustainability measure and encompassed longevity, stability, community alignment, environmental influence and dispute resolution.

The second phase showed that the 23 risk factors should be divided into three groups, as shown in Figure 4.3. The first, second and third components were named the joint venture boundary, compatibility and governance and external and communication components. Each one of these groups included a set of risk factors that were highly correlated with each other.

As a result of these two phases, JVs success measures were examined to determine their contributions in measuring the degree of success in JVs. A list of critical strategic risk factors were then identified and categorized to study their correlation with the measures, as shown in Figure 4.3.
Figure 4.1: Summary of the first phase

First Phase

Ten Measures were identified

Analysis

Two components were extracted

First Component:
  a) Market Share,
  b) Access to New Markets,
  c) Growth,
  d) Profitability, and
  e) Reputation

Second Component:
  a) Longevity,
  b) Environmental influence,
  c) Community Alignment,
  d) Stability, and
  e) Dispute Resolution

Degree of success
*See Tables 4.2, 4.3, and 4.4 for more details about the risks.

Figure 4.2: Summary of the second phase
Figure 4.3: Process of the conceptual model

4.3.3 Model development

4.3.3.1 Model Preparation

Multiple regression analysis was the statistical tool that was used to develop the model that included all the factors. Figure 4.4 shows a summary of the process of the model development.
As seen in the figure, each extracted factor had several risks correlated with it. Each of the 23 risks belonged to an extracted component, and each contributed to the total impact of each component and of the degree of success of the JV. This information was used to prepare the data for the model. In the preparation process, dependent and independent variables were identified and calculated. The independent variables (predictors) were the three risk components that were used to predict the dependent variable, which was the degree of success. Therefore, this information was utilized to develop the overall model, which dealt with the three extracted components and their weights of impact and total degree of success. The variables were defined as follows:

1. Dependent variables

   As discussed in the research method section, each participant was asked to select one JV and rate it with respect to the two success measures (the financial and sustainability measures, which are indicated as the first and second components in Figure 4.1). A Likert scale, where 1 meant a high rating and 10 indicated low rating, was used. The participants were then asked to rate each risk factor individually, with respect to their relationships to success measures using a Likert scale ranging from 0.1 to 1, where 1 indicated a very strong relationship and 0.1 meant a very weak relationship. This value was considered as the relationship coefficient for each risk factor.
Figure 4.4: Detailed flowchart of the model development process
As a result, the two previously identified measures and their relationships with the risk factors were utilized to calculate the dependent variable – the total degree of success. Equation 4.1 was used for each risk factor to calculate the total degree of success of a JV.

**Total Degree of Success of a JV**

\[
\text{Total Degree of Success of a JV} = \sum (\text{financial measure score for the JV in general } \times \text{relationship coefficient of individual risk}) + (\text{sustainability measure score for the JV in general } \times \text{relationship coefficient of individual risk})
\]

(Equation 4.1)

where the financial measure score represents the financial score of a JV, which was obtained from the questionnaire; the relationship coefficient is the value of the relationship of each risk factor to the financial measure; the sustainability measure score represents the sustainability score of a JV, which was obtained from the questionnaire; and, the relationship coefficient is the value of the relationship of each risk factor to the sustainability measure.

For example, the total degree of success for a JV had a weight of 5 for the financial measure and a weight of 7 for the sustainability measure would be calculated as shown. In Equation 4.2.
Table 4.1: Example of relationship coefficient

<table>
<thead>
<tr>
<th>Risks</th>
<th>Financial satisfaction measure</th>
<th>Sustainability satisfaction measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>R1</td>
<td>0.4</td>
<td>0.2</td>
</tr>
<tr>
<td>R2</td>
<td>1</td>
<td>0.4</td>
</tr>
</tbody>
</table>

\[
Total Degree of Success of a JV = \sum \left( 5 \times 0.4 + 7 \times 0.2 \right) + \left( 5 \times 1 + 7 \times 0.4 \right) \ldots R23
\]

(Equation 4.2)

2. Independent variables

As seen in Figure 4.4, the impact factors of the risks were considered as the independent variables. These variables were simply calculated by adding the impact weight of the set of risks in each component (JV boundary component, compatibility and governance component, and the external and communication component). Table 4.2 shows an example for the total impact weight for JV boundary component. The weight of each risk was added together to create the total impact of this component, which was 61. This step was performed for each component and each JV, as shown in Tables 4.3 and 4.4. The impact weights of the compatibility and external factors were 40 and 56, respectively.
### Table 4.2: JV boundary component and its impact

<table>
<thead>
<tr>
<th>Item</th>
<th>JV Boundary component</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>R1</td>
<td>The term &quot;JV&quot; and its content are not clearly defined and understood</td>
<td>7</td>
</tr>
<tr>
<td>R3</td>
<td>No clear exit strategy and replacement procedures</td>
<td>8</td>
</tr>
<tr>
<td>R5</td>
<td>Previous negative relationships among parent organizations</td>
<td>8</td>
</tr>
<tr>
<td>R6</td>
<td>Control of the JV split, regardless of each parent's expertise</td>
<td>5</td>
</tr>
<tr>
<td>R10</td>
<td>Inadequate knowledge management practices</td>
<td>8</td>
</tr>
<tr>
<td>R12</td>
<td>Ignoring national and organizational cultural differences in communication, management style, time zone, decision-making and managing personnel</td>
<td>7</td>
</tr>
<tr>
<td>R22</td>
<td>Financial difficulties for parent due to cost escalation and inflation</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>Total for this factor</td>
<td>61</td>
</tr>
</tbody>
</table>
### Table 4.3: Compatibility component and its impact

<table>
<thead>
<tr>
<th>Item</th>
<th>Compatibility and governance component</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>R2</td>
<td>Ignoring changes over the course of the JV for each party</td>
<td>6</td>
</tr>
<tr>
<td>R4</td>
<td>Poor strategy on handling future investment of each party outside the JV</td>
<td>3</td>
</tr>
<tr>
<td>R9</td>
<td>Poor governance strategy and ineffective involvement of parent companies in the JV</td>
<td>6</td>
</tr>
<tr>
<td>R11</td>
<td>Parents are different in the stage of the value chain (size)</td>
<td>2</td>
</tr>
<tr>
<td>R15</td>
<td>JV drivers and motives of parents are different</td>
<td>8</td>
</tr>
<tr>
<td>R16</td>
<td>Control and resolution mechanisms were not developed properly and effectively resulting in delays</td>
<td>7</td>
</tr>
<tr>
<td>R17</td>
<td>Insufficient willingness of one or all of the parents to provide a long-term/short-term commitment to the JV or share resource</td>
<td>5</td>
</tr>
<tr>
<td>R21</td>
<td>Ignoring the forming of social ties among parents and developing shared values and relationships</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Total for this factor</td>
<td>40</td>
</tr>
</tbody>
</table>
Table 4.4: External component and its impact

<table>
<thead>
<tr>
<th>Item</th>
<th>External and communication component</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>R7</td>
<td>Government involvement is high and regulations frequently change</td>
<td>8</td>
</tr>
<tr>
<td>R8</td>
<td>Poor forecasting and handling of the global economy and political climate and their effect on commodity prices</td>
<td>10</td>
</tr>
<tr>
<td>R13</td>
<td>Absence of cultural differences training, such as observing each parent’s work environment, and lack of the cultural awareness.</td>
<td>7</td>
</tr>
<tr>
<td>R14</td>
<td>Protection of the proprietary information or technologies has not been addressed upfront, especially those are created by the JV</td>
<td>7</td>
</tr>
<tr>
<td>R18</td>
<td>Ineffective process for performance and responsibilities measurements of JV and its personnel</td>
<td>4</td>
</tr>
<tr>
<td>R19</td>
<td>Insufficient understanding and compliance of environmental policies</td>
<td>9</td>
</tr>
<tr>
<td>R20</td>
<td>Poor communication plans among parents and JV personnel including the main objective and expectations of the JV</td>
<td>7</td>
</tr>
<tr>
<td>R23</td>
<td>Participants’ contribution are not clearly outlined, documented, expected and understood</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Total for this factor</td>
<td>56</td>
</tr>
</tbody>
</table>

4.3.3.2 Model Development

The model was developed based on stepwise regression analysis, which allowed the best fit to the model to be determined by including each factor in an order. The three factors – JV boundary, compatibility and external components – were used to develop the model. The goodness and reliability of the model were also tested. A degree of success meter was developed to offer a base line to judge values. This baseline was created by examining the relationship between the actual rate of success (from the survey) and the calculated total degree of success.
The parameters of the model were entered as follows:

- Total degree of success as the dependent variable,
- Total impact of the JV boundary component as an independent variable,
- Total impact of the compatibility and governance component as an independent variable,
- Total impact of the external and communication component as an independent variable

In Table 4.5, each model is shown with its statistical parameters; the goodness of the models improved as the values of the correlation coefficient (R) and R² increased. The increase was the greatest in the third model; consequently, the third model was the most appropriate. Since the third model combined all three components, the results indicated that the three components together produced a more accurate model that could better predict the dependent variable. The R² and adjusted R² were 0.781 and 0.777, respectively, for the third model. This result showed that the amount of variance explained by the model was almost 80%. The F test value of 22 proved that the selected model as a whole was statistically significant in having a p value of 0.000, which allowed for the null hypothesis to be rejected.
Table 4.5: Characteristics of each model

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R²</th>
<th>Adjusted R²</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.566&lt;sup&gt;a&lt;/sup&gt;</td>
<td>.320</td>
<td>.312</td>
<td>.000&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>2</td>
<td>.766&lt;sup&gt;b&lt;/sup&gt;</td>
<td>.586</td>
<td>.580</td>
<td>.000&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>3</td>
<td>.886&lt;sup&gt;c&lt;/sup&gt;</td>
<td>.784</td>
<td>.779</td>
<td>.000&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

a. Predictors: (Constant), Compatibility Factor  
b. Predictors: (Constant), Compatibility Factor, JV boundary Factor  
c. Predictors: (Constant), Compatibility Factor, JV boundary Factor, External Factor

As a result, model number three was selected to be the main model based on the above results and because it included all the three factors as predictors and would provide the most accurate predictive model. Table 4.6 illustrates the parameters for the model in detail and shows the beta values along with their significance. The beta values of the predictors were 1.563, 1.338 and 0.874 for the compatibility, JV boundary and external components, respectively. These numbers reflect the importance of each component. The compatibility component had the highest beta value.

As shown in Table 4.6, the value of the variance inflation factor (VIF) was almost 1, which indicates that there was no multicollinearity in the model. This means that the three independent variables are totally uncorrelated. Moreover, the p values for each factor were smaller than 0.05, allowing for the rejection of the null hypothesis – the coefficients are equal to zero and, therefore, have no effect. Using these values, the model can be developed as follows:
Table 4.6: Beta and significance for the third model

<table>
<thead>
<tr>
<th>Model</th>
<th>Coefficients</th>
<th>Significance</th>
<th>VIF</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 (Constant)</td>
<td>14.901</td>
<td>.001</td>
<td></td>
</tr>
<tr>
<td>Compatibility Factor</td>
<td>1.563</td>
<td>.000</td>
<td>1.06</td>
</tr>
<tr>
<td>JV boundary Factor</td>
<td>1.338</td>
<td>.001</td>
<td>1.08</td>
</tr>
<tr>
<td>External Factor</td>
<td>.874</td>
<td>.007</td>
<td>1.06</td>
</tr>
</tbody>
</table>

Consequently, the typical equation of the multiple regression, as represented by Equation 4.3, was used to develop the main model for this research study.

\[
Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \ldots + \beta_k X_k + e \quad \text{Equation 4.3}
\]

where \(Y\) is the dependent variable, \(\alpha\) is the intercept value (the constant), \(\beta\) is the beta value of each predictor, \(X\) is the value of the independent variable itself, and \(e\) is the error.

The model’s equation is as follows:

\[
Y = 14.901 + 1.563 C_2 + 1.338 C_1 + 0.874 C_3 \quad \text{Equation 4.4}
\]
where $Y$ is the degree of success, $C_2$ is the total impact of the compatibility component, $C_1$ is the total impact of the JV boundary component, and $C_3$ is the total impact of the external component.

4.3.3.3 Model Verification

Figure 4.5 shows the normality for the data. The normality indicated that the data were normally distributed, which allowed for the above analysis. The results out of the curve were minimal, and most of the data fit under the curve.
Figure 4.5 indicates the integrity of the data, showing the homoscedasticity of the data, i.e. the randomness of the data and that clusters of any kind were not formed.
4.3.3.4 Success Meter

As stated in the research methodology section, participants were asked to rate the total degree of success using a Likert scale ranging from 1 to 10, where 1 indicated successful and 10 meant unsuccessful. The results of this question and the calculated total degree of success were compared in order to develop a success meter. An inverse relation was determined, whereby the larger the value of the total calculated degree of success meant the less successful the JV was likely to be. The degree of success increased as the success meter decreased. Based on this
inverse relation, a success meter was developed as shown in Figure 4.7. The result of the main model was compared with this figure in order to determine the success rate.

In Figure 4.7, the success meter has a range from 1 to 10, where low values indicate greater success, and high values denote the opposite. The results of the model should be compared to the meter below in order to predict the success rate. A red colour indicates danger (failure) and green indicates safety (success). Decision makers should try to make the success meter number low by controlling the involved risk.

Figure 4.7: Success meter for the total degree of success

4.4 Application and Validation

The main model was tested by applying the results to past JVs. Participants were asked to complete a survey concerning this main model. They were asked to select a specific JV based on
their experience and then rate it according to its success rate. They were asked to use a Likert scale ranging from 1 to 10, where 1 indicated successful and 10 meant unsuccessful.

In the second part of the survey, the 23 strategic factors were listed according to their association with the three risk components. They were asked to rate the risk using a Likert scale and to rate these components based on how well they were handled in the selected JV. A Likert scale from 1 to 10, where 1 indicated handled/managed/impacted very well and 10 meant poorly handled/impacted/inadequately acknowledged, was used.

The results were compared to the real and predicted scores using the main model. The responses were used to predict the success rate; and, the predicted success rate value was then compared to the actual score from the survey. Equation 4.3 was used to predict the total degree of success score for the JV, and the success meter was then used to determine the success rate. Table 4.7 summarizes the results.

\[
Y = 14.901 + 1.563 C_2 + 1.338 C_1 + 0.874 C_3
\]  

Equation 4.3
Table 4.7: Parameters for actual JVs

<table>
<thead>
<tr>
<th>JV</th>
<th>Compatibility C2</th>
<th>JV boundary C1</th>
<th>External C2</th>
</tr>
</thead>
<tbody>
<tr>
<td>One</td>
<td>51.00</td>
<td>40.00</td>
<td>56.00</td>
</tr>
<tr>
<td>Two</td>
<td>45.00</td>
<td>30.00</td>
<td>70.00</td>
</tr>
<tr>
<td>Three</td>
<td>73.00</td>
<td>62.00</td>
<td>68.00</td>
</tr>
</tbody>
</table>

The above data were used as input in the model to anticipate the degree of success of the JVs. For example, the first JV was calculated as follows:

\[ Y = 14.901 + 1.563 (51) + 1.338 (40) + 0.874 (56) \]

\[ Y = 197 \]

The results of the model are depicted in Table 4.8. Table 4.8 presents the actual success rate for the JV and the predicted degree of success using the model.

Table 4.8: Actual and predicted values of JVs

<table>
<thead>
<tr>
<th>JV</th>
<th>Actual success rate (1-10)*</th>
<th>Predicted degree of success (Y)</th>
</tr>
</thead>
<tbody>
<tr>
<td>One</td>
<td>7.00</td>
<td>197</td>
</tr>
<tr>
<td>Two</td>
<td>5.00</td>
<td>186</td>
</tr>
<tr>
<td>Three</td>
<td>9.00</td>
<td>270</td>
</tr>
</tbody>
</table>

* 1 = successful and 10 = unsuccessful
Table 4.8 shows the goodness of the model; and, the above values were demonstrated using the developed success meter. Figures 4.8, 4.9 and 4.10 show each JV and the comparison between the actual and predicted values. In general, as the figures indicate, the model demonstrated its accuracy in anticipating the success rate of JVs.

The first JV is presented in Figure 4.8. The actual success rate was 7 based on the responses of the survey. The predicted degree of success was 197, which is equal to a success rate of 6-7. Both success rate values are shown on the success meter. The two values were almost the same; therefore, the model was relatively accurate.

![Success Meter Comparison](image)

**Figure 4.8: Comparison between the actual and predicted success rates in the first JV**

Figure 4.9 shows a comparison between the actual and predicted success rate of the second JV. The values were almost the same, therefore, the accuracy of the model was again supported.
The results shown in Figure 4.10 are very similar to the two previous examples. The total degree of success predicted was 270, which was represented by 8-9 on the success meter. The actual success rate was 9.
4.5 Conclusion

The oil and gas industry is abundant of opportunities and projects. However, new oil and gas projects, especially unconventional ones, encounter a great deal of obstacles that organizations are not willing to face alone. The projects have numerous risks, demanding capital requirements, and a high level of complexity. These problems are the major drivers that motivate companies to cooperate and form JVs. Usually, the motives influencing the formation of JVs are the sharing of the involved risks, reduction of the burden of capital, and the gain of expertise. However, JVs have many risks, due to the fact that two or more companies have to work together. The success rate of JVs is low; some studies indicate that the success rate is only approximately 30-40%.

Knowing the expected rate of success of a JV before the deal is entered into would not only allow organizations to make informative decisions, but would also allow companies to assess JVs in determining the cause of their associate risks. The main objective of the study was the development of a model that could predict the success rate of JVs in the oil and gas industry by evaluating the involved strategic risk factors and their relationships with success measurements. As a result, organizations could evaluate the success of a JV before entering the deal; this prior evaluation would result in improving the overall success rate of JVs.

This study used quantitative research methods in order to ensure the accuracy of the research. A pilot study was done to obtain more information regarding the problems and implications of entering into JV deals. A well-constructed questionnaire was deployed, targeting different companies and individuals. Open-and closed-ended questions were used. Consequently, a
predictive model concerning the success rate of JV was developed. In the final stage of the research, the model was applied to JVs in order to test its validity.

The model was developed using a multiple regression statistical tool, which helped in elucidating the relationship between risk factors and their ability to predict the success rate. Three risk components were included in the model based on their strength in predicting the success rate of JV. The model showed that the compatibility component had a value of 1.5. The JV boundary and external components ranked in second and third place with values of 1.33 and 0.87, respectively.

The correlation between the success rate and the factors indicated that there was a strong correlation, especially with the success rate and the compatibility component. Finally, the validation process, which compared actual success rates to predicted rates, demonstrated that the model was fairly accurate. The differences between the actual and predicted rates were considered minimal.

The developed model can be used to predict the success rate of JVs in the oil and gas industry as summarized in Appendix F. Ultimately, organizations cannot solely rely on the model in making decisions regarding JVs. However, this model should be incorporated in the process of forming JVs as a starting point. The model will allow organizations to assess their JVs and whether or not to proceed to the next phase. The researchers suggest that the model should be implemented after deciding whether or not the JV is the right vehicle for the project.
CHAPTER FIVE: CONCLUSIONS AND RECOMMENDATIONS

This last chapter of the dissertation presents the conclusions of the research and recommendations for future research. This chapter also presents a summary and contributions of the research. The research limitations and obstacles are also discussed.

5.1 Research Summary

The research process of this study followed a robust research methodology in order to achieve its ultimate goal. Qualitative and quantitative methods were utilized to assure the accuracy and credibility of the research. A set of data collection techniques were used, including observation, document reviews, interviews and questionnaires. A variety of statistical tools were utilized, including basic statistical analysis, correlation, dimensions reduction and regression.

The main purpose of the research was the development of a model that can assist companies in predicting the success rate of joint ventures in the oil and gas industry through evaluating the involved strategic risk factors. In order to achieve the ultimate goal, the researchers had three phases: 1) identification and establishment of success measurements of joint ventures (JVs), 2) identification and categorization of strategic risk factors, and 3) examination of the relationship among measurements and risk factors. Each one of the phases has its own analysis and conclusions, which eventually served the main purpose of the study. Each of these phases used a variety of data collection and analysis techniques, leading to the proposed model.
The first phase concerned the establishment of the success measures of JVs in the oil and gas industry. A few steps were executed in order to achieve the goal of this phase. It started by examining current JVs in the oil and gas industry and other industries, identifying and examining the success measures. A set of interviews targeting different position levels and firms was conducted. As a result, ten measures were identified to be the most suitable to measure the degree of success of JVs. A well-constructed questionnaire was deployed to obtain more understanding of the measures and their relationships among each other.

A descriptive statistical analysis, including means and standard deviations, was used to prepare the data for the more advanced principal component analysis (PCA). Two main components were developed as a result of the PCA, with each one consisting of five items. The financial measure consisted of profitability, market access, market share, growth and reputation; and, the sustainability measure encompassed longevity, stability, community alignment, environmental influence and dispute resolution. Structural equation modeling (SEM) was then performed in order to establish these two components as measurements for the degree of success in JVs.

The second phase dealt with the identification and categorization of the most critical risk factors in JVs. Relationship between the risk factors, success measures, and JV phases were also determined. Therefore, a thorough review and analysis of literature spanning 30 years were performed; and, two JVs were studied in depth to understand their mechanics and to identify the most critical risk factor. This was followed by conducting interviews aimed at confirming the results of the previous steps. Such information helped to measure the views of the interviewed
personnel regarding the study’s subject. This method provided the authors with all the information that was needed to be collected in order to develop a suitable solution that met the study’s expectations. As a result, 23 risk factors were identified and used to construct the main questionnaire for this research.

The main questionnaire of this study was constructed based on the identified risk factors. Its main purposes were the establishment of the correlations among factors and the examination of their relationships. Participants were asked to rate several items in association with the risk factors using a 10-point Likert scale. The collected data were analyzed using a correlation matrix and PCA to obtain more meaningful and useful information, which could be used to develop the proposed model. As a result, the 23 risk factors were categorized and grouped into three components. These components – JV boundary, compatibility and governance, external and communication components – consisted of several risk factors and were then tested for consistency to confirm the reliability of the results.

The last phase of the research was concerned about with the determination and utilization of the relationships between risk factors and success measurement in the development of a predictive model. All the data collected and the analysis results from each method were used to clarify the situation and develop a solution for the research problem. Therefore, the data were prepared before performing the analysis. Independent and dependent variables were identified in order to perform the analysis. The degree of success served as the dependent variable, which the model tried to predict. The three previously established risk components served as the predictors, which are the input parameter of the model. Statistical regression analysis was conducted to
determine the relationships among the variables and to compute the model’s equation. To ensure the goodness of the model, it was verified by performing several tests, including homoscedasticity and normalization. The model was then validated with its applying to other cases of joint ventures.

5.2 Conclusion

Joint ventures are an inherent and vital part of the oil and gas industry, which will not disappear. Especially given the rapid increase of business dynamics due to complexity and uncertainty. Companies prefer not to face these risks and complexities alone and form a joint venture to do so. However, despite the high number of JVs, there has not been much success. This study introduces a new perspective on this matter with the conclusions described in the following paragraphs.

The first phase of this research concluded that there were two measures that can evaluate the degree of success of JVs in the oil and gas industry. These two measures were financial and sustainability measures, with each one developed by grouping the most correlated measures together. As a result, the financial measure consisted of five variables: profitability, access to new market, growth, market share, and reputation. The sustainability measure encompassed longevity, stability, environmental performance, community alignment, and dispute resolution. This phase proved that the two developed measures can measure the degree of success in JVs and can be used in academic research and by the industry.
The second phase resulted in the identification and categorization of 23 risk factors. A list of the most critical strategic risk factor was identified, and the risk factors were then grouped based on their correlations to form a categorization for the factors. Therefore, three groups of risk were developed and tested. The groups were 1) the joint venture boundary component, 2) the compatibility and governance component, and 3) the external and communication component. Each one these components consisted of several risks that identified the character of the group.

After establishing the three risk components, their relationships with the two success measures and the phases of JVs were examined. The results indicated that, while the JV boundary component tended to be more related to the sustainability measure, the other two components tended to be more important for the financial measure. The importance of each component was examined in regards to the phases of JVs. The result showed that the planning and operation phases tended to be more affected by the compatibility and external components. The JV boundary component was more crucial in the formation and termination phases.

The main objective of the third phase of the research was the development of a model that could predict the success rate of JVs in the oil and gas industry by evaluating the involved strategic risk components and their relationships with success measurements. Therefore, the three risk components were considered as the predictors, and the degree success of JV was considered as the response. A regression analysis was conducted.

The model showed that the compatibility component had a value of 1.5 and was, therefore, the strongest component in predicting the success of a JV. The JV boundary and external
components ranked in second and third places, with loading values of 1.33 and 0.87, respectively. The correlation between the success rate and the factors indicated that there was a strong correlation, especially with the success rate and the compatibility factor.

The validation process compared actual and predicted success rates and demonstrated that the model was fairly accurate. The differences between the actual and predicted rates were considered minimal. Therefore, the developed model can be used to predict the success rate of JVs in the oil and gas industry.

5.3 Contributions

The contributions of this research can be categorized as follows:

- **Academic contributions:**
  - Established and validated the success measurements of joint ventures (JV) in the oil gas industry.
  - Identified and validated the most critical risk factors of JVs in the oil and gas industry.
  - Established and categorized risk factors into three risk components based on their correlation with each other.
  - Examined and presented the relationships among risk components, success measurements, and JV phases.
  - Developed a well-integrated statistical model, which assists companies in predicting the success rate of a JV based on the evaluation of the involved risk factors.
• Laid the foundation for future research for hypotheses testing on risk categorization and success measurement for JVs.

• The research has added to the body on knowledge of JV by collecting and analyzing data from the oil and gas industry. So, researchers can rely on this research and build their models on it.

❖ Practical contributions:

• Assessed the current practice of JVs in the oil and gas industry and proved that there is a need to address their success issues to help the industry evolve.

• Offered oil and gas companies a new tool to measure the success of JVs.

• Enabled oil and gas companies to understand the interaction among risk factors, JV phases, and success measures, which allow the companies to make informed decisions.

• Created a model that oil and gas companies can use by entering the impact of each factor, then the model will show the expected success rate based on the entered information.

5.4 Practical Recommendations

This research presents a tool to predict the success rate of JVs. However, JV managers should not depend solely on this tool. There are many elements that should be taken into consideration to understand the full picture and lead JV projects to success. The following are the most important for managing and sustaining JVs

1. Joint venture documentation

There are many different forms of JV contracts; however, JV managers should
understand JVs needs and act accordingly. A combination of standard forms, such as the Canadian Association of Petroleum Landman (CAPL) and the Association of International Petroleum Negotiation (AIPN), can be utilized to build a robust form.

2. Scope of the joint venture

The scope of a JV should be determined by the parties. In general, the parent company may have similar ideas about the JV’s scope of work; however, details shall be discussed.

3. Control and governance

Having different objectives can usually lead to a highly demanding for JVs, which should be discussed and negotiated in detail during the early stages (Pearce, 1997; Shenkar, 1990). Control of JVs should be split among parent companies and not based on equity or contributions; ideally, control should be split based on the relative expertise (Beamish & Lupton, 2009). Moreover, there are a number of elements that need to be considered in this process, which are sometimes neglected, such as a JV manager’s attitude, prior experiences and relationships, and the effect of cultural differences on governance.

The level of involvement and commitment are very critical considerations for JVs. There is a wide range of approaches that can be utilized, but the parent company should agree on the appropriate method.

4. Financial contributions

The structure of financial arrangements is often linked to the success of a JV. The impact of this element is crucial, and it may affect other issues such as commitment. These contributions can take different forms such as cash, assets, capital, and key personnel.
5. Dispute resolution methods

The parent company should consider this issue during the early stages and plan for it. Details such as resolution methods and escalation process should be discussed. Parties shall try to resolve disputes in a timely manner and avoid escalation (arbitration and litigation).

6. Confidentiality and intellectual property

The parent companies should be able to share information between each other. Rules should be developed regarding any new intellectual properties that are developed during the JV.

7. Employees and human resources

The workforce of a JV is also vital and plays a key role in structuring the JV. Several issues must be considered such as leadership liability, skills, training, and culture. Also, employees can be recruited from the parent company or outside of it.

8. Insurance

The parent companies should not ignore this issue as it can be very damaging. Details such as general liability, environmental impairment, and key personnel should be included.

9. Cultural differences

National and international cultural differences should be taken into consideration. Training should include this issue and the parent company shall try to increase awareness. Failing to acknowledge this issue may have an impact on JVs.
5.5 Limitations

Many limitations were experienced throughout the research that may have affected the outcome. The researcher tried to avoid these obstacles or reduce their impact. The major limitations of this study are as follows:

- There was a limited number of opportunities to access the needed information. At the time of the study, the researcher tried to select the most suitable sources that could provide the best and most accurate information.
- One of the major limitations was the survey. The survey was faced by many uncertainties as a consequence of many factors, such as the sample size, response rate and quality. However, the researcher minimized its effect by early engagement and the utilization of statistical techniques.
- The researcher faced high resistance from the industry, especially oil and gas companies. They were very hesitant in providing information. This limitation was minimized by offering complete anonymity to participating individuals and companies.

5.6 Recommendations for Future Research

This research has provided a foundation for future research, including:

- This study has established the most critical risk components with regards to JVs in the oil and gas industry, these risk components can be used in a variety of hypothesis tests.
- A future study can be done with regards to the implementation and monitoring of the risk components behaviour throughout the JV phases.
• A future study can be done regarding the accuracy of the success measures by testing it on multiple joint ventures.

• The model can be tested in regards to its dynamics by applying it throughout JVs
References


• Mason, M. (2010). Sample size and saturation in PhD studies using qualitative interviews. In Forum Qualitative Sozialforschung/Forum: Qualitative Social Research (Vol. 11, No. 3).


• Phillips, T., Gauthier, D., & Thurimella, R. (2010). Using transitivity to increase the accuracy of sample-based Pearson correlation coefficients. 12th International Conference on Data Warehousing and Knowledge Discovery (DaWaK).


APPENDIX A: SUMMARY OF THE RESEARCH PROCESS AND STEPS

Predicting the Degree of Success of Joint Ventures in Oil and Gas Industry by Evaluating the Strategic Risks

The main process and steps of the thesis

Phase 1. Success Measurements of Joint Ventures in the Oil and Gas

<table>
<thead>
<tr>
<th>Why</th>
<th>How</th>
<th>Findings</th>
<th>Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>-Examine the current measures for JVs, -Study the applicability to oil and gas, -Evaluate their correlations, -Find the constructs they measure, -Establish the measures</td>
<td>-Quantitative and qualitative methods -Pilot study (to examine and assess) -Identify the measures (11 measures) through data collection (interviews, questionnaires and documents) -Reduce the number of measures and find the underlying constructs using extraction analysis method. -The two component relationships were tested using the structural equation model</td>
<td>-10 measures were positively correlated -Two components were extracted (financial and sustainability) -Ten out of the 11 measures was strongly correlated with one of the above components -The two extracted components were positively correlated with the degree of success and could measure it</td>
<td>-The two components can represent the 10 measures. -Can be used to measure the effect of risk factors on the degree of success in JV in the oil and gas industry</td>
</tr>
</tbody>
</table>
Phase 2. Factor analysis of strategic risk factors in JV in the oil and gas industry

<table>
<thead>
<tr>
<th>Why</th>
<th>How</th>
<th>Findings</th>
<th>Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>-Find the underlying constructs and components of the identified strategic risks.</td>
<td>-Quantitative and qualitative methods</td>
<td>-Three components were extracted to represent the 23 factors (JV boundary, compatibility and external)</td>
<td>-The three extracted components can be used to assess the effect of the factors on the degree of success.</td>
</tr>
<tr>
<td>-Test the relationships among the factors and find the main constructs they measure</td>
<td>-Identify the most critical strategic factors (23 were identified by interviews, questionnaires and JV agreements)</td>
<td>-Each component was critical in different JV phase</td>
<td>-Find out the most critical factor with the respect to the JV phases</td>
</tr>
<tr>
<td>-Examine the relationship between factors and success measures</td>
<td>-PCA were used to explore the relationship among factor and to discover the latent constructs</td>
<td>-Each component was related differently with the two measure components.</td>
<td></td>
</tr>
<tr>
<td>-Examine the relationship and criticalness between factors and JV phases.</td>
<td>-Correlated factors were grouped into one component</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-Statistical analysis used to depicts the relationships between the factors, measures and JV phases.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Phase 3. A predictive model for JV degree of success

<table>
<thead>
<tr>
<th>Why</th>
<th>How</th>
<th>Findings</th>
<th>Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>-To develop a model that can predict the degree of success in JVs in oil and gas industry,</td>
<td>-Quantitative methods</td>
<td>-The three risk components were correlated to the degree of success and can measure it.</td>
<td>-It must be utilized as a major and mandatory step before proceeding with the JV</td>
</tr>
<tr>
<td>-Help participants to make decisions regarding the JV and hopefully contribute in improving the success rate of JVs.</td>
<td>-Develop a questionnaire based on the three risk components and the two measure components to evaluate the degree of success</td>
<td>-The model: $Y = 14.901 + 1.563 C2 + 1.338 C1 + 0.874 C3$</td>
<td>-The model can be used to evaluate the JV and to make decisions</td>
</tr>
<tr>
<td>-Help to find and identify the weak areas and most critical phases of JV</td>
<td>-Using multiple regression method to develop the model.</td>
<td>$Y$: The degree of success</td>
<td>-it can be used to discover the weaken areas and improve them before continuing on with the JV</td>
</tr>
<tr>
<td></td>
<td>-Test the model using experts</td>
<td>C2: Compatibility component</td>
<td>-Participants can do it together and separately</td>
</tr>
<tr>
<td></td>
<td>-Create a success meter to use to project the result of the model</td>
<td>C1: JV boundary component</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>C3: External component</td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX B: FIRST SURVEY

Dear Participant,

Thank you in advance for taking the time to participate in this study. This study is a part of an initiative of the Centre for Project Management Excellence (CPME) at the University of Calgary, to provide industry with the needed tools and techniques. This research is intended to examine the influence of risk factors on the success likelihood of joint ventures in the oil and gas industry.

By clicking "Next" at the bottom of this page, you are agreeing to participate in this research study. You will be asked to complete an online survey and to share your expertise and ideas. In order to save time, the survey has been designed with multiple-choice questions. It will not take more than 5 minutes to complete. Your contributions in this survey is voluntarily and confidential; therefore, you have the right to end the survey at any time. In this case, the data you have provided will not be retained.

Thank you for participating in this survey. If you have any questions regarding the survey, please contact me at
asalmohs@ucalgary.ca

Your time and contributions are highly appreciated
Best Regards
Abdul, PhD Candidate
Demographic Information

1. What type of organization are you working for (please select the most appropriate one)?
   - Oil and Gas
   - Infrastructure
   - Building and construction
   - Service (financial, legal, consulting)
   - Mining
   - Academia
   - Government (regulatory)
   Other (please specify)

2. What is your position level at the organization (please check the most appropriate one)?
   - Chief executives
   - Senior management
   - Middle management
   - Entry-level management
   Professional/Technical
   Other (please specify)

3. How many years of experience do you have in joint ventures?
   - 5 or less
   - 6-10
   - 11-15
   - 16-20
   - More than 20

4. How many joint ventures have you been involved in?
   - 1
   - 2-4
   - 5-8
   - 9-12
   - More than 12

5. Which of the following do you represent (You can choose more than one)?
   - Owners
   - Contractors/Operators
   - Negotiators
   - Coordinators/Facilitators
   - Observers/Researchers
   - Regulators
   Other (please specify)
6. Which role of joint ventures is most appropriate for you? (You can choose more than one)

- [ ] Deciding on the JV
- [ ] Working/Operating on the JV
- [ ] Negotiating the JV
- [ ] Advising on JV

Other (please specify)
Joint Ventures: Degree of Success Measurements

7. Based on your expertise and experience in joint ventures, please rate the degree of success. 1 means a low rating and 10 means a high rating.

<table>
<thead>
<tr>
<th>Overall success</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
</tr>
</tbody>
</table>

Any comments?

8. Based on your expertise and experience in joint ventures, please rate the following measures and their contributions in measuring the degree of success of joint ventures in the oil and gas industry. 1 means a low rating and 10 means a high rating.

<table>
<thead>
<tr>
<th>Measures</th>
<th>Longevity/Survival (age)</th>
<th>Stability (change in ownership structure)</th>
<th>Profitability</th>
<th>Community alignment</th>
<th>Environmental performance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

9. Continued

<table>
<thead>
<tr>
<th>Measures</th>
<th>Managers satisfaction</th>
<th>Dispute resolution</th>
<th>Access new markets</th>
<th>Growth</th>
<th>Reputation</th>
<th>Market share</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
</tbody>
</table>

Please name and rate other performance indicators

<table>
<thead>
<tr>
<th>Performance indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>
APPENDIX C: PCA CONCEPT AND ITS CALCULATION PROCESS

(LINDSAY I SMITH)

This appendix is designed to give the reader an understanding of principal component analysis (PCA), which is a common technique for finding patterns in data of high dimension. PCA is a way of identifying patterns in data and expressing the data in such a way as to highlight their similarities and differences. Since patterns in data can be hard to find in data of high dimension, where the luxury of graphical representation is not available, PCA is a powerful tool for analysing data. The other main advantage of PCA is that once these patterns have been found in the data, the data can compressed without much loss of information.

In computational terms, the principal components are found by calculating the eigenvectors and eigenvalues of the data covariance matrix. This process is equivalent to finding the axis system in which the variance matrix is diagonal. The eigenvector with the largest eigenvalue is the direction of greatest variation, the one with the second largest eigenvalue is the (orthogonal) direction with the next highest variation, and so on.

To see how the computation is done, a brief review on eigenvectors/eigenvalues is provided. Let A be an $n \times n$ matrix. The eigenvalues of A are defined as the roots of:

$$\text{Determinant} (A - \lambda I) = |(A - \lambda I)| = 0$$
Where I is the $n \times n$ identity matrix. This equation is called the characteristic equation (or characteristic polynomial) and has $n$ roots.

Let $\lambda$ be an eigenvalue of $A$. Then, there exists a vector $x$ such that:

$$Ax = \lambda x$$

Vector $x$ is called an eigenvector of $A$ associated with the eigenvalue $\lambda$.

The calculation for this paper is as follows:

This is $A$, which is the correlation matrix for the data set.
Matrix A

<table>
<thead>
<tr>
<th></th>
<th>Access new markets</th>
<th>Market share</th>
<th>Growth</th>
<th>Reputation</th>
<th>Profitability</th>
<th>Longevity</th>
<th>Stability</th>
<th>Community alignment</th>
<th>Environmental performance</th>
<th>Dispute resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Component 1</td>
<td>863</td>
<td>879</td>
<td>836</td>
<td>690</td>
<td>734</td>
<td>-0.97</td>
<td>0.3</td>
<td>0.4</td>
<td>0.1</td>
<td>0.3</td>
</tr>
<tr>
<td>Component 2</td>
<td>0.08</td>
<td>0.07</td>
<td>0.3</td>
<td>0.4</td>
<td>0.2</td>
<td>0.830</td>
<td>0.627</td>
<td>0.693</td>
<td>0.809</td>
<td>0.629</td>
</tr>
</tbody>
</table>

\[
\mathbf{X} = \lambda \mathbf{X}
\]

Then

\[
\text{Determinant } (\mathbf{A} - \lambda \mathbf{I}) = |(\mathbf{A} - \lambda \mathbf{I})| = 0
\]

Where these values represent the eigenvalues.

These values are substitute in the equation to produce the eigenvectors which represent the factors loading between the components and the measures.
APPENDIX D: SECOND SURVEY

Consent

Dear Participant,

Thank you in advance for taking the time to participate in this study. This study is a part of an initiative of the Centre for Project Management Excellence (CPME) at the University of Calgary, to provide industry with the needed tools and techniques. This research is intended to examine the influence of risk factors on the success likelihood of joint ventures in the oil and gas industry.

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Your time and contributions are highly appreciated
Best Regards
Abdul, PhD Candidate
1. What type of organization are you working for (please select the most appropriate one)?

- Oil and Gas
- Infrastructure
- Building and construction
- Service (financial, legal, consulting)
- Academia
- Government (regulatory)
- Mining
- Other (please specify)

2. What is your position level at the organization (please check the most appropriate one)?

- Chief executives
- Senior management
- Middle management
- Entry-level management
- Professional/Technical
- Other (please specify)

3. How many years of experience do you have in joint ventures?

- 5 or less
- 6-10
- 11-15
- 16-20
- more than 20
- Other (please specify)

4. How many joint ventures have you been involved in?

- 1
- 2-4
- 5-8
- 9-12
- More than 12
- Other (please specify)
5. Which of the following do you represent (You can choose more than one)?

- Owners
- Contractors/Operators
- Negotiators
- Coordinators/Facilitators
- Observers/Researchers
- Regulators

Other (please specify)
# Evaluating Risk Factors and their Relationships with Performance Indicators

**Based on your experience, please select one joint venture and provide information about it.**

6. Please rate the degree of success as well as the success measures of the selected joint venture.

<table>
<thead>
<tr>
<th>Degree of success</th>
<th>Financial measure score</th>
<th>Sustainability measure score</th>
</tr>
</thead>
<tbody>
<tr>
<td>The selected joint venture</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Please justify your answers and score if possible.

Please provide the project and parent names of the joint venture (Optional).

7. A list of the most influential risk factors that impact joint ventures in the oil and gas industry has been identified as below. Based on your experience and expertise in the selected joint venture, please select the most appropriate option from the drop-down list of the four columns including: Impact, Financial measure, Sustainability measure, and Joint venture phases.

- On the first column, from the drop-down list, please select the level of impact for each factor in the success likelihood of JVs.
- On the second and third, please rate the weight of the importance and relationship of each risk factor with respect to the success measures of JV (how much each factor is important/related to these success measurements).

On the fourth column, please indicate in which joint venture phase each factor is most critical.

- The term "joint venture" and its content are not clearly defined and understood
- Ignoring changes may happen over the course of the JV for each party
- No clear exit strategy and replacement procedures
- Poor strategy on handling future investment of each party outside the JV
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Thank you

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APPENDIX E: THIRD SURVEY

Consent

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Evaluating Risk Factors and their Relationships with Performance Indicators

BASED ON YOUR EXPERIENCE, PLEASE SELECT ONE JOINT VENTURE AND PROVIDE INFORMATION ABOUT IT.

6. Please rate the degree of success as well as the success measures of the selected joint venture.

Degree of success

| The selected joint venture |

Please justify your answers and score if possible

Please provide the project and parent names of the joint venture (Optional)
7. A List of the most influential risk factors that impact joint ventures in the oil and gas industry has been identified as below. Based on your experience and expertise in the selected joint venture, please select the most appropriate option from the drop down regarding the level of impact for each factors on the success likelihood of JVs.

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APPENDIX F: OVERALL ILLUSTRATION OF THE MODEL

Strategic Risk Assessment Model (SRAM)

- Risks Assessment and evaluation
- Model process
- Interpretation of the success rate

**JV boundary component Impact (C1)**
\[ C1 = R1 + R3 + R5 + R6 + R10 + R12 + R22 \]

**Compatibility component Impact (C2)**
\[ C2 = R2 + R4 + R9 + R11 + R15 + R16 + R17 + R21 \]

**External component Impact (C3)**
\[ C3 = R7 + R8 + R13 + R14 + R18 + R19 + R20 + R23 \]

**The Degree of Success (Y)**
\[ Y = 14.901 + 1.563 \times C2 + 1.338 \times C1 + 0.874 \times C3 \]

\[ Y = 14.901 + 1.563 \times (2D) + 1.338 \times (3I) + 0.874 \times (3I) \]

\[ Y = DS \]

- Parents (JV parties) can separately or together assign each one these risk factors a weight from 1 to 10, then add their weight to obtain the impact for each risk component.
- 1 means the risk would be well managed and its impact would be kept to minimum. 10 means the risk would not be managed well.
- The total impact weight for each component is input into the model equation to process.
- The result of the model equation is the total degree of success of the JV. Then, the this value is inputted in the following step to obtain the expected success rate of the JV.
- The DS Value would be compared against the above meter, then the success rate of the JV can be predicted.
- Parents can repeat this assessment till a proper success rate can be achieved.
ALLIANCE: a working relationship that has the primary purpose of achieving business objectives for all parties to that agreement (Hartman 2000).

Contractual Joint Venture: a contract governs the relationship between joint ventures where no separate legal entity is created (Grant, 2012).

JV’s parents: JV partners

Risks: a potential event that may impact the JV positively or negatively.

Strategic risks: an event that need the attention of JV’s parents.

Success meter: the developed meter which indicates how successful the JV will be.

Success: each participant (parent) achieved their goals of the joint venture.