University of South-Eastern Norway

Holistic Risk Assessment Skills in a Project Organization Taking in Consideration Organizational Culture Aspects

A Case Study Approach

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Abstract

Risk management is one of the critical elements for a successful project. In the present industrial scenario risk management model developments have been more rapid and advanced in the recent past 10-15 years. This is mainly due to changing market structure in terms of competition and the stakeholders demand for efficiency and client demands.

In general, the approach towards risk management across industry especially shipbuilding and offshore oil & gas industry is broadly qualitative in nature.

In offshore industry the application of risk management models can be considered as structured and tends to cover the value chain across the organization and uniform in their implementation as well. All other sectors involving heavy investments and complicated processes too have their own risk management models for handling the risk elements faced by them. This is again driven by the nature of business and the type of competition prevalent.

In practice, risk management is a multi-faceted function-oriented activity in an organization. For example, Risk management requires inputs by all members of a project organization. This ranges from risk identification to risk monitoring. One of the challenges in risk assessment is that personnel like a designer in the office or a supervisor at the yard may only assess risks for their functional targets. As a result, risk registers in Engineering Procurement Installation Commissioning (EPIC) projects report risks which are more execution based but don't register risks having impact on the overall project interests. This leads to unforeseen risks at times when it was already identified but the risk was never registered appropriately to catch the client's attention.

Organizational culture on the other hand is a critical element too which tends to affect the overall organization's day to day working as well its approach towards project execution. An organizational culture which tends to lean towards an environment with prime focus on market and business opportunities may tend to be aggressive in its intent for customer satisfaction and organization's overall growth through commercial success. While an organization with an inclination towards characteristics such as adhocracy may tend to be more encouraging towards innovative ideas and vision development-based success path.

The purpose of this study is to verify the holistic alignment of risk assessment by the project members across an organization within a standardized risk management system where assessment and measurement process may be influenced by organizational culture.

The study focuses to establish this possibility through a project case study in an organization. The chosen project is in a mature phase of its completion and chosen for the same purpose due to the possibility of getting more reflective answers from the personnel. The current areas of risk management and organizational culture are deep subjects in their individual ways and this makes it harder to clearly establish a hard link but it does point the possibility that a possible influence exists. The results from the study were confirmed based on the statistical analysis to be genuine but some of the support theories like possibility of holistic alignment wasn't clearly established.

Key Words: Risk Management, Risk Assessment, Risk Management Training Organizational Culture, Project Risks

Acknowledgements

An opportunity to pursue a graduate education after completing my undergraduate studies was an unfulfilled ambition. Although I have been generally successful in my career path in the last 15 years and been very fortunate to work with a wide variety of large and complex oil and gas projects ranging from exploration to city gas distribution. However, pursuing a masters for me was an objective that drove me to resign from my position to pursue this education full time.

Writing a master's thesis graduates you in a different level of academic and professional perspective. This was something said during one of the motivation lectures of our course. At the end of my thesis writing I think I understand that statement now. I have interacted with a number of people from academia as well as the industry in the last few months and learned something from every one of them.

Among such peers of guidance, the first and foremost is my supervisor Prof. Lars Iversen who has been supportive and invaluable in his guidance for helping me to balance the academic aspects with an industrial perspective. Dr. Kjell Ivar Øvergård for still helping me with statistical analysis guidance for the research method structure in spite of his own personal difficulties. Prof. Anne H Gausdal for motivation through her workshops and guidance in methodology. A further hand of gratitude to my friends Amit Sharma and Mehdi Poornikoo for helping with SPSS and R usage for the statistical analysis of the collected data. Many thanks to the 33 personnel and the Quality Head of the organization from my survey without whose feedback all this would be incomplete. I must also make a special mention of my father Indresh Mohan who I lost during the summer this year. He was a strong support for me in all my endeavours including this master's education when I decided to quit my position 2 years ago. My mother Sureshta who has been a strong guide to remind me of my father's wishes and helped to bring my focus back in my time of grief. And last but not the least my wife Pushpa my support system who has always been beside me and encouraged me to pursue my unfulfilled ambition and my two lovely children who have been kind, patient and supportive for all my struggles in trying to balance work schedule and thesis writing phase.

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1. Introduction

All projects contain elements which expose them to a certain degree of risks. This affects the project execution positively or negatively based on their exposure to these elements. Factors such as complexity of scope, assumptions, stakeholder expectations are some of the key drivers of these elements. Risks can be classified in various categories and levels. Project Management Body of Knowledge (PMBOK) defines the existence of project risks at two levels namely individual risk and overall project risk (Project Management Institute, 2017). While latter affects the overall project, the former tends to affect certain project objectives. The affects may be positive or negative based on their driving factors and potential consequences. It is for this purpose that risk analysis is performed, to describe the features or nature of the risk so that a suitable action or measure may be taken to control the risk or its consequence effects. This section of the thesis serves to introduce the subject with a background description of the factors and issues which have contributed for this topic to be undertaken as the focus for this master thesis research.

1.1. Background

A core issue that is raised in the event of an occurrence of a risk is that it was either overlooked or its probability for occurrence was inaccurately assessed. Such situations usually occur when the perspectives with respect to project objectives vary between members of the project organization. The differences may be high and low with each having their own impact on the overall assessment of the risks identified. There are numerous factors which are possible contributors like professional background, years of experience, familiarity with organization's own systems, years of service with the organization, closer understanding of similar projects, lessons learnt sharing with other projects and many more can be added but they all broadly indicate towards perspective and communication (Aven, 2016). Here perspective doesn't mean

point of view but the objective held by the assessor while building his point of view while looking for possible risks. Communication refers to the way this objective is communicated or conveyed and how well it is understood by the recipients. In other words, a risk while being assessed by person A may be ranked higher due to his association with those issues on day to basis than person B who may be aware of the risk in general but may not score it as high as A.

An example for this can be taken from a typical oil platform design project. A change in process system design may just be the focus of a chemical engineer but this change when implemented in the integrated design will require a piping layout design, instrumentation like pressure sensors and control valves system design change including associated structural arrangements like pipe supports etc. This is just a small example of how one action creates a chain reaction of actions from other disciplines. In a situation such as this if process discipline only looks at the impact from process system point of view without giving due consideration to the constraints of layout discipline then small risk can escalate to a completely different level leading to high cost impact and time delays.

One of the key incidents inspiring the thesis subject was a personal encounter in a project. During the project the client representative raised an objection with the Project Manager of the contractor organization. The risk register for the project consisted of risks which were having an impact on the scope executed by the contractor but there were no risks identified by the project which may have consequences for client's overall interest. The outcome of this meeting led to a strong observation from the client that all the key personnel from the contractor project organization had listed risks related mainly to their individual discipline scope areas but no one had paid much attention to the 'big picture' and advised of risks that may affect the client's project interests. This further led to a risk assessment training arranged by the client organization for all the lead engineers for the contractor organization. It was this event that

inspired the hypothesis that risk assessment perspectives in a project are not entirely holistic across a project organization and there was a certain degree of organizational culture element which contributed to the focus of the disciplines in the way as observed by the client. As stated earlier this can be due to various factors like focus on individual responsibility, organization's cultural environment, risk assessment training, understanding of project objectives and various other factors which cannot all be listed or explored.

1.2. Research Question

The example stated in the previous section leads to our research question which basically states that even though many organizations have a well-documented and structured risk management system the extent of risk assessment practices by the personnel leads to a different perspective and assessment of the risks identified for the project (Johansen, 2010; Vik, 2012). And the question that comes up is "Is the risk assessment across a project organization aligned holistically?" Or "Are all risks in a project identified and measured equally by the members of that project irrespective of organizational culture? Does organizational culture influence the holistic alignment during risk assessment in an organization?"

The endeavour here is to find basis to answer this research question in the thesis study through exploring a sample case described in the further section. The case study project considered for this study will only manage to support or discard the theory stated above. The prime focus is on establishing if the risk assessment by everyone after having received the same risk management training and working in similar level positions in the project is appropriately aligned or not. Factors such as experience in the industry and years of service with the organization may also be typically identified as elements which may have impact on understanding of project objectives and thus may lead to an effect on how risks are identified and managed. However, it is difficult to say if this can be generalized for applicability to all

projects. In order for generalizing such a statement more such studies will be needed to be performed to add relevance to the stated theory. It may however be used to apply for projects which may be established to be of similar nature and features.

1.3. About the Case

The chosen project case is an oil and gas industry-based project. The cooperation for project data collection and survey respondents was provided by a successful lumpsum turnkey contractor organization. A lumpsum turnkey project is a contract under which a firm agrees to fully design, construct and equip a service facility (like a platform, drilling rig or a process facility) and handover to the operator (the client ordering the contract) when it is ready for operation for a remuneration as per contractual terms. The organization in the present research study is a leading service company within the oil and gas industry and renewable energy. The company has a strength of more than 4000 employees globally engaged in onshore and offshore projects executed from its offices based in various locations namely Norway, Denmark and Southeast Asia. From the above information in a general sense it can be considered that the risk management system is established uniformly across all areas of the organization with a fairly standardized framework for training and implementation. Standardized framework for training helps in imparting the common principles for risk management structured in a way which the organization deems as appropriate to their risk management philosophy and principles (Klein & Weaver, 2000). The homogeneity of the established process ensures that the same principles are known to all personnel irrespective of location of the employee. Such strategies are key to the global approach that organizations have during execution of their projects.

In the present-day globalization and volatile markets, it is difficult for organizations to arrange mobilization or hiring of more employees for short project phases and so it becomes more effective to use employees from their group location offices. This is a fairly common

practice in the present-day competition in the industry as it even helps to reduce operability cost for an organization by placing back offices in locations which are much lower in their liability cost to the overall company group and project cost. However, in order to ensure an equal level of standardized execution level quality the organization has to ensure a global system implemented uniformly across these location offices. This ensures that all personnel mobilized to the project walk the company line and work on common basis. This is achieved through common training modules, globally standardized work systems and policies for all areas across the organization for everyone. This allows for multiple locations to work together with a high degree of cohesion. However, it doesn't mean that this is a flawless systematic approach because there are other facors like local culture, location and local experience, market knowledge for every region that still tend to challenge / influence the homogeneity established by the training system.

The subject project contract scope included engineering, procurement, construction and installation work for two new modules which were to be later integrated with a platform. The duration of the project was three years in which one module was to be delivered in two and the second one year later the previous one. In addition to building the modules, the contractor would also clear the area on platform and manage integration of the modules on the platform. At its peak, the project was planned to mobilize an approximate manpower of around 700 people. Among the data collected was the company's risk register for the project, risk management process and cooperation from the project organization employees for providing their feedback through response to a questionnaire circulated through an online survey.

The survey was conducted around the end part of the execution phase of the project. The installation activities were completed and final testing activities were ongoing. The project as per the corporate management perspective was a successful one as it fulfilled the quality

objectives of the organizations and had stayed the course for project budgeted cost and timeline for the project milestones. Definition of success of a project is not being evaluated in this case as this is not the main focus.

1.4. Thesis Outline

The research method employed for this study was a project case study method in which the data collection was done through a likert scale-based questionnaire. The data collected was then subject to different statistical tests and a qualitative overview of the patterns observed was performed on the results to draw inferences and support the possible conclusions to support to discredit the theory stated in the research question.

To examine the supposition and the research question a case study approach was preferred within the offshore oil and gas industry. One reason for selecting offshore oil and gas project is the better-established risk management systems in organizations working in the offshore oil and gas service industry. This is mainly due to the high amount of risks involved and associated cost to these projects. Also, it is the minimum requirements specified in the contracts by the clients for a quality management system of an organization in order to be a prequalified bidder for the project. Furthermore, the execution companies bidding for these projects themselves see such quality and risk management systems as effective tools for providing them with the right tools for protecting the organization's interests in terms of their own long-term success in delivering such projects with the right quality and optimal cost. And finally, the international standards governing the technical nature of these projects also define minimum requirements in terms of compliance. In such projects the involvement of the customer (in this case an oil and gas operator company) is also substantially high to ensure safeguarding of their project interests and the nature of the projects which involves government and public stake in the success of the project.

Project data was collected through an online questionnaire survey which was circulated to key personnel in the project organization ranging from the corporate interface functions to project execution-based responsibilities. Project background data like risk register and project profile were gathered from the company's authorised representative with prior approvals. As mentioned earlier all private information regarding the respondents was excluded to ensure the privacy of the respondents and the project.

The findings of this study also act as a follow-on study suggested in a master's thesis for assessing the ability to adapt to a holistic view at all levels in the enterprise which may add value to the organization (Vik, 2012). The results from this thesis will add further reference to those recommendations.

2. Literature Review

Various international standards from organizations and guidelines exist which provide reference and details for common practices regarding risk management concepts, principles and methods. But it is still a challenge to create a risk management training system which is more centralized or standardized to a common structure. This is due to a large variety of definitions for risk analysis from multiple schools of thought. As a result, every training module has its own unique ways for identifying or treating a risk with the basic underlying principle being common. There is a lack of consensus for a common definition for terms like "hazard", "risk", "risk analysis" and "risk assessment" (Aven, 2012) can easily be noted while studying the various articles on this subject.

In its early origins the Society of Risk Analysis (SRA) in its vision statement stated "risk analysis is broadly defined to include risk assessment, risk characterization, risk communication, risk management, and policy relating to risk, in the context of risks of concern to individuals, to public and private sector organizations, and to society at a local, regional,

national, or global level." ISO on the other hand considers risk analysis, identification and assessment as a more combined activity and doesn't include management and communication as part of the analysis (Aven, 2012).

In this chapter it is also aimed to reviewing the work mechanism of the risk management system of the organization whose project is the case undertaken for the thesis study. The purpose for this is to present an overview of the risk management system that exists in the organization and its effectiveness in the various projects where this system is implemented. This will be followed by a section which will discuss the various supportive and opposing information in the published research. This is basically to develop a perspective for the industrial approach while having a closer understanding of the risk assessment from a research viewpoint.

2.1. Risk Assessment: Theoretical and Industrial Approach

The first issue of the journal Risk Analysis states that risk assessment comprises scientific elements but it is not a scientific method as accurate predictions are hard to make especially where large uncertainties are involved (Aven, 2012). The purpose of this section is to compare the theoretical structure of risk management and challenges faced by everyday approach towards risk management in various organizations (more specifically oil and gas, offshore and maritime industries). One standard definition of risk is not necessarily the right definition to summarize all cases where risk is to be assessed and managed (Garen, 2017). Broadly risk analysis can be approached with quantitative or qualitative perspective. The qualitative risk management is the more simplified approach towards risk management while the quantitative works more with a mathematical model-based approach in its probability calculations.

Table 1. Categories risk analysis methods (Aven, 2008)

Main Category	Type of analysis	Description
Simplified Risk Analysis	Qualitative	Simplified risk analysis is a simplistic procedure focussed on creating a risk picture with the aid of tools like workshops and group discussions. The risk might be presented on a broad scale, e.g. low, moderate or large, making no use of formalised risk analysis methods.
Standard Risk Analysis	Qualitative or Quantitative	Standard risk analysis is a more structured procedure using more formal risk analysis methods are used, such as HAZOP and coarse risk analysis, to name a few. Risk matrices are often used to present the results for an overview understanding.
Model based risk analysis	Primarily Quantitative	Standard risk analysis is a more formalised procedure in which recognised risk analysis methods are used, such as HAZOP and coarse risk analysis, to name a few. Risk matrices are often used to present the results.

Industry based approach has the main focus towards having a defined risk management procedure which allows the project organization to identify, manage a risk and mitigate its consequences. This is more on the lines of a simplified qualitative approach towards risk analysis. In usual practice in the organizations it is managed by a designated risk manager who is responsible for the overall implementation but the implementation is done by the entire project organization. Risk identification and its scale is done through a group-based activity in the form of a workshop or a brainstorming session. It is conducted to identify the risks or tasks associated with risks and scale them on a broad value of low, medium and high probability and consequence on a mutual consensus basis.

Quantitative risk analysis on the other hand is more specific and has a model based approach (Aven, 2008). The more common forms of this are QRA (Quantified Risk Assessment) and PRA (Probabilistic Risk Assessment) for systems with complexities. One of the core issues with probabilistic methods is that they are not based on solid foundation of any specific evidence and therefore are frequently questioned for their validity (Aven, 2012).

In a broad summary it may be said that quantitative method is preferred when most of the data are available or when information available can be transformed into numerical results. If some data are missing, semi-quantitative will be useful as well. When there is no data at all then qualitative method is preferred. Another example of such mathematical model-based approach is the Monte Carlo based simulation. Many oil operator companies while analysing the risks associated with the project lifecycle costs use this to model the probability of different possible outcomes which would otherwise be difficult to predict due to the intervention of random variables. It is a technique which helps to understand the impact of risk and uncertainty in prediction and forecast.

From an industrial perspective most of the organizations while implementing a risk management system prefer to establish a qualitative approach-based risk management model. A major reason for doing so is the low complexity in terms of application and ease in creating a training module compatible to a wide range of employees possible to train in such simplistic approach. The qualitative aspect as implemented in the industry focusses on identification of a probable risk and score the probabilities associated with that risk and map it on a risk matrix for a better identifiability. Based on the consequence and associated features of the task the mitigating or preventive actions are proposed and implemented. Furthermore, there is a demand for the system to be flexible in terms of structure. This allows itself to be implemented in any type of project and still yield standardized reports for review and assessments. This type of

implementation takes place in lumpsum turnkey scope-based projects where it is hard for the contractor to identify and quantify accurately all factors which may pose as risks or contribute to risk-based events. However, it must also be noted that in this type of analysis there is no quantified data available or easily comparable within various cases. The main reliability and success of the risk management system in the project depends on the experience and skills of the project organization personnel and its own archive of past executed projects which are used as a basis of reference to scale the identified risks. In other words, the experience gained from numerous executed projects in the career and familiarity with company systems greatly influences the risk management exercise. At the end of the project the record generated mainly is a project risk register with a broad scale of all the identified risks along a probability and consequence scale.

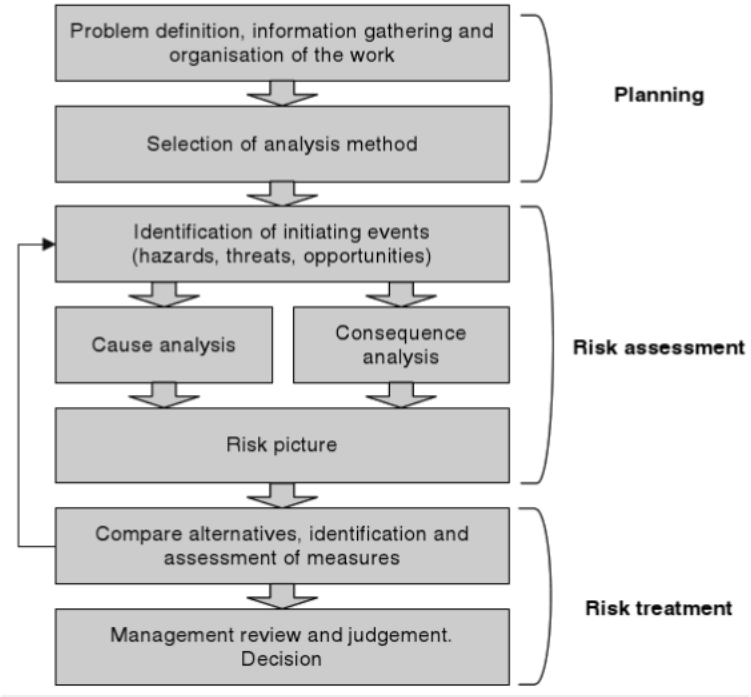


Figure 1. Main Steps followed during Risk Analysis (Aven, 2008)

However, from research perspective anything based on pure experience is not a definitive basis enough and requires more conclusive evidence to establish it as a basis. It is due to these reasons that theoretically statistical analysis and mathematical simulation models

are considered more reliant in terms of providing credible and reliant theories. However, the major part of the industry uses the qualitative and probabilistic methods for their day to day risk management. It also probable that these methods allow the organization to communicate these risks across the all the personnel in the project and can be effectively be implemented as a process with simplistic training and very little core background in risk management for all the personnel.

2.2. Quality Management System (QMS) Approach towards Risk in the Organization

The risk management system implemented in the organization as this is a global system implemented across all their locations. This system has been developed based on the overall assessment of the organization's own objectives and goals for risk management in projects. In broad purview the risk management system in the organization is established as an integral part of their day to project execution process itself. It is referred to as 'Quality in Execution' in the organization. As shown in the figure below it is a 5-step process which is aimed towards maximizing the level of quality by interconnecting the relation of every task for the project with a certain type of high, medium or low risk.

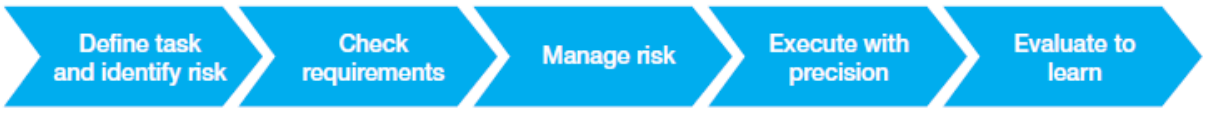


Figure 2. Main steps defined for Quality in Execution (QiE)

The early project phase consists of a risk workshop which is mainly for the purpose of identifying all the types of risks which can be expected and building a risk register of the risks which pose a threat to its successful execution. The risk register of a project is an important document as it lists all types of risks identified throughout the course of the project. It is a live document which is monitored on a frequent basis and updated based on the existing status.

The workshop participants refer to the project scope and attempt to identify the various scope tasks required for completing the key project activities. This is an activity which is

heavily reliant on the training of the personnel in the organization's risk training and the personnel's own past experience and scope perspective. Based on the identified key tasks the various associated risks are identified and rated along a standard scale of risk occurrence probability and consequence or impact. The rating is performed based on the organization's own guideline and consensus between the risk workshop chair and the participants. The higher the probability and impact score the higher ranking of the risk. Based on its overall rank it is required to be continuously tracked during the project to avoid the occurrence of the risk or mitigate the impact of its consequences on the project. These risks listed for the register are then registered in the risk management system of the organization which is PIMS R4. This workshop exercise is conducted on a predefined frequency which is established either based on the standard guideline process of the organization or customized based on client organization requirements.

PIMS is at present one of the commonly used risk management systems in the offshore industry among operator as well as contractor organizations. However, many organizations have their own or ORACLE based database as well which are quite similar but are custom designed to suit an organization\s needs for their risk management system.

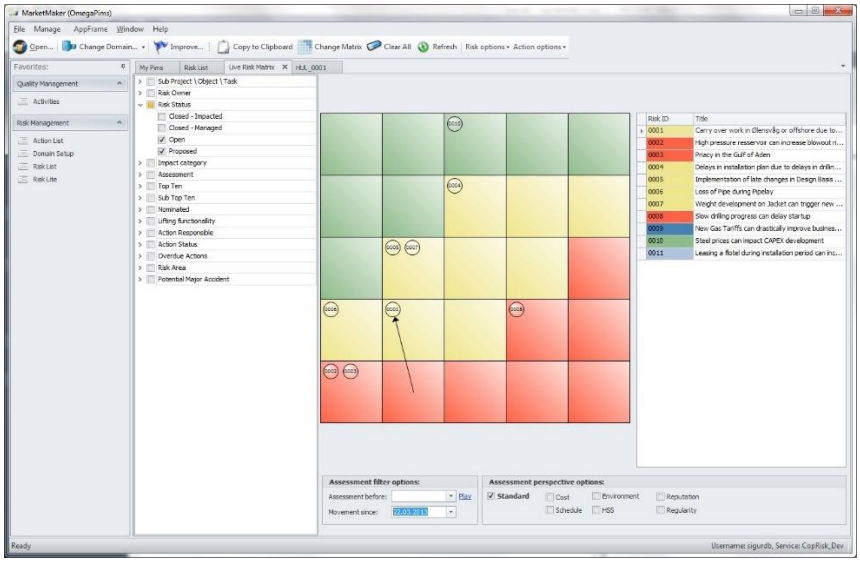
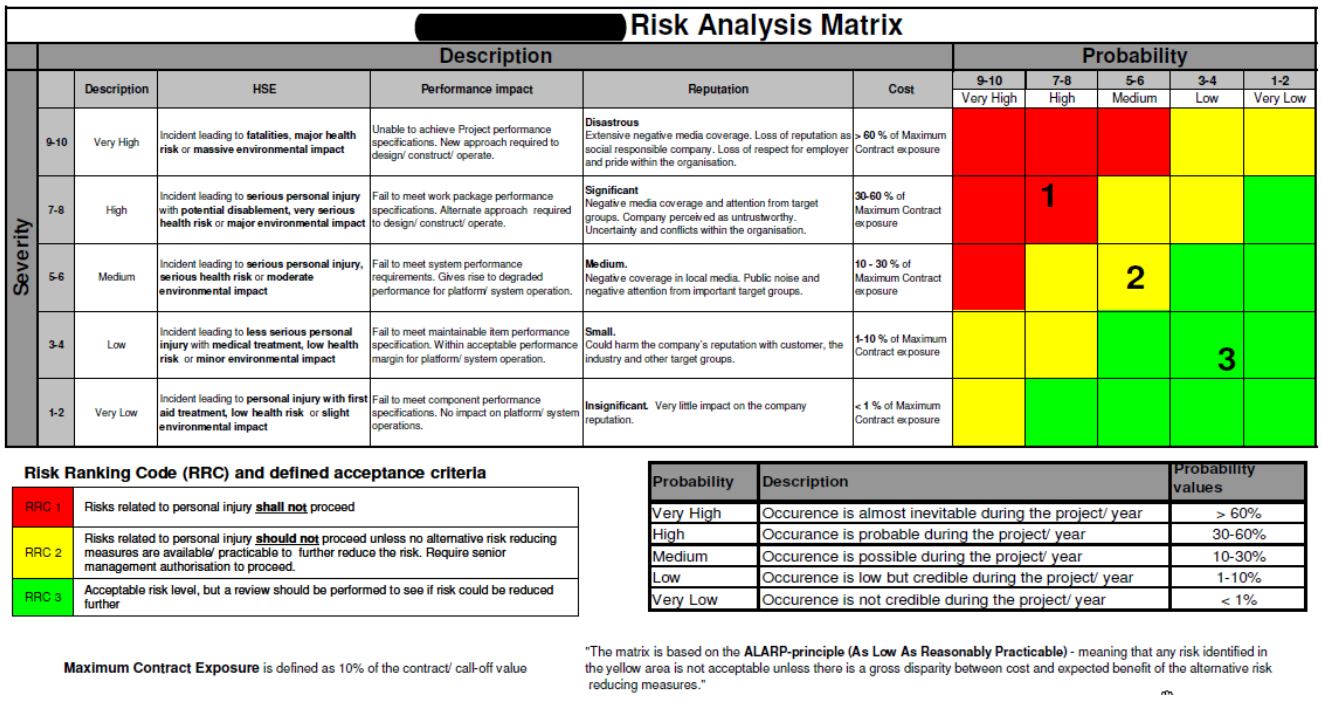


Figure 3. Sample snapshot of a PIMS Risk Matrix

It must be noted that the software or risk handling platform is not the key player but the established guidelines and the methods in which these guidelines are executed by the various personnel across the organization which makes all the difference. At the end of the day all such systems are mainly tools which allow the users to manage the risks that they identify, quantify and monitor to manage. For example, the risk analysis matrix normally has a guideline or work instruction which has the risk analysis matrix. It is this matrix which all users refer to when rating the risks identified by them. It is this matrix which allows the organization to standardize the measuring scale for the risks identified in the workshops. However, it is also this matrix which provides the difference in assessment as well. For example, a core discipline personnel may measure the risk accurately based on his own expertise and understanding but in the same way they may measure a more non-related risk at a different scale altogether.



[redacted] Risk Analysis Matrix

Severity		Description	HSE	Performance impact	Reputation	Cost	Probability 9-10 Very High	7-8 High	5-6 Medium	3-4 Low	1-2 Very Low
	9-10	Very High	Incident leading to **fatalities, major health risk** or **massive environmental impact**	Unable to achieve Project performance specifications. New approach required to design/ construct/ operate.	**Disastrous** Extensive negative media coverage. Loss of reputation as social responsible company. Loss of respect for employer and pride within the organisation.	**> 60 %** of Maximum Contract exposure					
	7-8	High	Incident leading to **serious personal injury** with **potential disablement, very serious health risk** or **major environmental impact**	Fail to meet work package performance specifications. Alternate approach required to design/ construct/ operate.	**Significant** Negative media coverage and attention from target groups. Company perceived as untrustworthy. Uncertainty and conflicts within the organisation.	**30-60 %** of Maximum Contract exposure		1			
	5-6	Medium	Incident leading to **serious personal injury, serious health risk** or **moderate environmental impact**	Fail to meet system performance requirements. Gives rise to degraded performance for platform/ system operation.	**Medium.** Negative coverage in local media. Public noise and negative attention from important target groups.	**10 - 30 %** of Maximum Contract exposure			2		
	3-4	Low	Incident leading to **less serious personal injury** with **medical treatment, low health risk** or **minor environmental impact**	Fail to meet maintainable item performance specification. Within acceptable performance margin for platform/ system operation.	**Small.** Could harm the company's reputation with customer, the industry and other target groups.	**1-10 %** of Maximum Contract exposure				3	
	1-2	Very Low	Incident leading to **personal injury with first aid treatment, low health risk** or **slight environmental impact**	Fail to meet component performance specifications. No impact on platform/ system operations.	**Insignificant.** Very little impact on the company reputation.	**< 1 %** of Maximum Contract exposure					

Risk Ranking Code (RRC) and defined acceptance criteria

RRC 1	Risks related to personal injury **shall not** proceed
RRC 2	Risks related to personal injury **should not** proceed unless no alternative risk reducing measures are available/ practicable to further reduce the risk. Require senior management authorisation to proceed.
RRC 3	Acceptable risk level, but a review should be performed to see if risk could be reduced further

Probability	Description	Probability values
Very High	Occurence is almost inevitable during the project/ year	> 60%
High	Occurance is probable during the project/ year	30-60%
Medium	Occurence is possible during the project/ year	10-30%
Low	Occurence is low but credible during the project/ year	1-10%
Very Low	Occurence is not credible during the project/ year	< 1%

Maximum Contract Exposure is defined as 10% of the contract/ call-off value

"The matrix is based on the **ALARP-principle (As Low As Reasonably Practicable)** - meaning that any risk identified in the yellow area is not acceptable unless there is a gross disparity between cost and expected benefit of the alternative risk reducing measures."

Figure 4. Sample snapshot of a Risk Analysis Matrix used as a guideline by organizations

But in broad perspective it must be agreed that the established system is similar to the guidelines laid by PMBOK which defines the following risk management processes in seven parts (Project Management Institute, 2017):

- Plan how risk management will be conducted
- Identify the various risks
- Perform qualitative risk analysis
- Perform quantitative risk analysis
- Plan risk responses like options, strategies and exposure levels and possible actions
- Implement risk responses for mitigating risk impact or consequences
- Monitor the risks on a timely basis to review the increase or decrease in probability of the risk.

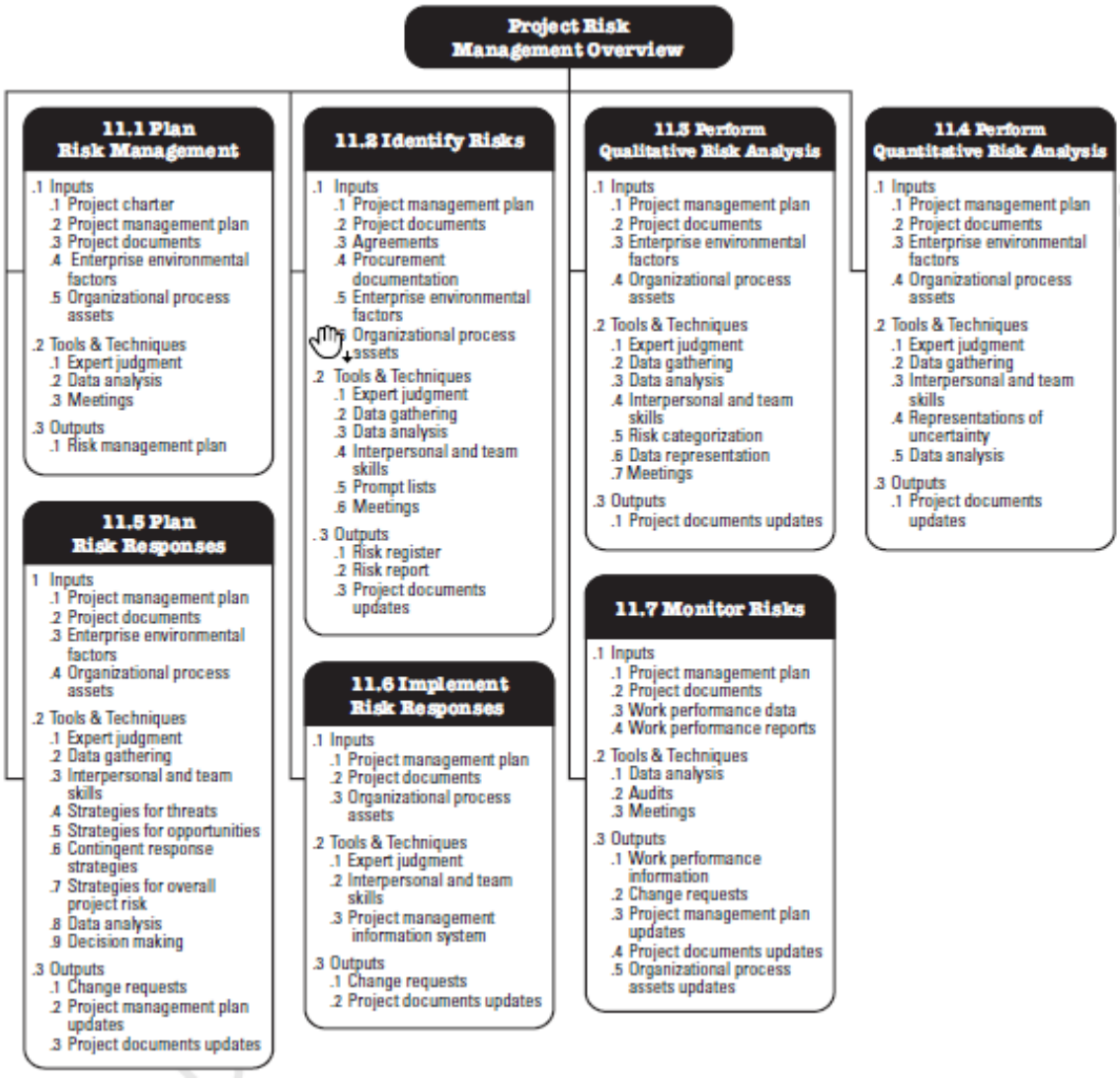


Figure 5. Project Risk Management Overview (Project Management Institute, 2017)

Further to the various categories of risks as defined in

Table 1 in the earlier section 2 risk is also classified based on the level of knowledge of a risk event's occurrence and the extent of understanding of its impact (Kim, 2017). This leads to four types of possible uncertainties (Cleden, 2009)

- Known–knowns (Uncertainties which are known knowledge-based),
- Unknown–knowns (known in terms of existence but not exactly measured knowledge),
- Known–unknowns (risks or uncertainties which are not identified but still anticipated), and
- Unknown–unknowns (unsounded uncertainty which is not identified, measured or anticipated).

Table 2 Schematic Structure of Modified Risk Categorization (Kim, 2017)

Certainty / **Identification**	**Certain (Known)**	**Uncertain (Unknown)**
Identified (Known, Recognized, Familiar)	Known Known (Identified Knowledge)	Known Unknown (Identified Risk)
Unidentified (Unknown, Unfamiliar)	Unknown Known (Untapped Knowledge)	Unknown Unknown (Unidentified Risk)

There is no clear database or concrete historical data which clearly says what type of unknowns occur the most because each will have its own set of examples and supportive unique theories to disapprove the other. However it must be noted that the “known-unknowns” are treated as “risks” by project risk management (PRM) (Project Management Institute, 2017). On the other hand, unknown unknowns are quite unimaginable and therefore project risk management (PRM) does not attempt to account for these.

Based on the discussion above and earlier sections it becomes even more apparent to consider that experience in terms of work and service tenure in an organization are two factors which play a crucial role for this activity.

2.3. Risk Management system and risk analysis as per research industry

Risk management is defined as all the activities which are undertaken to identify, monitor and manage the risk. In terms of academic perspective risk management is categories in 3 main categories strategic, financial and operational (Aven, 2008). The first one focusses on risks associated with the long-term goals of an organization with respect to its corporate plans. The financial risks focus more towards the organization's market, credit and cashflow situation. And the operational risks tend to cover the accidents, quality and legal risks for its day to day working. The risk analysis for these various types of risks follows a common structure which is mainly in three parts planning, assessment and treatment (Aven, 2008). There are number of methods to analyse risk accompanied with different advantage and disadvantages. But it is difficult to say risk can be completely analysed by a single method. The term risk acceptance criteria basically used to define this part only. There are certain types of risks for which the assessment will be the same irrespective of the method employed. For example, judging the outcome of a sports match, journey planning etc. The only thing that is different between each method is the degree of accuracy based on the method used. The higher the accuracy of the assessment the better is the reliability of the risk measured. At the end of the day main purpose of conducting risk analysis is to provide supportive evidence for the decision-making in both selection of solutions and suitable measures. Another example for more complex yet simple approach towards risk analysis is oil and gas operator organizations performing Monte Carlo simulation to estimate the probability of appropriate exploitation of an oil reservoir to support their drilling plan for the coming years.

It must also be noted that some of the risk management methods in projects are perceived to be linear and rigid, with little stress on continuous assessment and identification of risks. In some organizations it is often looked upon as "fill it, shut it and forget it", performed only once or twice in the project in the beginning or during client or management reviews. This

is mainly on account of either of the two issues. The overall operation and work foundation of the organization is quite small in scale and simple in its scale. The other is that the understanding and use of risk management is not entirely understood or implemented. But an organized risk management strategy can be very helpful in identifying potential risks (Garen, 2017). According to ISO 31000:2009 and IEC/ISO 31010:2009 (Nieto-Morote & Ruz-Vila, 2011; Ostrom & Wilhelmsen, 2012) risk management is defined as "coordinated activities to direct and control an organization with regard to risk". The ISO 31000:2009 prescribes for the project management process to include risk assessment, risk treatment and risk monitoring and review. Although there are some guidelines provided with a model offering advice on how a risk management process can be performed but most guidelines are generic and do not specify any method on how to do it (Garen, 2017).

In several risk management methods, especially Failure Modes Effects and Criticality Analysis (FMECA), there are three criteria that are highlighted to assess the risk level. It is towards Occurrence (O), Detectability (D) and Severity (S). These are numbered on a quantitative scale, and then multiplied in order to get a Risk Priority Number (RPN). The risks with the highest RPN will be prioritized for further mitigation. This is again quite similar to the risk assessment method described in general in the earlier sections. In summary it can be noted that there are no specifics for any organization which may be referred to while designing and establishing their risk management processes and training systems which may be a real guide to provide a holistic alignment for risk management process except a broad alignment.

2.4. Organizational Culture Assessment Instrument (OCAI)

A significant factor which is although studied in detail as a subject but not specifically identified with risk management systems is the organizational culture. This is an area which is believed to a known area of impact within organization's functioning but never directly

addressed in risk management themes too directly. In addition to influential factors like individual assessment by individuals of the project organization cultural environment of the organization also plays an important role in influencing the risk assessment alignment among the personnel. Organizational culture is an influential factor that contributes to organization's operational success and promotes employee work effectiveness. In the present-day industrial competition there is a rising trend of self-managed or autonomous work teams and team cultures (Shin, Kim, Choi, & Lee, 2016). The best part is that organizations too have embraced this need as part of their own interest and are investing resources in this for further development.

Organizational Culture is a concept which has been become prominent in recent years (Schein, 1990). Although there are various structures and terms developed in the last few years but one of the most popular ones to be used all across the industry as well is the 'Organizational Culture Assessment Instrument' (OCAI). 'Organizational Culture Assessment Instrument' (OCAI) developed by Kim Cameron and Robert Quinn is a well-known and widely accepted research method to examine organizational culture. As per this method every organization has a mix of four different types of cultures which can be categorized into 4 competing values but in many cases this is undetectable (Cameron & Quinn, 2011). As per this framework when the culture leads to explicit behaviour then it becomes more observable. The term organizational culture refers to elements which are the core characteristic of the organization which are often consensual interpretation or also described as "how things are around". But this also includes individual views which are somewhat transformational in nature based on situation and new information. The exemplification of the culture is done through branding like logos, themes, formal goals which makes the organization recognizable. But it must also be noted that culture of an organization is also influenced by individually the values, norms and standards pursued by the individuals or the core principals' but tends to influence eachother as well.

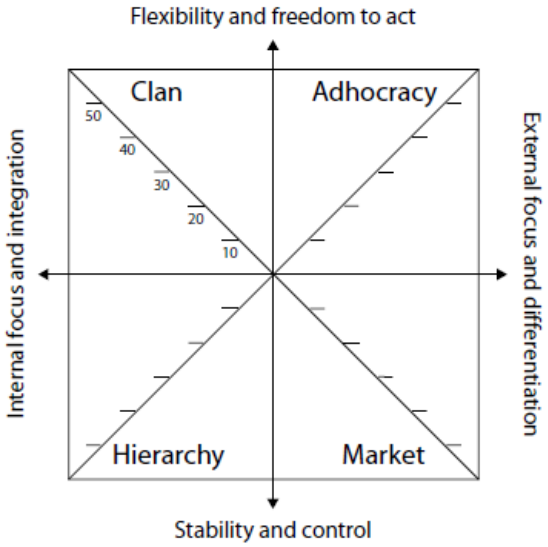


Figure 6. Competing Values Framework (Cameron & Quinn, 2011)

The framework focuses on classifying the organizational culture along four broad values Adhocracy, Market, Hierarchy and Clan while considering 6 dimensions for judgement:

- Dominant Characteristics
- Organizational Leadership
- Management of Employees
- Organizational Glue
- Strategic emphasis
- Criteria of success

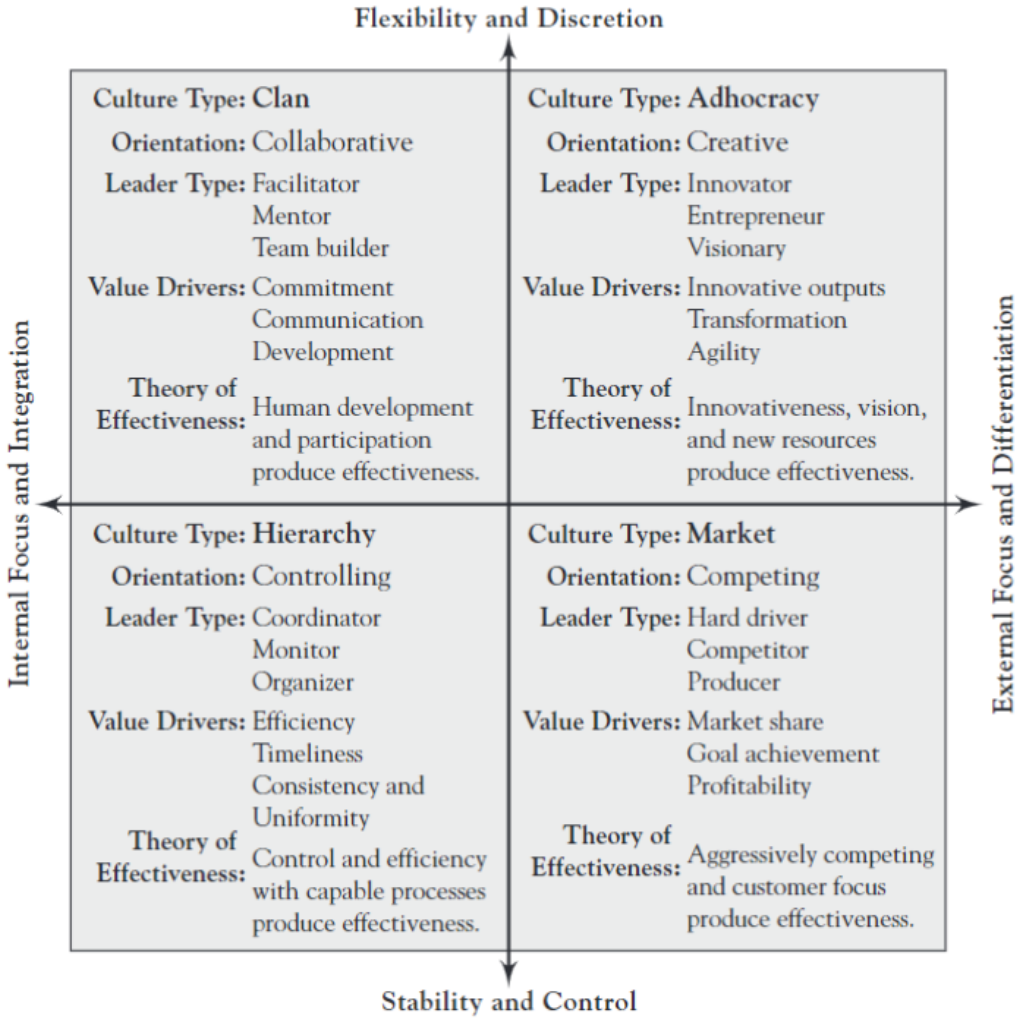


Figure 7. Competing Values of leadership, effectiveness and organizational theory (Cameron & Quinn, 2011)

The personnel are required to take a survey test in two parts. The first part requires the test takers to score the four different culture types with a weightage adding up to a total score of 100 existing in the organization as per their perspective. The second part of the test requires them to repeat the scoring for the same four characteristics but based on what they would prefer should be the desired change in the organization in future.

As it may be seen from the Figure 7 that the entire exercise of risk assessment in a project will greatly influenced by such competing values which are predominantly existing in the organization's own risk management training as well as the individual members of the

project organization. The extent of these values playing a significant role during risk assessment will depend on their own individual perceptive competing values.

Only OCAI results cannot be used to support our claim completely. This is because organizational culture is just one of the many factors which can influence risk assessment in personnel. One of the major reasons for strong disagreement with the ipsative measures used by the OCAI questionnaire to map the organizational culture. It is argued that ipsative measures are more individualistic and person specific. One of the observations pointed out is the part where all scores for present and future of the organization are made by individuals with no common scale except the part that the scores are allocated within a count of the total score of 100. And since the sum of scores are over the attributes of a person therefore it is incorrect to compare the measures between personnel in an organization (Eijnatten, Ark, & Holloway, 2015). It is however a subject which is neither entirely rejected not accepted since OCAI with ipsative measures is applied by organization consultants who are contracted to assess and develop a model suited for possible rectifications to support the organization's strategy for competing in the industry. Therefore, the results for this part of the questionnaire is mainly utilized for the purpose of establishing the overview of the organizational culture to support the theory that it may have its influence.

The snapshot below is a sample snapshot to demonstrate how the mapped organizational culture from OCAI appear on the OCAI quadrant model. The mapped out quadrilateral shape basically demonstrates the effect of the polarities of values on the organization which is Internal Vs External focus and Stability Vs Flexibility. In our present area of case study, it should also be perceived as adherence to corporate goals Vs individual goals. A high score in present Vs future Clan culture basically will show that there is a certain degree of internal focus and

flexibility which would like to push a culture of higher degree of collaborative environment which may encourage employee development and participation.

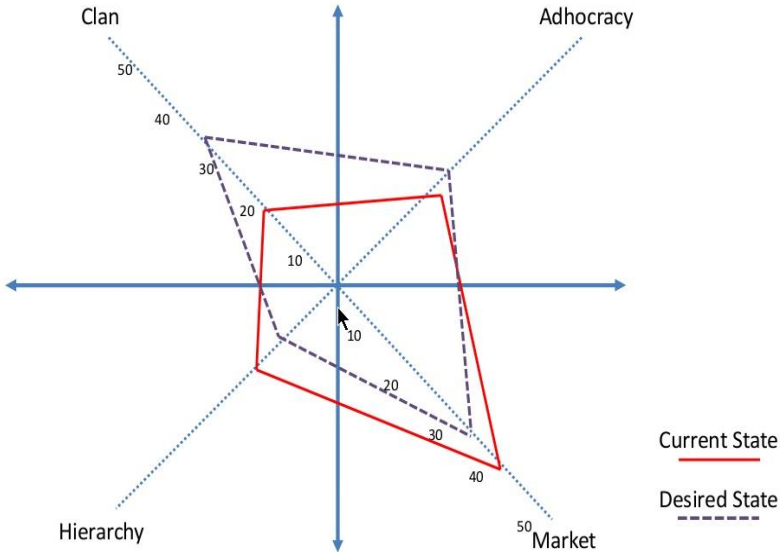


Figure 8. Sample Snapshot of OCAI Analysis Framework (Cameron & Quinn, 2011)

Similarly, a low score of current Vs future state in Market culture shows a reduction in external focus and differentiation. This basically doesn't mean that the organization collectively is leaning away from the market share or profitability but rather in the balance of equations between external vs internal focus the inclination is higher for growth for internalization and integration. It is of course logical for any organization leans towards achieving effectiveness by achieving a closer balance between all the four quadrants. But it is a difficult goal to achieve because factors such as market competition, sustainability of resources, training needs, innovation and consistency in delivery of scope irrespective of client expectations, manageability of project factors tend to create an imbalance across the quadrant depending on what the organization tries to achieve and what the resources may actually lack.

2.5. Risk Management System and Organizational Culture Link

Risk management is an activity which is primarily driven on organizational goals and objectives. It is a system framed and structured based on an organization's philosophy and approach towards its business and core values and objectives. It is this aspect which drives the

theory that organizational culture must have an influence on the risk assessment. The purpose of this section is to present reference information from articles which may present some support to the supposition in this research study.

There is a three-tiered approach to risk management that addresses risk-related aspects at different levels:

(i) the organization level;

(ii) core mission and business process level; and

(iii) information system level

The risks at tier 1 are considered more of strategic risks while the risks at tier 3 are considered tactical risks. Based on earlier sections and the description above it must be noted that risk is complex and multi-layered as a result of which the organization has to be involved with it at different levels in different ways. At leadership level the strategic vision and objectives is shaped to mitigate certain types of identified risks, at project levels through planning and managing and execution / operational level by constant development and implementation. (Force & Initiative, 2010)

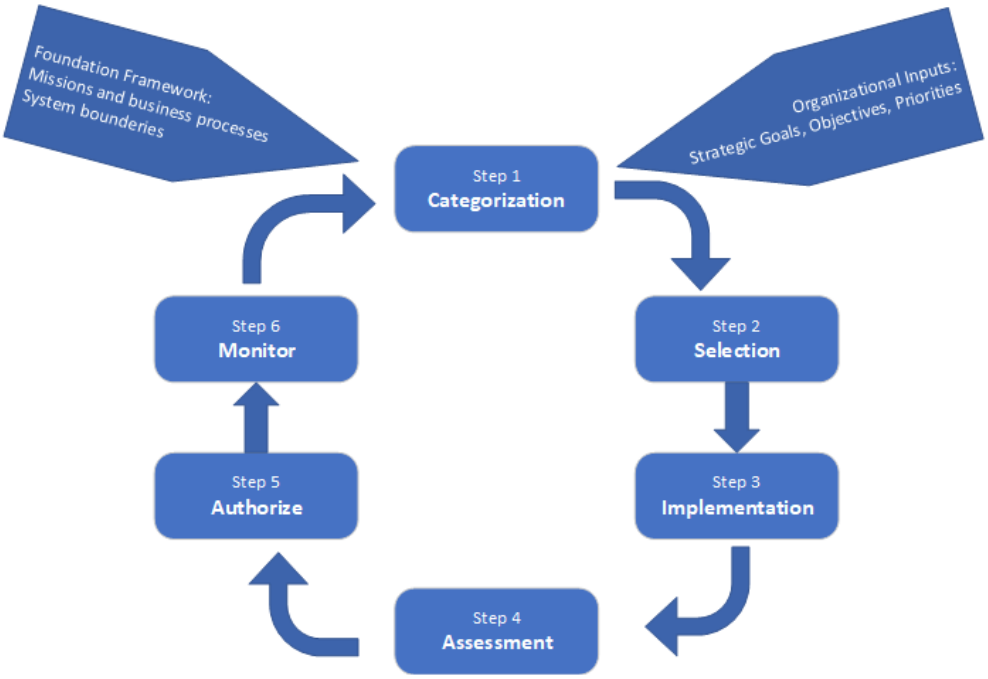


Figure 9. Risk Management Framework (Force & Initiative, 2010)

As it may be seen in the figure above that the organizational management style can at one or various points play the influence in the form of a top-down command. It is this fine form ways of intervention where we can see the organizational culture influencing the risk management system and its framework.

3. Research Method

3.1. Basis of Method Selection

One of the challenges for a research thesis is the selection of the research method. A research method although may yield results with its supportive data but it may still lack a credible argument to summarize the thesis results in conclusive manner.

In the present research study risk assessment and organizational culture are two topics which have been mostly published as subject specific studies and are difficult to relate with eachother. This makes it challenging to present citations or identify the test methods which closely discuss or help to link organizational culture and risk assessment together with a broad perspective.

The traditional experiment-based approach involving a pre-test - post-test experiment with a control group and experimental group was a difficult method to apply. This was due to the part that the risk management models across the industry are similar but yet still have quite different approach so it was difficult to design and conduct such an experiment with an experimental group and control group. The optimal solution was finding a group in an organization with a well-established risk management system and the group should be proven to be reasonably experienced in application of the system and familiar with the organization’s objective in risk management system. The term for well-established risk management here refers to a system which should have been applied globally by an organization and across various projects of medium to high value with the same principles and objectives in all

locations. Such a system can be assured to be a fairly well tested and applied system. The other challenge was the limitation of finding adequate sample size for such data collection. The only suitable apparent choice was to restrict this to a project-based case. As a result of such multiple criteria limitations for drawing inferences the research design was restricted to a case study approach.

The initial strategy in questionnaire approach was to perform an interview based qualitative data and rearrange the data based on the keyword and broad direction of the answers. However, based on general overview of the literature it was evident that data collection for such a research structure may not yield clear results and the possibility of filtering out key information from interviews may turn out to be a more complicated. It must also be noted that one of the referred thesis for this research utilized an interview-based approach in an organization (Vik, 2012). This is mainly on account of the large scale of variety with in risk management and organizational culture subjects.

Considering these factors, a closed type questionnaire was designed towards quantitative data set so that the data gathered can be analysed for possible covariance and correlation. The research method employed for evaluation of the assumptions was initially evaluated to be performed as a data created in two parts. The questionnaire is briefly summarised below but is explained in more detail in Section 3.2

The first part as discussed in earlier section was a standard questionnaire from Organizational Culture Assessment Instrument' (OCAI) developed by Kim S. Cameron and Robert E. Quinn is a well-known and widely accepted research method to examine organizational culture. The purpose to utilize the standard questionnaire was to establish the possibility of an organizational culture which may demonstrate the influence of the four broad values Adhocracy, Market, Hierarchy and Clan on the organization in general. The method in

its broad application is already discussed and explained in Section 2.4 and the questionnaire is also described briefly in section 4.1.

The second part of the questionnaire focuses more on the characteristics of risk management system in the organization. The aim of the second part is mainly to develop a structure which demonstrates that the organization's objective and the relevance of risk management system in the project is perceived with a similar degree by all the lead members driving the various disciplines of the project. It also attempts to broadly map the variety of experience among the respondents with respect to working within the oil and gas industry and experience within the organization for the purpose of checking the possibility of its probable impact on risk management system of the organization.

3.2. Online survey questionnaire

As briefly mentioned earlier the method adopted for finding answers to the research question was strategized to be performed through a case study with statistical analysis of the data. The survey was created in an online survey website which allows researchers and industry-based people to create questionnaires for the purpose of gathering research data. The questionnaires can either be restricted only to a limited group of respondents or can be open to public access. In this case the questionnaire was accessible only to the respondents described in the previous sections and in Section 3.3 through an invitation link.

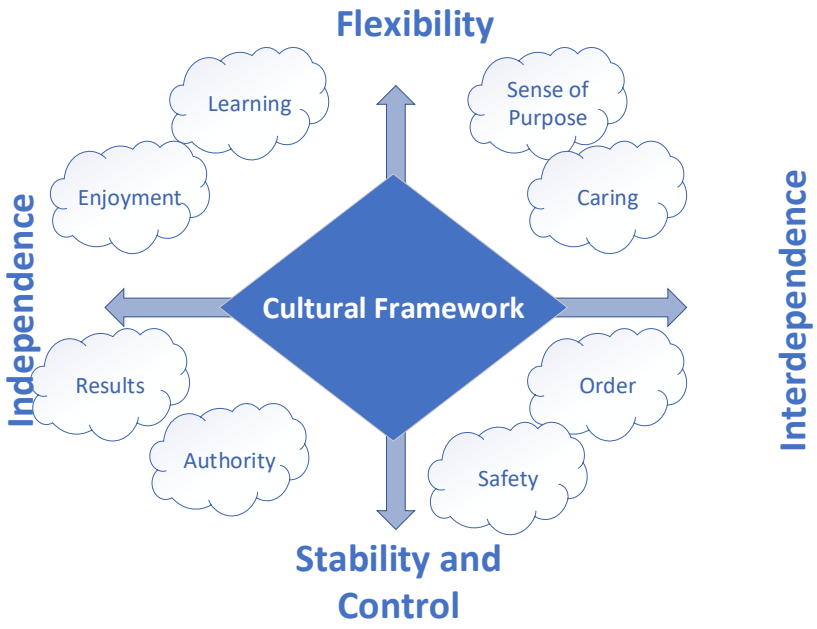


Figure 10. Cultural Framework Quadrant

The survey is split in two parts. The first part mainly focusses on obtaining data regarding the organization culture. As mentioned in the earlier sections it is apparent that organizational culture plays a significant role in driving the personnel into looking at characteristics of a project with an outlook which is partly influenced by these organizational culture-based characteristics. The culture-based questionnaire is a standard questionnaire used in OCAI based analysis of organizations. The focus of the questions is mainly towards drawing a rating-based response from its respondents for presenting their views on how they perceive the organization in the present environment and how they see it in future times. The intention is to use this for presenting the measurement of the organization's cultural atmosphere with the Competing Values Framework for the organizational culture: Clan culture, Adhocracy culture, Market culture and Hierarchy culture. This can be described with the help of a sample question from the questionnaire.

The cultural survey contains six sets of statements. Each set of statements has four options. The respondent is required to assign a weightage-based score out of 100 points between

options depending on how they perceive the present state of organization. The weightage allocation is to be done such that the sum total should always add up to 100. For example, if the respondent thinks option A is very similar to their organization, option B and C in the middle and option D almost not at all, then a possible breakdown may be 55 points to A, 20 points to B and C, and 5 points to D. The questionnaire is such that respondent will first have to respond to the statements based on how they feel that the organization is NOW or in the present times. The next set of statements is identical to what is being considered during the current situation, but this time the points have to be distributed according to the desired situation in the FUTURE, so how the respondent would like their organization to look a few years ahead of time.

The data in the present case study will not be used for providing evidence towards the organization's cultural environment but mainly to present that there is a valid type of organization culture and to see if the questionnaire from part B may present a patern in the answers which may connect with the cultural map. The data will also be validated with a test to check the significance of the data. Although there will be a brief discussion regarding the type of the culture characteristics prevalent in the organization based on the guidelines of OCAI evaluation but we are not evaluating the culture itself but rather looking at the possibility of its impact on risk assessment.

The second part of the survey focusses on the risk management system characteristics of the organization like training system, important influencing factors for risk management system and respondents own understanding of risk management system and overview. Most of the questions of the second part have basically been placed with the purpose of establishing credibility for the system in terms of its own framework so that it may be observed that a functional risk management frame work is in place within the organization. The intention is not to check the functionality or the foundation of the established system but only to validate that

a credible system exists and people understand the system with its relevance. In other words, an aspect that has been attempted to establish is the understanding or recognition by all respondents regarding the relevance of risk management system. Towards the end of the questionnaire, demographic data has been collected so that the data can be mapped to see the variability in the overall group. The intention was to utilize this data and test for any possible correlation between the risk assessment characteristics and variable such as experience in the organization and overall experience. For this part can be elaborated by listing the questions raised with the respondents for a likert scale rating for agreement or disagreement with the basic intention of the result intended.

The listed questions aim to measure the respondent's agreement or disagreement with the statements made with reference to the project and risk management system implemented in the organization.

i. Risk management training in the organization is very effective
ii. Risk Management training is essential for your role in the project

In the following questions 'experience' referred to in the statements refers to overall experience in the related industry, project, job and even organization.)

iii. Effective Risk Management requires work experience
iv. Implementation of Risk Management training guidelines does not require experience.

Questions 'i' till 'iv' focus on establishing if all respondents affirm to the idea that risk management plays an important role in their day to day execution of responsibilities and if experience plays a complimentary role in this or not. A low likert scale rating basically will only refer to the risk management system of the organization and cannot be linked to respondent's generic towards risk management system in general across projects.

Questions from 'v' till 'xiii' focus on respondent's perspectives with respect to project objectives like Scope, Quality, Time and Cost on a likert scale.

v. Risk Management is very effective for Scope assessment in the project.

vi. Risk Management is very effective for Quality assessment in the project

vii. Risk Management is very effective tool for assessment of project delays (Schedule and Plan).

viii. Risk Management is very effective in assessment of Cost overruns in the project.

ix. Design quality check in the project is an important part of Risk Management system in the project.

x. Progress Reporting is very effective for Risk monitoring in the project.

xi. Quality Audits are very effective for Risk monitoring in the project.

xii. Cost reporting is a very effective tool for Risk Monitoring.

xiii. Activities like "Lessons Learnt" is very effective for Risk management in the project.

xiv. Please provide the following information (Do not provide your name anywhere) Age, Number of years of experience (relevant to the industry), Number of years of service in the organization and Project Role / Position (Project Management / Technical / Quality)

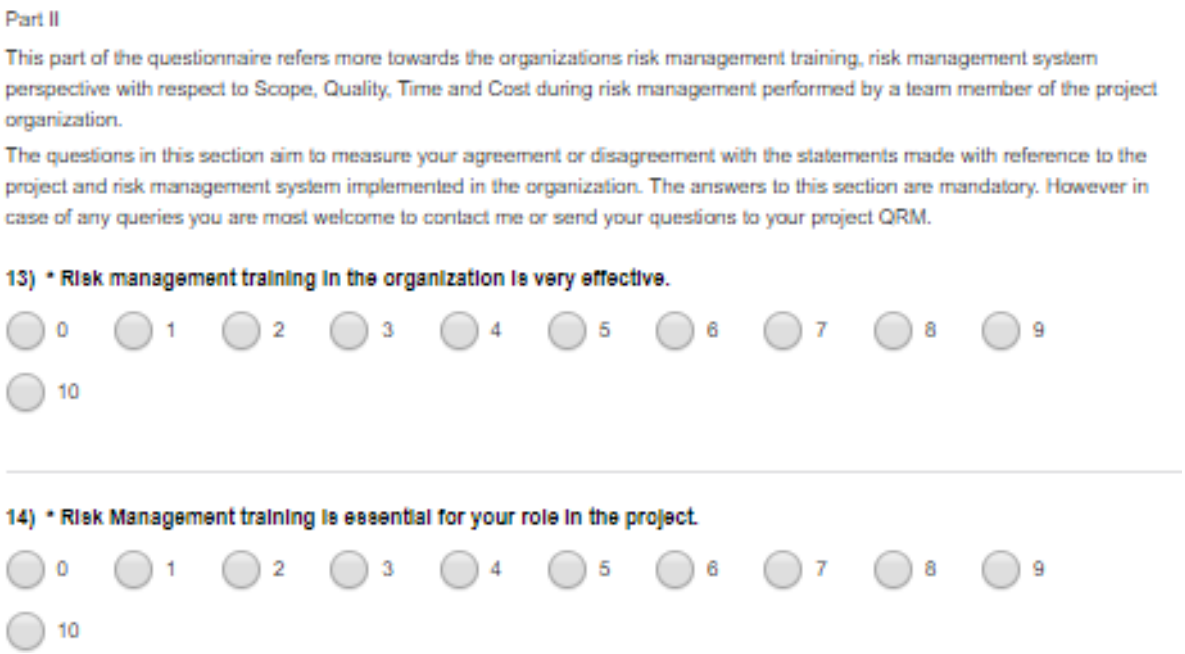
Questions above help us to observe if all the respondents have the full purview of the project objectives and their relationship with risk management system. Questions i to iv are arranged in a cyclic manner with the questions v to xiv. The first five tend to build on relevance of risk management system in the organization while questions in the later part tend to reaffirm that project objectives are a significant part of the risk management system. In one way these questions help us to map a complete circle of risk management with project objectives with a complementary relationship. A low rating on the above only reflects disagreement of the respondent from the relationship of risk management system in the project with the project objectives of the case project. This cannot be linked back to disagreement with the statements in general applicability since all questions have been raised with perspective to the case project.

These questions have been also been grouped together to analyse the answering patterns from the respondents based on their grouping as per years of work experience and experience within the organization and also compared to average responses from group of personnel in the

manager or corporate positions. This has been done with the purpose of counterchecking the statistical analysis results as well.

3.3. Respondents

The project organization includes lead personnel from various design disciplines like Process, Structure, Piping, Electrical and Instrumentation etc. with an approximate strength of 54 personnel. All the respondents are key personnel have substantial expertise with respect to their discipline and past background for such similar scope projects. As a common procedure during bid evaluation for a project it is a prerequisite to provide the profile and resume of the personnel nominated for a project Most of the key personnel profiles were listed with their resume during the bidding stages of the project and were pre-approved by the client prior to mobilization to the project.


Part II

This part of the questionnaire refers more towards the organizations risk management training, risk management system perspective with respect to Scope, Quality, Time and Cost during risk management performed by a team member of the project organization.

The questions in this section aim to measure your agreement or disagreement with the statements made with reference to the project and risk management system implemented in the organization. The answers to this section are mandatory. However in case of any queries you are most welcome to contact me or send your questions to your project QRM.

13) * Risk management training in the organization is very effective.

0 1 2 3 4 5 6 7 8 9 10

14) * Risk Management training is essential for your role in the project.

0 1 2 3 4 5 6 7 8 9 10

Figure 11. Sample snapshot of the online survey circulated for data collection

The questionnaire survey was circulated among 50 respondents from the lead personnel of the organization. However, responses from only 33 personnel were received. The identities of all the respondents were classified and no one was required to reveal any personal

information except their age, number of years of experience with the organization and overall industry-based experience. This was done in order to substantiate the basis for relevance of sufficient industry experience and understanding of relevance of Quality and Risk Management system. The questionnaire was circulated through the Quality Risk Manager of the project who was also the point of contact in the organization.

3.4. Limitations

The present form of research study has various limitations which have contributed to different aspects ranging from the selected research method till the type of tests conducted for the statistical analysis.

As initially highlighted in Section 3 there is lack of published literature which capture Organizational Culture and Risk Management together. This mainly on account of the fact that both these subjects are dense areas of study within themselves. This limitation makes it difficult to cite many studies or cases used in the past to propose a concrete method which may help us draw specific results.

The measurement of organization culture through the OCAI model (Cameron & Quinn, 2011) cannot be entirely called as a strong basis due to the argument that ipsative scale measurement is not a true measurement of organizational culture as a whole but rather is an individual measurement of the organizational culture on singular level (Eijnatten et al., 2015). These measured results cannot be compared with eachother or combined to study the whole organization by mapping the results on the same scale. This is due to the argument that every individual has their personal perspective scales when putting weightage scores on a statement regarding the organization. Also circumstances such as individual experiences tend to create a substantial influence over such scaling of ideals. As a result, it may be quite easily possible for two persons who may feel about the same point almost equally but their individual score levels

may vary by enough points to create different results. It is on this account only that the ipsative scores of the analysis will not be used for organizational culture mapping but will be used for drawing the aspect if the organization is leaning towards corporate values or individualistic values.

From statistical standpoint the sample population of respondents is adequate for drawings results on the project level itself but still quite low for adding credibility to a theory. In order to make this research study more valid it is required to perform these tests for more project cases of similar nature so that results are demonstrate distinct conclusive or at least indicative direction for establishing a correlation between independent and dependent variables.

One of the major pitfalls observed at the end of the data collection observed was that some more questions should have been added which could have raised queries with the respondents on their views regarding the organization cultural impact on their risk assessment practices. Unfortunately, this was an area which if covered in this questionnaire could have contributed to large extent to the present outcome of the research study. However, there would also be the possibility of receiving answers which may not have been answered openly or clearly as required. But this leaves a substantial room for this research study to be carried forward at a higher level in which the questionnaire may be elaborated to cover culture and risk management related questions with a more direct approach.

4. Results

As described in Section 3.1 this part mainly focuses on presenting the results from the statistical tests performed for validation of the data for both parts of the questionnaire. This is followed by pattern observations of the graphs plotted from the collected data. The inferences from this section are discussed in more detail in section 5:

4.1. Part A Statistical Analysis

4.1.1. Questionnaire “OCAI”

OCAI results were added to an excel based OCAI sheet downloaded from a freely available online source. The survey scores from the questionnaire were added to the blank sheet to obtain the calculation of the results to map the organizational culture values. There were some bad data (highlighted in color) observed in both the “present” and “future” scenario. A 10% error margin was considered on account of the assumption that some people may have made error in summing up their scores to 100. Based on this the data was refined to eliminate errors which had a difference of more than 10% difference in sum scores. One specific entry was taken out of the data (Number 20) since all the entries had 3 bad data inputs in each questionnaire and answers appeared quite arbitrary. For the sake of analysis, data were transposed (in terms of rows and columns), labelled according to their initials e.g. DC_A for “Dominant Characteristics” for the question “A” and so on. These are displayed in detail

DC_A	DC_B	DC_C	DC_D	OL_A	OL_B	OL_C	OL_D	ME_A	ME_B	ME_C	ME_D	OG_A	OG_B	OG_C	OG_D	SE_A	SE_B	SE_C	SE_D	CS_A	CS_B	CS_C	CS_D
20	35	35	10	30	30	10	30	45	15	20	20	35	20	30	15	15	30	50	5	30	15	15	50
10	5	50	35	0	0	0	100	45	5	5	45	20	10	35	35	25	25	25	25	8	2	40	40
10	10	50	30	10	10	30	50	50	10	30	10	20	10	40	30	20	10	50	20	20	10	20	50
14	14	45	27	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25
5	15	50	30	0	10	60	30	20	10	40	30	25	10	35	30	5	5	80	10	5	5	40	50
10	20	50	20	25	25	25	25	35	15	35	15	10	10	60	20	20	20	30	30	70	5	10	15
10	10	50	30	10	10	10	70	20	5	5	70	70	5	10	15	20	10	10	60	15	5	10	70
10	15	25	50	15	25	10	50	15	15	10	60	30	20	10	40	20	15	15	50	20	10	40	30
20	10	30	40	20	20	0	60	70	0	0	30	60	0	10	30	20	0	0	80	0	0	40	60
10	20	30	40	40	10	10	40	20	30	20	30	30	5	50	15	30	10	20	40	20	5	10	65
50	20	20	10	10	20	30	40	20	20	50	10	20	20	30	30	10	10	60	20	10	10	60	20
5	0	65	30	10	0	10	80	50	0	30	20	85	0	5	10	10	10	10	70	10	10	35	45
20	0	60	20	40	30	0	30	33	13	24	30	30	12	34	24	0	10	60	30	10	0	50	40
5	10	55	30	20	5	55	20	10	5	30	55	20	5	45	30	20	5	30	45	10	5	50	35
5	15	50	30	5	15	50	30	20	20	30	30	40	10	30	20	20	20	40	20	30	10	30	30
10	10	60	20	10	30	15	45	25	25	25	25	20	30	30	20	15	30	40	15	15	20	40	25
30	20	30	20	30	30	10	30	30	30	10	30	50	10	30	10	50	5	20	25	50	10	10	30
30	20	45	5	40	35	5	20	60	20	10	10	60	20	10	10	50	30	10	10	10	10	40	40
30	10	20	40	18	17	22	43	33	13	24	30	20	20	40	20	10	20	30	40	15	30	30	25
20	20	40	20	15	10	15	60	30	10	10	50	15	15	40	30	15	15	35	35	10	0	60	30
0	0	70	30	5	5	70	20	5	5	70	20	10	0	70	10	5	0	70	25	30	20	30	20
25	25	25	25	35	20	15	30	30	30	10	30	25	25	25	25	30	20	20	30	1	10	40	49
5	5	5	85	5	5	20	70	5	5	30	60	5	5	30	60	5	5	10	80	10	10	20	60
10	15	35	30	10	10	20	60	40	20	20	20	5	5	80	10	10	10	45	35	10	20	60	10
20	10	50	20	20	20	30	30	15	15	40	30	20	10	50	20	10	20	60	10	15	5	30	50
15	20	40	15	10	20	20	50	40	5	15	40	40	10	30	20	20	20	30	30	60	0	10	30
5	20	70	5	10	20	10	60	70	10	10	10	10	5	65	15	65	15	15	5	10	0	45	45
10	0	40	50	10	10	0	80	30	10	40	20	20	0	40	40	10	10	40	40	20	5	30	45
10	10	60	20	50	25	15	10	40	10	10	40	50	20	20	10	30	30	10	30	15	5	40	40
0	15	65	20	20	20	40	20	20	10	40	30	25	10	30	35	10	15	35	40	30	10	30	30
20	30	40	10	20	30	10	40	30	10	20	40	25	25	25	25	25	25	25	25	10	5	5	80
10	26	60	4	5	5	60	30	20	5	70	5	55	5	35	5	20	15	32	33	19	9	32	40

Figure 12. Snapshot of the online survey data after rearrangement (The detailed results are enclosed in the appendix)

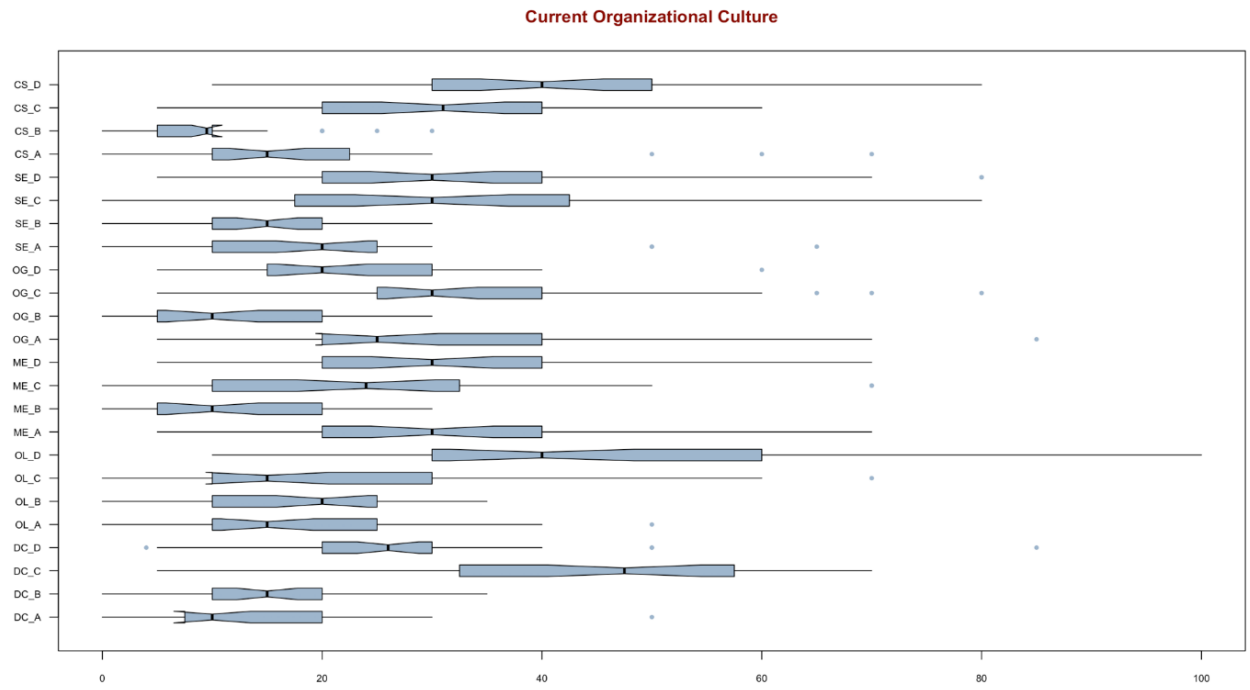


Figure 13. Snapshot of graphical data results. Details are enclosed in the appendix.

The above referred data set are available for reference in the attached appendix. Based on the above assumptions the data for the present-day organization culture was tested under the ANOVA (Analysis of Variance) test. ANOVA is a statistical test method used for testing differences between two or more means of data. Statistically significant test results mean that the value of P will be quite low. As may be seen in the last row of the table the "0***" is and values close to it show highly significant data. Similarly, '0.001', '0.01' and '0.5 also represent high significance.

ANOVA Test						
	Df	Sum Sq	Mean Sq	F value	Pr(>F)	
ind	23	75274	3273	**14.61**	**<2e-16 *** **	
Residuals	744	166701	224			

Signif. co	des:	0 '***	' 0.001	'**' 0.01	'*' 0.05 '.' 0.1 ' ' 1	

Figure 14. Snapshot of ANOVA test results for present data. Detail in the Appendix for reference

As it may be seen that the value of P is calculated to be $P<2^{e-16}$ or $2*10^{-16}$ shows highly significant data.

For the other case consisting of future scenario the same assumptions as mentioned earlier were applied and the following were obtained.

DC_A	DC_B	DC_C	DC_D	OL_A	OL_B	OL_C	OL_D	ME_A	ME_B	ME_C	ME_D	OG_A	OG_B	OG_C	OG_D	SE_A	SE_B	SE_C	SE_D	CS_A	CS_B	CS_C	CS_D
15	40	35	10	30	30	10	30	50	20	20	10	50	30	10	10	25	40	20	15	40	10	10	50
10	10	40	40	0	0	0	100	40	10	10	40	25	25	25	25	25	25	25	25	18	2	40	40
20	50	20	10	10	10	30	50	20	30	20	30	20	30	30	20	30	30	20	20	30	40	15	15
18	24	39	19	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25
20	30	25	25	0	10	60	30	25	25	25	25	20	30	40	10	20	30	30	20	20	30	30	20
10	20	50	20	25	25	25	25	35	20	30	15	10	10	60	20	30	30	20	20	70	5	10	15
5	5	60	30	10	10	10	70	10	5	5	80	70	5	10	15	20	5	5	70	15	5	10	70
20	30	20	30	15	25	10	50	20	20	10	50	40	20	10	30	30	20	10	40	25	15	30	30
20	20	30	30	20	20	0	60	60	10	0	30	50	0	20	30	40	10	0	50	10	0	40	50
10	30	40	20	40	10	10	40	20	30	30	20	30	10	55	5	20	20	30	30	15	10	10	65
30	20	30	20	10	20	30	40	15	20	60	5	10	20	40	30	5	5	70	20	5	5	70	20
20	0	50	30	10	0	10	80	80	0	10	10	50	0	0	50	30	20	5	45	25	25	25	25
20	20	40	20	40	30	0	30	60	0	20	20	0	0	70	30	10	30	50	10	20	20	40	20
20	20	40	20	20	5	55	20	15	5	30	50	20	10	40	30	20	10	30	40	15	10	40	35
10	20	30	40	5	15	50	30	30	20	20	30	30	10	30	30	30	20	25	25	30	10	30	30
20	20	50	10	10	30	15	45	25	25	25	25	20	30	25	25	25	25	25	25	25	35	15	25
40	20	20	20	30	30	10	30	40	20	20	20	70	10	10	10	60	10	10	20	40	30	10	20
35	35	25	5	40	35	5	20	60	30	5	5	50	30	10	10	50	30	10	10	30	30	30	10
40	5	30	25	18	17	22	43	40	25	25	10	25	30	20	25	20	20	30	30	20	25	25	30
20	30	40	10	15	10	15	60	30	15	10	45	20	20	40	20	20	10	40	30	10	0	60	30
0	0	70	30	5	5	70	20	5	5	70	20	10	0	70	10	5	0	70	25	30	20	30	20
25	25	25	25	35	20	15	30	30	30	10	30	25	25	25	25	30	20	20	30	50	30	15	5
10	50	35	5	5	5	20	70	30	50	10	10	30	40	20	10	40	40	10	10	5	5	20	70
10	20	30	30	10	10	20	60	40	20	20	20	5	5	80	10	10	30	30	30	20	10	60	10
20	40	30	20	20	20	30	30	50	30	10	10	10	40	40	10	10	30	50	10	40	10	20	30
10	30	40	20	10	20	20	50	40	5	15	40	40	10	30	20	20	20	30	30	60	0	10	30
5	20	75	0	10	20	10	60	70	10	10	10	5	10	70	15	70	10	10	10	20	10	35	35
20	10	50	20	10	10	0	80	30	30	20	20	20	20	40	20	20	20	30	30	30	0	20	50
5	15	60	20	50	25	15	10	50	10	0	40	55	15	25	5	30	25	5	40	25	25	25	25
25	30	30	15	20	20	40	20	30	30	25	15	20	40	15	25	30	30	20	20	30	10	30	30
20	30	30	20	20	30	10	40	30	10	20	40	25	25	25	25	25	25	25	25	30	15	25	30
15	40	42	3	5	5	60	30	35	10	20	35	55	5	35	5	40	15	25	20	27	15	27	31

Figure 15. Snapshot of the online survey data after rearrangement (The detailed results are enclosed in the appendix)

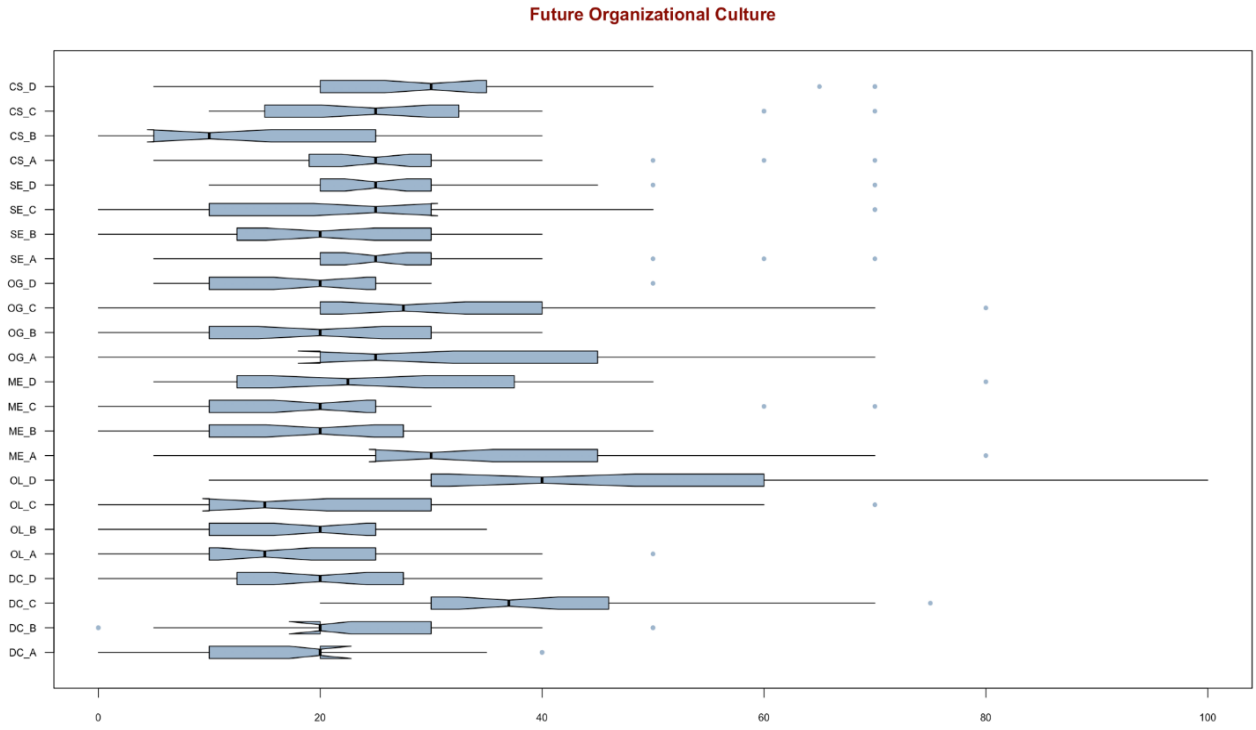


Figure 16. Snapshot of graphical data results. Details are enclosed in the appendix.

As mentioned earlier a similar trend of significant variance in means of the data was observed even for the 'future' case data from ANOVA test. Again, the value of P is considered to be highly significant at $P< 2^{e-16}$ or $2*10^{-16.}$ Some more aspects are discussed regarding the ANOVA results in Section 5.2

ANOVA Test

	Df	Sum Sq	Mean Sq	F value	Pr(>F)	
ind	23	38664	1681.1	**7.867**	**<2e-16 *** **	
Residuals	744	158984	213.7			

Signif. c	odes:	0 '***'	0.001 '	**' 0.01	'*' 0.05 '.' 0.1 ' ' 1	

Figure 17. Snapshot of ANOVA test results. Details enclosed in the Appendix for reference

As mentioned, the errors observed were omitted and the ones under 10% margin were corrected. The results of the tests showed significant variance in the means of their data. In other words, the data from Part A can strongly be considered as a valid data.

4.1.2. Questionnaire "Risk Management System"

The second part of the questionnaire focusses on independent variables like age, number of years of experience and number of years of experience relevant to the industry. The following validity tests were performed on the results from the questionnaire data and the following results were recorded:

i. Reliability Analysis: For measure of internal consistency and to see if closely related data set is a group a Cronbach's alpha test was performed as well. As can been seen from the snapshot below the observed value of Cronbach's alpha at 0.878 is quite high and shows that the collected data is highly reliable.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.878	.883	13

Figure 18. Snapshot of Cronbach's Alpha test results.

ii. Shapiro Wilk Test: The Shapiro–Wilk test is a test of normality in statistical data. It was performed to check if the data obtained from the questionnaire was having a normal distribution. The observed data overall from the SPSS can be considered more or less normal on a broad perspective. The details of the test results are enclosed in the Appendix for reference purpose.

iii. Pearson's Correlation: To measure the strength of the linear relationship between two variables. In this case the test was performed two times. Once with the independent variable as number of years of experience with the organization and another test considering the independent variable number of years of experience with the relevant industry. These variables were tested for correlation with the questions from the questionnaire. Unfortunately, the values in both the cases didn't show a significant correlation. (refer to details of the SPSS export shown in the appendix for the detailed reference and review.

4.2. Part B Graphs and Data Pattern

4.2.1. Questionnaire Part A "OCAI"

In the present case after plotting the answers from the questionnaire multiple curve cases for each analysis were prepared for each of the characteristic features. The detailed curves have been shown in the Appendix attached with this document. The graph below shows the total results summarized for all the characteristics.

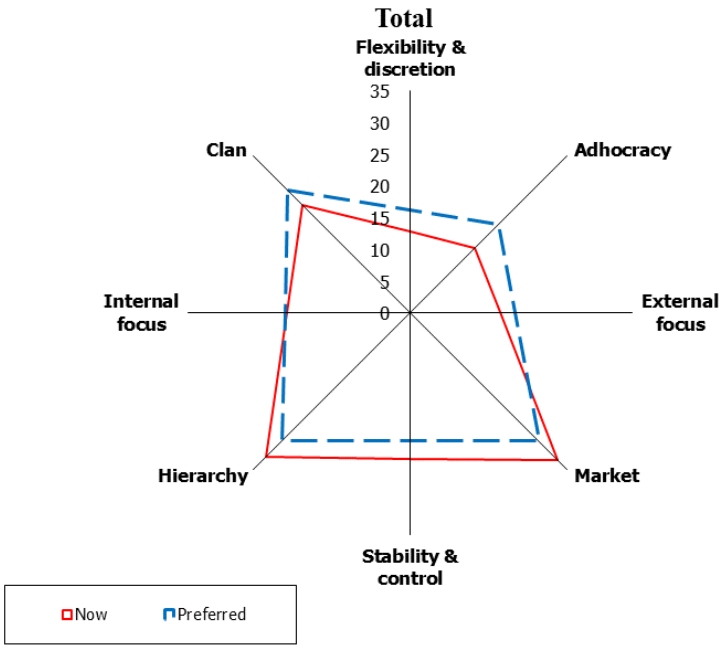


Figure 19. Snapshot of OCAI test results (v).

With all the four area individual scores added it may be seen that there is an increase for Clan and Adhocracy culture for a preferred futuristic condition and a fairly visible reduction for Hierarchy and Market cultures in the Present Vs Future preferred organization culture. This indicates that there is a strong market and hierarchy culture in the organization. And the future preferred outlook shows a movement towards Clan and Adhocracy culture. In general, the present culture are top management and stakeholder driven areas. In the present market situation with low projects and strong competition the prevalence of this culture is only natural. On the other hand, the move for idealistic future reflects inclination towards increasing innovation and friendly culture which is also obvious to a certain degree due to the level of uncertainty that is prevalent in the present times across oil and gas industry.

4.2.2. Questionnaire Part B "Risk Management Characteristic"

The broad calculation of mean, standard deviation and variance for the data collected from the likert scale questions in Part B of the questionnaire is shown in the tables below. In the statistical plots of the responses the data in majority questions reflects negative skewness. Also, the standard deviation is not very high but also not too low either. In a broad perspective it may be said that the opinions in each of the questions majority of the respondents were somewhat in vicinity.

Table 3 Basic statistical results for Part B Questionnaire results

		Risk management training in the organization is very effective.	Risk Management training is essential for your role in the project.	Effective Risk Management requires work experience.	Implementation of Risk Management training guidelines does not require experience.	Risk Management is very effective for Scope assessment in the project.	Risk Management is very effective for Quality assessment in the project.
N	Valid	33	33	33	33	33	33
	Missing	0	0	0	0	0	0
Mean		4.90	6.48	8.24	4.60	6.72	7.54
Std. Deviation		2.33	2.48	2.34	2.74	2.26	2.16
Variance		5.46	6.19	5.50	7.55	5.14	4.69

	Risk management training in the organization is very effective.	Risk Management training is essential for your role in the project.	Effective Risk Management requires work experience.	Implementation of Risk Management training guidelines does not require experience.	Risk Management is very effective for Scope assessment in the project.	Risk Management is very effective for Quality assessment in the project.
Skewness	0.71	0.07	-0.71	0.59	-0.46	-0.78

Table 4 Skewness across Part B Questionnaire with Standard Error (Contd.)

		Risk Management is very effective tool for assessment of project delays (Schedule and Plan).	Risk Management is very effective in assessment of Cost overruns in the project.	Design quality check in the project is an important part of Risk Management system in the project.	Progress Reporting is very effective for Risk monitoring in the project.	Quality Audits are very effective for Risk monitoring in the project.	Cost reporting is a very effective tool for Risk Monitoring.	Activities like "Lessons Learnt" is very effective for Risk management in the project.
N	Valid	33	33	33	33	33	33	33
	Missing	0	0	0	0	0	0	0
Mean		7.45	7.60	8.06	7.18	7.39	6.75	8.45
Std. Deviation		2.35	2.13	2.66	2.48	2.17	2.16	2.41
Variance		5.56	4.55	7.12	6.15	4.74	4.68	5.81
Skewness		-1.07	-0.94	-1.04	-0.65	-0.44	-0.29	-0.83

But the focus in this section is the descriptive histograms from the SPSS analysis have been displayed to show the pattern of answers received for each of the questions of Part B section from the 33 respondents.

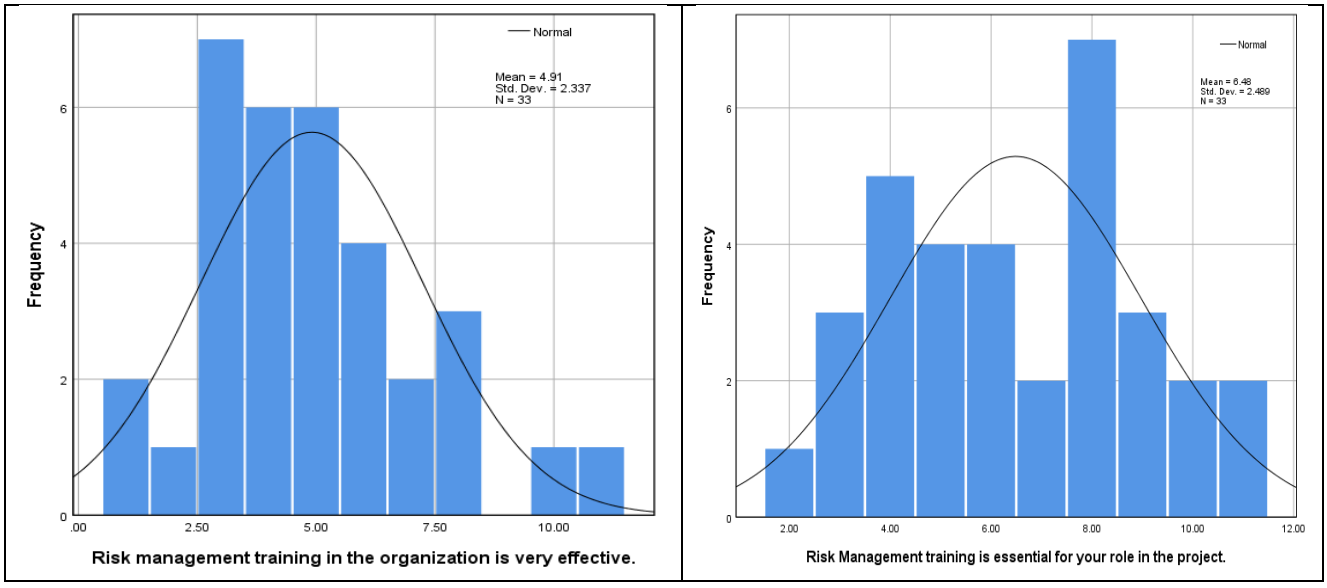


Figure 20. Snapshot of Part B Questionnaire Descriptive Statistical Analysis

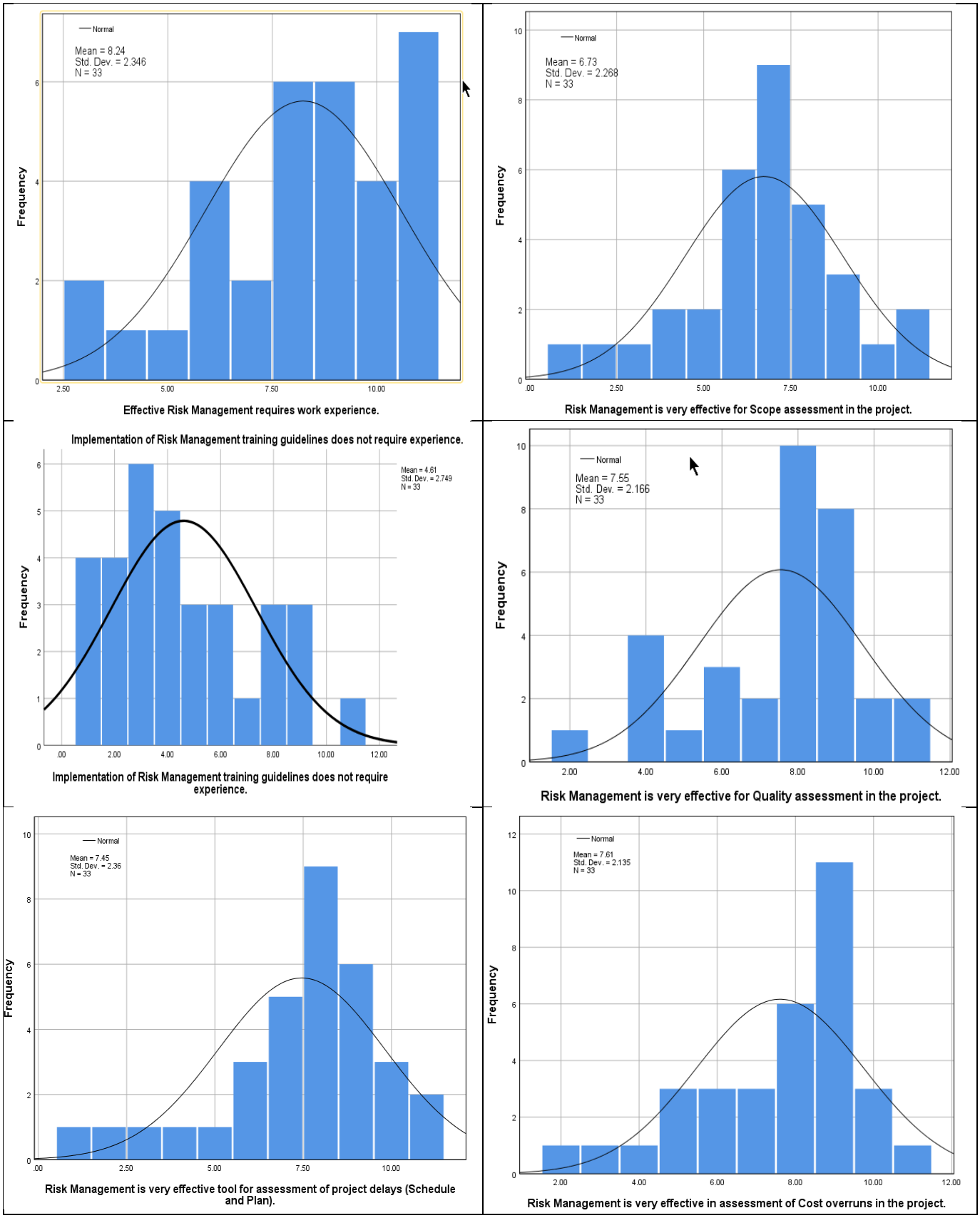
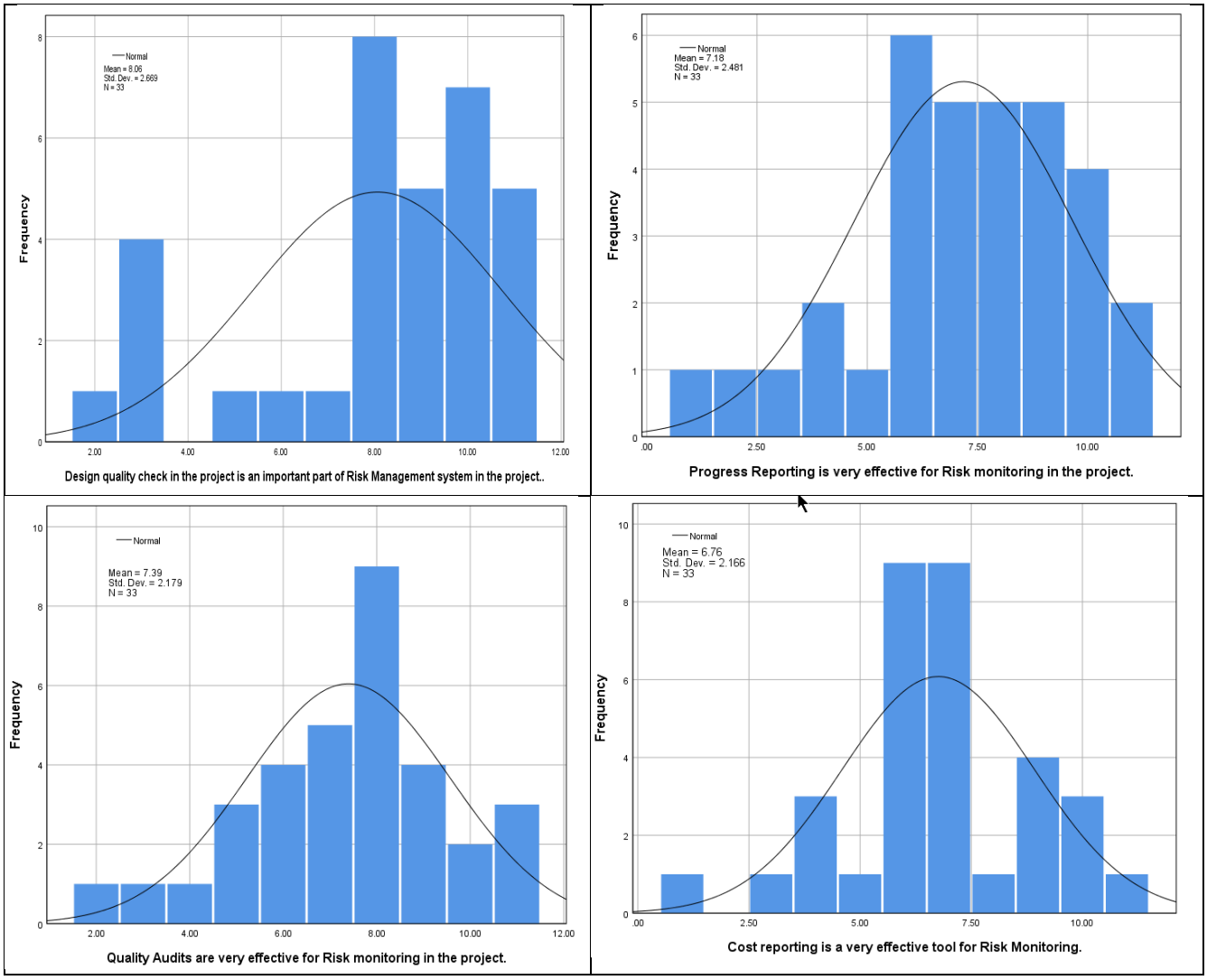


Figure 20. Snapshot of Part B Questionnaire Descriptive Statistical Analysis (Contd.)



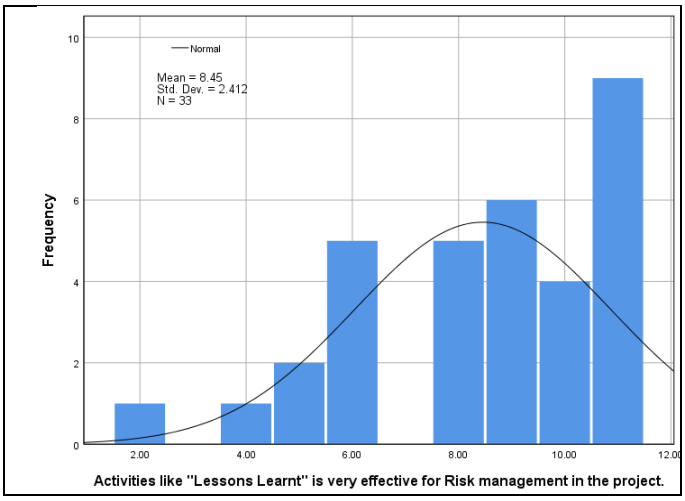


Figure 20. Snapshot of Part B Questionnaire Descriptive Statistical Analysis (Contd.)

It must be observed that in some of the questions the highest frequency is for a low likert scale score. Below are pasted the tables for those questions. For all other questions the tables are available in the Appendix for comparison and review.

Risk management training in the organization is very effective.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	2	6.1	6.1	6.1
	2.00	1	3.0	3.0	9.1
	3.00	7	21.2	21.2	30.3
	4.00	6	18.2	18.2	48.5
	5.00	6	18.2	18.2	66.7
	6.00	4	12.1	12.1	78.8
	7.00	2	6.1	6.1	84.8
	8.00	3	9.1	9.1	93.9
	Strongly Agree	2	6.1	6.1	100.0
	Total	33	100.0	100.0	

Implementation of Risk Management training guidelines does not require experience.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	4	12.1	12.1	12.1
	2.00	4	12.1	12.1	24.2
	3.00	6	18.2	18.2	42.4
	4.00	5	15.2	15.2	57.6
	5.00	3	9.1	9.1	66.7
	6.00	3	9.1	9.1	75.8
	7.00	1	3.0	3.0	78.8
	8.00	3	9.1	9.1	87.9
	9.00	3	9.1	9.1	97.0
	Strongly Agree	1	3.0	3.0	100.0
	Total	33	100.0	100.0	

Figure 21. Snapshot of Part B Questionnaire Descriptive Statistical A

In the snapshot in Figure 21 that the frequency for these two questions was strikingly lower while in all other answers the average frequency of scores is between 6 and 8 on the likert scale. ('Strongly Agree' represents a score of 10) The above two questions' frequency and percentage of respondents indicates that risk management training is not considered to be very effective by the respondents. The second one indicates that most respondents believe that experience has influence in good risk management implementation. These results and other will be discussed in more detail in Section 5.

5. Discussion

5.1. OCAI Analysis Results

Organizations often have to choose whether they should have an Internal focus and integration or External focus and differentiation? Similarly, should they focus on Stability and control - or - Flexibility and discretion? It is difficult to have both polarities for full hundred percent at the same time. Therefore, they are defined as competing values in a quadrant. By plotting those two dimensions in a matrix, the Competing Values Framework can be drawn.

From OCAI analysis point of view and the guidelines by the book for analysis of results (Cameron & Quinn, 2011) the survey indicates that the increase in Clan culture characteristics indicates that there is a preference towards increasing things like self-management opportunities, creates high levels of employee trust and supports team play. An increase in Adhocracy culture demonstrates the higher need for the organization towards creating alternatives and innovation, dynamism in business and forward-looking environment. Decrease in hierarchy qualities are again indicative of the organization attempting to be effective through eliminating ineffective rules and procedures, trying to promote freedom of decision making at every level and eliminating excessive control. And finally, a decrease in Market culture indicates an indication for increasing towards motivation for the employees, adapting to human and market needs both while still keeping focus towards financial gains. It must also be noted that in organizational leadership characteristics the total score for present vs future idealistic is the same which demonstrates a strong satisfaction for the way leadership is handling the organizational management.

For the above analysis performed based on OCAI measurement must be noted that this is mainly a perspective. This doesn't consider the difficulties and strategies that are set into place by the organization based on competition and market scenario. For example, at the time when the survey was performed earlier during the year 2018 the oil and gas projects in the present market were still limited and stability in the markets was returning slowly with the operator companies being careful with new announcements. At the same time due to lack of projects many organizations were reducing staff or avoiding to recruit new positions. Such factors unfortunately do not get accounted for in such tests.

5.2. Statistical Test Results for Part A and B

In this section the results from the statistical analysis performed on both the parts of the questionnaire have been discussed.

5.2.1. Part A, OCAI:

As shown in Figure 14 and Figure 17 it may be observed that the ‘f’ value is significantly large which shows that the variation among the group is quite high. If the assumption in research question is true then f will have a value close to 1.0 most of the time and the larger the f ratio the variation among the group is considered to be very uncommon. In the present case the value of f is significantly high while the p value is quite low (as per the scale for p values in the Figure 14 and Figure 17). As shown in the last row of the table in figures 14 and 17 the “0***” is and values close to it show highly significant data. Similarly, ‘0.001’, ‘0.01’ and ‘0.5 also represent high significance. Since the value of P is calculated to be $P< 2^{e-16}$ or $2*10^{-16}$ therefore it shows highly significant data. This definitely supports the practical significance of the OCAI data. Statistical significance here itself doesn't imply that the results have practical consequence but they only help us to conclude the significance of collected data as discussed in section 5.1

Other than this it there is not much that can be written further to discuss the ANOVA results as the prime focus for the ANOVA was to mainly establish the significance of the variance in the OCAI data. The main use for those results is more for organizational cultural mapping to to identify if any cultural factors may have impact over the risk management process of the organization.

5.2.2. Part B, Risk Management System:

In section 4.2.2 it is observed is brief regarding the average frequency in almost all questions falls in the range between the likert scale score of 6 and 9. In other words all respondents in general rated most of the answers very closely with eachother. As an inference

from those we have listed out the key points observed, the tables from the analysis are available as part of the appendix for your detailed reference:

- The high average scores in questions (i) till (iv) demonstrate that all respondents agree and understand the relevance of risk management system. But the low score for risk training system of the organization and implementations of training guidelines shows that there a lack of satisfaction which in which people do not find the training system to be effective as per their needs.
- It must also be noted that all respondents have given a high rating score for experience driven risk implementation and significance of work experience in effective risk management. This shows that respondents believe that experience, age and years of service have an important role in implementation of the risk management system in the organization.
- From questions v till xiii all questions are mainly associated with the project objectives and have all received high agreement score. This indicates that all personnel strongly agree and understand that risk management is related with the successful achievement of project objectives like scope, cost, quality and time.
- The high score on questions regarding the relevance of experience and lessons learnt demonstrate that most of the respondents too believe that successful risk management requires age, experience and knowledge sharing. This is a part which oddly shows little correlation with respect to variables like age and experience (refer to point no. iii in Section 4.1) as per the statistical analysis.

For adding to this validity from part A reliability analysis test was also performed. The observed value of Cronbach's alpha is seen to be 0.878 which is quite high and confirms that the collected data is highly reliable. To test this further the Shapiro–Wilk test of normality in statistical data was also performed. Details of the tests are included for reference in the Appendix C with SPSS output file. This in general can be termed as normal though not entirely ideal. But the main end to the reliability and normality checks was to ascertain if the data are somehow correlated. As mentioned in some of the earlier chapters that factors such as overall experience, background training, understanding of project objectives and many other factors tend to have an impact on the way risk is perceived and assessed by an individual. In order to find a correlation between the risk related questions and the independent variable of number of

years of experience with the organization the Pearson's correlation test between number of years of experience relevant to the industry with the risk related questions was also performed. But in both cases the value of Pearson's correlation was quite low and insignificant. However, an insignificant Pearson's correlation doesn't mean that risk assessment is not affected by such factors, but the effect is probably low. But this also establishes that various other factors such as risk management related training, project objectives and various others need to be listed out as well and tested for correlation. Furthermore, these tests need to be applied to more project case studies considering the factors mentioned before it can be entirely credited for validating a theory.

To check this further on a more generic note instead of pure statistical information the data was rearranged in three sets

- Case I: Data set for personnel with more than 20 years of work experience and service with the organization
- Case II: Data set for personnel with work experience and service with the organization between 10 to 20 years
- Case III: Data set for personnel with work experience and service with the organization less than 10 years
- Case IV: Data set for personnel working at Senior, Lead and Manager positions in the project or the organization.

It was the results from these data sets which add the theoretical connection between the results from statistical tests and the theoretical content discussed in the research study.

Table 5. Dataset Categories of the respondents with their respective averages for visual pattern

Cat I: Experience 20+ yrs exp	
Average Work Experience	30 years
Average Service with the Organization	27 years
Average Rating scores assigned in Part B	7 (rating)

Cat II: Experience 10 to 20 yrs exp	
Average Work Experience	19 years
Average Service with the Organization	14 years
Average Rating scores assigned in Part B	6 (rating)

Cat III: Experience less than 10 yrs exp	
Average Work Experience	8 years
Average Service with the Organization	5 years
Average Rating scores assigned in Part B	7 (rating)

Cat IV: Management Position Personnel	
Average Work Experience	24 years
Average Service with the Organization	12 years
Average Rating scores assigned in Part B	6 (rating)

It may be seen from the tables above that in almost all cases the average rating scores are a little different by 1-point score. This difference can be considered significant in some ways but at the same time demonstrates the close similarity as well. It shows that irrespective of experience the average views with respect to risk management system are similar across the project organization and therefore helps to support the results from the correlation test. At the same time the small 1-point rating difference also adds a certain credit to the aspect of holistic alignment of perspectives especially for personnel who are either in the corporate or manager roles or have spent a considerable amount of time with the organization to be aligned to its culture and expectations especially with respect to risk management system.

5.3. Industrial and Theoretical Implications of the research study

The main purpose for any research is to bring an overall positive impact to the features associated with the area in which the research study was performed. For example, a research associated with training applications or human factors always bring forward observations which help the organizations to self-observe and reflect on their systems more closely. This usually brings about corrective measures through improved procedures, modified training modules to cater to the weak areas better. From an academic perspective such type of research study helps to give basis to a theory or even detail a pre-existing theory with more associated conditions for human factors or training related research.

As a thought towards the implication due to this research study from an industrial perspective it can be noted that personnel in project may understand the same project objectives and possible undergone the same training but the degree of holistic views during any risk assessment may have different measurability which is probably influenced by the individuals at various levels of the organization. It must also be noted that an underlying organizational culture has a certain impact on the corporate and project processes such as risk management system. This impact can of course channelize everyone on a project team for focussing on the project objectives but at the same time it is not entirely measured on the level of impact it may have. It is also discovered that risk management can be successfully implemented in an organization supported by a strong training system but it may not be necessarily governed only by age or experience of the personnel working in the project.

From an academic perspective the results of this research firstly emphasize that organizational culture and its relationship with risk management is an area which should be considered for a deeper study to evaluate and possibly see if they tend to influence eachother. It leads to the demand for more such similar studies to be performed with a wider variety of cases to add more data for producing a more noticeable amount of observations. This will help to add more specific conditions to the pre-existing theories regarding organizational culture and risk assessment.

6. Conclusion

Based on the results from section 4 and the discussion in section 5 it cannot be stated in black or white that there is holistic alignment in risk assessment skills across a project organizaion. It is a mixed response scenario. It may be referred to the questionnaire in Part B where most of the answers are in almost similar rating frequency. This demonstrates that there is a broad alignment of ideas for agreements as well as disagreements. For example, all

respondents believe that experience is a significant factor for effective risk management but unfortunately the statistical analysis results state otherwise.

At the same time, it can be indicated that organizational culture has a role in the risk management system implemented in a project. This is broadly based on OCAI results and the answers which tend to link age and experience with effective risk management. However, the degree of margin by which organizational culture affects risk management is not clearly conclusive. This mainly due to lack of specific questions which should have been included to identify and map this relationship more clearly.

One of the factors rated by all respondents to be significant for risk management and implementation was age and experience. This unfortunately as per statistical test for Pearson's correlation couldn't be proven to have any direct impact. At the same time, it is also clearly seen that there is a small amount of impact with personnel working for more years with the organization or the industry which means that there is a certain influence of ideas and perspective due to organizational culture probably. But it is very small difference at least within the project case. It is also probable that this data set was too small to capture observations and perhaps some more questions should have been included to capture the essence of organizational culture and risk management directly. It is an area which may be investigated in more detail as a future carry forward of this study.

As stated in section 5.3 in order to add a more conclusive argument for this subject study similar case projects should be identified and data collected to have a much larger data set for more identifiable differences. Also, other influential factors for risk assessment skills should also be included in future studies to include the possibility of identifying collective impact of all factors such as professional background, lessons learnt modules, organizational culture, organizational goals which affect the risk assessment process.

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8. Appendices

Appendix A: Questionnaire Data

- Complete questionnaire Part A and B (unfilled)
- Export of Online Questionnaire results Part A and B from the survey website.

Appendix B: OCAI Data Sets and Characteristic Curves

- Data set tables Present and Future Preferred for OCAI Part A
- OCAI Characteristic Curves Present Vs Future Preferred
- Data set tables for the 3 comparison cases for Risk Management System Questionnaire Part B

Appendix C:

- OCAI Statistical Analysis for Data set from 'Present and Future Preferred' for ANOVA
- SPSS Data Input
- SPSS Statistical Analysis Test Output