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Writer: Mette Berntsen	*Mette Berntsen* .... (Writer's signature)

Faculty supervisor: Terje Aven External supervisor(s): Jan-Rune Brox

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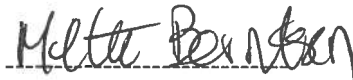| Key words: Risk management Principles Benefits	Pages: 51 + enclosure: 10 Stavanger, 15/06/2015 Date/year

Preface

This master thesis is the final work in my master degree in Risk management at the University of Stavanger.

I would like to thank my supervisor at Aibel Jan-Rune Brox for good discussions and help to complete this thesis.

Also a special thanks to my supervisor at the University of Stavanger, Professor Terje Aven for guidance, help and constructive feedback throughout the entire process.

I am very grateful for all the respondents on the survey performed. Thanks for your time!

Stavanger, June 15, 2015

Mette Berntsen

Summary

In the oil and gas industry it has become a higher focus on risk and risk management the last years. It is higher expectation from stakeholders that organizations take full account for risks. It is important for Aibel as a leading service company and serious player in the industry to keep track and control of risk at all levels in the organization. Aibel has therefore established a risk management strategy for the company.

In this thesis the objective is to discuss how to achieve good risk management. A review of the risk management in Aibel is performed along with a survey to map the employee's knowledge and experience on the subject. Gaps between the present risk management and principles from ISO 31000 are identified. The risk management strategy is also compared to the PSA requirements to see if they comply. An evaluation and classification of the risk maturity level for the organization is done. This is based on a risk maturity model. The risk maturity level measures the current level of risk culture in an organization. In this case there are 4 defined levels, naïve, novice, normalized and natural. With natural as the highest achieved level. The overall impression made in this thesis is that many of the principles for achieving good risk management are implemented. Despite of this there have been revealed weaknesses and huge potentials for improvement. The findings are discussed and there are also suggested areas of improvements for the organization on how to achieve an even more effective risk management. There have been identified several benefits for improving the present risk management along with suggestions for further work.

Abbreviations

W3	Way We Work
ALARP	As Low As Reasonably Practicable
COSO	Committee of Sponsoring Organizations of the Treadway Commission
CoCo	The Canadian Criteria of control
PIMS	Project information management system
HAZOP	Hazard and Operability studies
HAZID	Hazard Identification
QRM	Quality and Risk Management
PSA	Petroleum Safety Authority
SWOT	Strengths, Weaknesses, Opportunities, Threats

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1. Introduction

1.1 Background

In the oil and gas industry it has become a higher focus on risk and risk management the last years. For an organization today it is no longer acceptable to be in a position where unexpected events cause damage to reputation, loss in marked presence or financial losses. It is also higher expectation from stakeholders that organizations take full account for risks. With a proactive approach to risk and risk management, the organisation will be able to achieve improvements in areas like strategy, operations, compliance and tactics.

It is important for Aibel as a leading service company and serious player in the oil and gas industry to keep track, and control of risk at all levels in the organization. Until today it has been primarily focused on risk management in individual projects. The organization is missing a common risk structure. Another shortcoming is an efficient and systematic way of looking at risk transversely between projects, throughout the organization. Aibel is now in a process where the objective is to establish a new risk structure and a common overall risk process. Implementation of appropriate IT tools for risk management is also included in this work. These are elements that form the basis for good risk management. For this to be a good tool for the company, it requires development of a risk management culture at all levels in the organization. The development of such a culture must start at the top ("tone at the top") .The board and senior management is the basis for determining the core values and risk culture. Their behaviour must, in other words reflect the values that are determined and stated.

1.2 Purpose of the thesis

The overall purpose of this thesis is to:

- o Present and discuss factors on how to achieve good risk management in Aibel throughout the entire organization.
- o Identification of benefits gained from achieving good risk management.

1.3   Scope

In this thesis the risk management process in Aibel will be reviewed. The gap between present risk management and theory from ISO 31000 will be identified. To get an impression of the knowledge in risk management among the employees a survey has been carried out. The risk maturity level of four attributes has been classified. Strengths and weaknesses from findings and theory basically from ISO 31000 and literature will be discussed. The next step will be to discuss findings and identify areas of improvements. Furthermore, the benefits of the new risk strategy throughout the entire organisation will be discussed. At the end further work will be mentioned along with a conclusion.

1.4   Content of thesis

In chapter 1 background, purpose, scope, methodology and limitations will be presented. Chapter 2 contains theoretical background from ISO 31000, literature and authorities. In chapter 3 and 4 an overview of the present and new risk management in Aibel is present. A GAP analysis is presented in chapter 5. Chapter 6 explains and addresses a risk maturity model and classifies four attributers with a risk maturity level from 1 to 4. Next chapter will present the discussion of the identified the findings, area of improvements, benefits and further work. The last chapter will present the final conclusion.

1.5   Methodology

The first part will the present risk management in Aibel. The review is based on analysis of documents, processes and methods. A survey to map the knowledge and attitude towards risk among employees is performed. The survey is limited to only look at the present risk management.

A GAP analysis is performed to see if there are gaps between present risk management and theory from ISO 31000. The risk maturity level of four chosen attributers is classified by using a risk maturity model. This is based on comparing present risk management to defined criterions. The levels in the model ranges organization with no risk management implemented to organization with a well-functioning risk management. There are four levels in the model (Hopkin, 2014).

1.6   Limitations

There has been developed several different documented books, framework and literature for risk management. This thesis is limited to mainly ISO 31000 but other literature is also used. Only risk management in engineering for projects within the business unit modifications and frame agreements are a part of this thesis. Other business units like yard Haugesund, renewables or field development will not be included. Only experience and knowledge from employees working at Aibel Haugesund is used in the review of risk management.

2. Theoretical background

In this chapter relevant theory and literature, regarding risk and risk management will be defined and explained to get a proper and comprehensive understanding. Risk and risk management is important for all projects in different industries. There has been developed several different books, documented framework and literature about managing risk, like COSO and CoCo- framework. This thesis mainly focuses on ISO 31000. The reason for this is based on the fact that Aibel has used ISO 31000 as guidance and basis for their risk management strategy. ISO 31000 is not a framework or requirements. This standard provides principles and functions as a guideline. There are also requirements from PSA that needs to be fulfilled. Other literature is also used.

2.1 Risk and risk management

There is risk related to all activity managed by people. Risk and decision about risk is a part of our everyday life. This may involve decisions about risk at work or at home. The outcome of a decision may be unknown and is an element of uncertainty. The outcome will have a positive or negative impact. Take the example of owning a car. For most people this is an opportunity and positive outcome to become more mobile and available. There are also uncertainties related to owning a car, like maintenance and repair cost. A car can be involved in an accident. This is a negative outcome that can occur. There are different definitions of risk, in this thesis some of the different definitions from literature are presented.

ISO 31000: Effect of uncertainty on objectives. The effect may be positive, negative or deviate from the expected. Risk is often described by an event, a change in circumstances or a consequence.

Hopkin (2014, p 14): An event with the ability to impact (inhibit, enhance or cause doubt about) the effectiveness and efficiency of the core processes of an organization.

PSA defines risk as the consequences of the activities, with associated uncertainty. The term "consequences" is used as a collective term for all potential consequences of the activities. The term is not solely limited to the final consequences of the activities in the form of e.g. harm to or loss of human lives and health, environment and financial assets, but it also includes conditions and incidents that can result to, or lead to this type of consequences. Associated uncertainty means uncertainty related to the potential consequences of the activities. The uncertainty relates to which incidents can occur, how often they will occur and which detriment of or loss of human life and health, environment and material assets the various incidents can lead to (PSA, 2015).

Aven (2014, p 40): Defines risk as consequences of an activity and associated uncertainties, (C, U).

Definition and interpretation of risk is according to Aibel: uncertainty that, if it occurs, will affect achievement of objectives (15-07-A Risk Management).

All efforts to prevent events and undesirable incidents from taking place are managing risk. The risk management process is well established and is presented in different framework, standards and books. Risk management applies to all industries and businesses, since there is risk related to all activities managed by people. For an organization today it is no longer acceptable to be in a position where unexpected events cause damage to reputation, loss in marked presence or financial loss. In the following text the risk management process in ISO 31000 will be presented.

Figure 1 shows the process for risk management. ISO 31000 gives a more detailed description of each of the steps in the process than the text below.
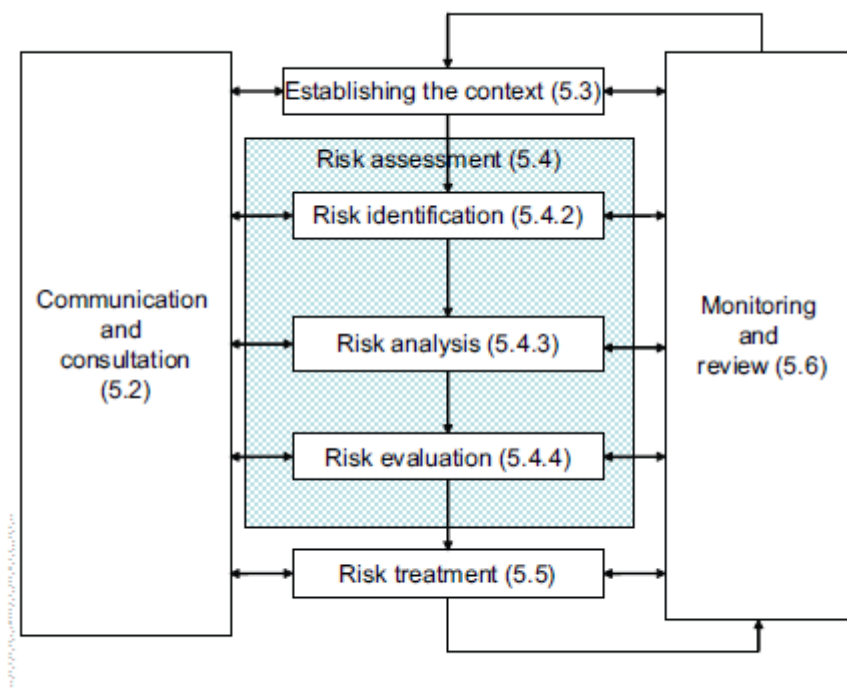
Figure 3 — Risk management process

Figure 1. Risk management process ISO 31000

Establish the context- The organization articulates its objectives and defines the external and internal context. External context can be social and cultural, political, financial and technological environment, trends and key drivers with impact on the objectives or relationship and value of external stakeholders. Internal context is anything within the organization that can influence the way to managing risk. The process should also be in alignment with the culture, structure and strategy for the company.

Risk identification- Identification of risks, impact, events and their causes and potential consequences. Risk identification tools and techniques should be used.

Risk analysis- Consideration of positive or negative consequences of the risk and the likelihood for the consequence to occur. Developing an understanding of the risk and provide an input to risk evaluation and decisions.

Risk evaluation- Based on outcome of the risk analysis risk evaluation should assist in decision making about prioritizing of risk and the treatment of them.

Risk treatment- Selecting one or more options for modifying risks. This can be avoiding, removing the source, change the likelihood or consequence (mitigate) or sharing the risks.

Communication and consultation- With stakeholders both external and internal should take place during all stages in the risk management process. To ensure that context are established appropriate and all risks are identified.

Monitoring and review- Should be a planned part of the risk management process with regular checking and monitoring.

2.2   Risk management framework

The effectiveness of the risk management framework is a key factor for success. The framework assist in managing risk effectively through the application of the risk management process at different levels in the organization. The organization needs to design a framework for managing risk. This includes understanding of the organization and its context. Establishment of a risk management policy, accountability and appropriate competence to manage risk is also a part of the framework. The process for risk management should be included in the existing management processes and establishing of both internal and external communication and reporting mechanisms. The framework needs to be monitored, reviewed and in continuous improvements. It is important that the management is committed along with strategic and rigorous planning for achievement of commitment in the entire organization. (ISO 31000).

2.3   Important factors for effective risk management

ISO 31000 mentions other principles for risk management to be effective; these should comply at all levels in the organization. The principles are listed below.

- o Risk management creates and protects value
    - o Achievement of objectives and improvement of performance in regularity compliance, security, human health and safety etc.
- o Risk management is an integral part of all organizations processes
    - o Responsibility of management, including strategic planning , project and change processes
    - o Not a stand-alone activity from the organization's main activities and processes.
- o Risk management is part of the decision making
    - o Contribute in prioritize actions; assist in making informed choices when decision is made and separate between solving actions.
- o Risk management explicitly addresses uncertainty
    - o Is taking uncertainties into account
- o Risk management is systematic, structured and timely
    - o Strengthens the efficiency and makes the results reliable, consistent and comparable
- o Risk management is based on the best available information
    - o Like experience, historical data, stakeholders, observations etc.
- o Risk management is tailored
    - o In accordance with the context of the organization, both internal and external
- o Risk management takes human and culture factors into account
    - o Both internal and external people's capabilities, perceptions and intentions that can hinder or facilitate achievement of the objectives of the organization is recognizes.
- o Risk management is transparent and inclusive
    - o Involvement of stakeholders
    - o Relevant and up- to- date
- o Risk management is dynamic, iterative and responsive to change
    - o Monitoring and review of risks
    - o Response to change
- o Risk management facilitates continual improvement of the organization
    - o Improvements of risk management maturity strategies should be developed

2.4   Benefit of risk management

Hopkin (2014, p 4) is giving a summary in his book of the key benefits of risk management. The book summarizes the benefits with the acronym MADE2, which stands for mandatory, assurance, decision making, effectiveness and efficient core processes.

Mandatory- ensure that risk management activities comply with both legal and regulatory obligations but also client requirements.

Assurance- make sure significant risks have been identified and appropriate control is in place.

Decision making- the organization should undertake risk management activities that provide additional structured information to assist with decision making, to enhance effectiveness and efficiency of operations.

Efficient core processes- the organization should ensure that the business processes and strategy are efficient. Analysis of the core processes and activities strategic, tactics, operational and compliance provides a comprehensive approach to risk management.

It is also important to have a clear set of benefits of the risk management to achieve success. If no benefits are identified it will not be easy to evaluate to what extent risk management is a success.

2.5   Risk culture

For risk management to be efficient a good risk culture at all levels in the organization is needed. Culture of an organization is not easy to define. A culture determines how individuals behave, feel obligated, commitment, awareness and attitudes towards in this case risk. Hopkin(2014, p 110) describes five factors for how risk- aware culture is achieved by what he shortens to LILAC.

Leadership- strong leadership within the organization in relation to strategy, projects and operations.

Involvement- of all stakeholders in all stages of the risk management process

Learning- training in risk management procedures and processes. Experience and lesson learned from events.

Accountability- absence of an automatic blame culture, but appropriate accountability for actions.

Communications- communication and openness on all risk management issues and lesson learned.

Risk management is only effective if the organization is risk-aware. This will require that each and one from management and down have knowledge, focus, commitment and good attitude against risk and risk management.

2.6 Petroleum safety Authority (PSA) requirements

The Norwegian government sets terms and requirements for risk management in the petroleum industry. Petroleum Safety Authority has since 2004 been an independent regulator with directorate functions. Before this it was a part of the Norwegian Petroleum Directorate. PSA is responsible for setting the terms for technical and operational safety in the industry. Their responsibility is also to follow up from initial planning of projects, through all phases like design, construction, operation and removal. PSA supplies information and advice the industry with the intention to continuously improve HSE (PTIL, 2015). One of the most important jobs for PSA is to verify and check that the companies are working on ways to manage risk. (Notes "Anvendt risikoanalyse-offshore").

To manage risk it is a premise to know the risks and to recognize that they exist but it is also necessary to have an understanding of them. According to PSA regulations each organization must analysis their own activities and identify the risks, consequences and take actions to handle them. Actions to handle risk shall be proportionate to the activities and the business (PTIL, 2015). The PSA regulations set goals for the industry, but also gives the industry freedom in how these goals are met. The regulations are based on principles of risk management. The two regulations from PSA that is relevant in risk management are The Management Regulations and The Framework HSE Regulations. The main features in the regulations are:

- o Regulations based on performance (functional) requirements
  - o Gives the industry the freedom to choose good solutions
  - o Placing responsibility on the operators
  - o References to norms and industry standards provide predictability for users, and indicate the expected standard of the solutions
  - o Deviations from standards: Required to be able to document at least as high safety level
- o Requirement that the companies establish risk targets and manage their activities in relation to these
- o Obviously there are challenges to using functional regulations, but outside of scope for today's talk(Notes "Anvendt risikoanalyse-offshore")

3. Review of present risk management in Aibel

This chapter gives an introduction of how risk management is carried out in Aibel. Until today it has been primarily focused on risk management in individual projects. The organization is missing a common risk structure. Another shortcoming is an efficient and systematic way of looking at risk transversely between projects, throughout the organization. Aibel is missing a risk management policy.

3.1 Risk management process

The process for risk management in Aibel is described in the flow diagram 15-07-A Risk Management. This flow diagram is implemented in the management system W3 (Way We Work). The main objectives for the management system is to create a unified, consistent and ensuring common work methods and standardised deliveries regardless of country, location or project. In addition, W3 also describes the company's values, HSE responsibilities, ethics, compliance, quality in execution and management philosophy. It also outlining the expectations set for the company as a whole, as well as those set for its employees and leaders (00-A Management System). Figure 2 shows the processes for risk management.
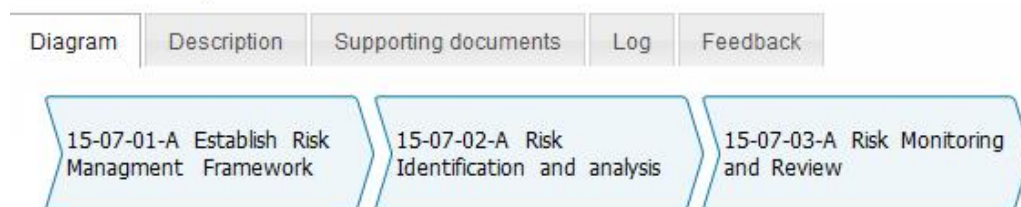
Figure 2: Risk management process in Aibel

15-07-01-A Establish risk management framework- In this step project management team needs to establish risk context. Both internal and external requirements for the project need to be identified. A risk database is needed either from tender or a new one will be made. Adjusting of risk database and risk matrix for project shall be performed. The team shall conduct different meetings like risk management kick off meeting and a risk brain storming meeting. Result of these meetings will be updated in the risk database. A risk management training plan shall also be established to see that the team members are known with the risk database and have focus on risk. These activities make the basis for the risk framework.
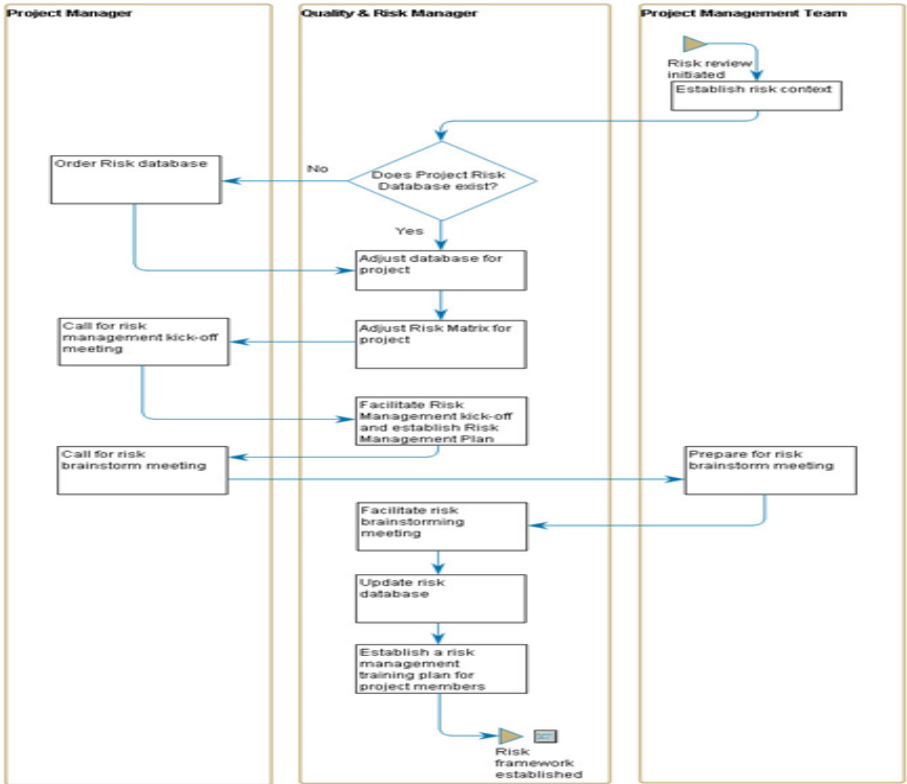
Figure 3: Flow diagram showing the process establish risk management framework

15-07-02-A Risk identification and analysis- Identifying of risk will be done in cooperation with project team, management and QRM resource. After identification the risks will be discussed, evaluated and risk reducing measures are proposed. Risk analysis is performed based on well-known techniques like ALARP. Based on this the risk register will be updated.
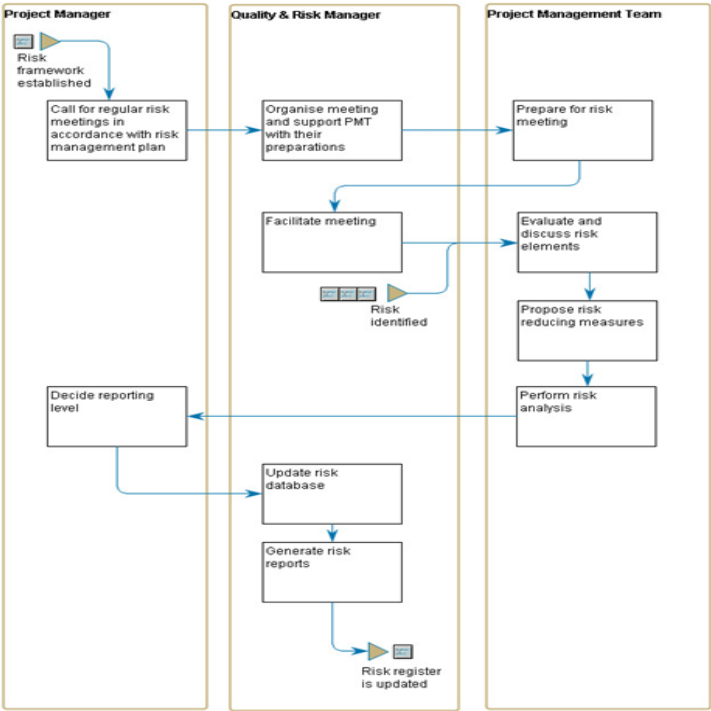
Figure 4: Flow diagram showing the process risk identification and analysis

15-07-03-A Risk monitoring and review- The last step in the risk management process is follow up risks. The risk register is used as a tool for decision support and discussions. At the end of the project lessons learned and experience transfer from the project shall be documented for future projects and should be a part of Aibel's lesson learned database.
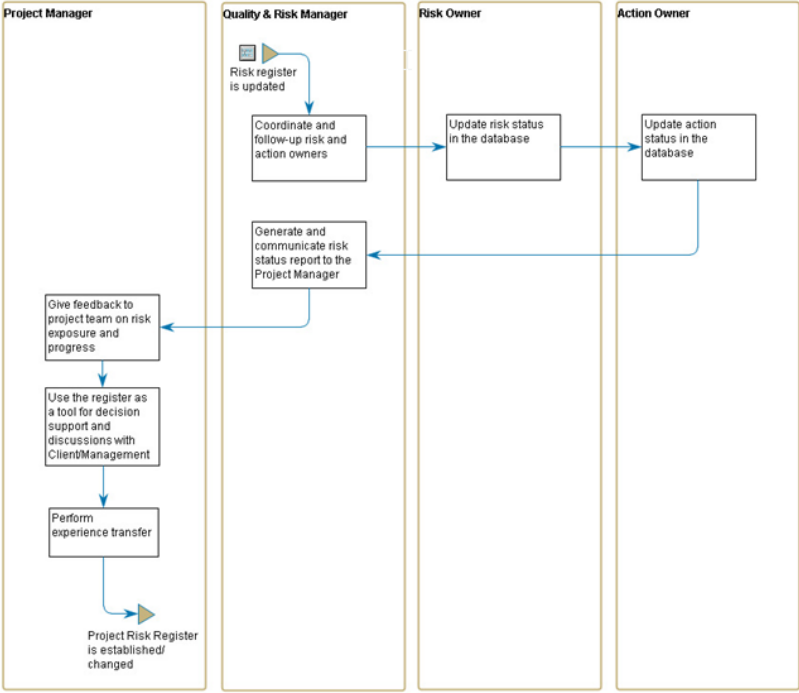
Figure 5: Flow diagram showing the process risk monitoring and review

Quality in Execution

Aibel also have developed a cooperation ability to ensure that there are seamless interfaces between the various disciplines. Quality in execution will contribute to achievement of this. This is a model that describes how the company will plan, execute and evaluate work activities. This model is also a description of how Aibel as a leading oil and service company must perform at the best and always deliver a high level of quality.

This five-step model is to be used in every delivery, ranging from minor tasks to major projects, in order to improve performance.

Figure 6: Aibel's Quality in Execution model

3.2 Risk management tools

For risk management tools the Lotus Notes Risk Database or Project Information Management System, PIMS are used depending on the project. Lotus Notes Risk Database has been used for internal risks and PIMS has been used for external risk since most of the clients use this as risk management tool. Bigger modifications/projects usually use both the systems and smaller modifications within the frame agreement with Statoil mainly use PIMS.

3.2.1 Lotus Notes Risk Database

Input to the database is formulation and description of the risk. Consequence, risk handling through actions, and date for closing the risk is also added. Figure 7 is showing the risk registration window. When the risk is registered in the database, it will be discussed in a risk meeting where the risk severity will be agreed. Probability and consequence score will be in accordance with the project risk matrix,see figure 8. After this the risk gets a number and a person will be responsible to handle, mitigate, follow up, and close the risk. If the risk has consequences beyond the project the risk shall be marked as critical item.

Figure 7: Lotus Notes Risk database registration of risk

Aibel Business Risk Analysis Matrix

Severity	Description	Description	HSE	Performance impact	Reputation	Cost	Probability				
							9-10 Very Likely	7-8 Likely	5-6 Medium	3-4 Unlikely	1-2 Very Unlikely
	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	(red)	(red)	(red)	(yellow)	(yellow)
	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	(red)	**1** (red)	(yellow)	(yellow)	(green)
	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	(red)	(yellow)	**2** (yellow)	(green)	(green)
	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	(yellow)	(yellow)	(green)	**3** (green)	(green)
	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	(yellow)	(green)	(green)	(green)	(green)

Risk Ranking Code (RRC) and defined acceptance criteria

RRC 1 (red)	Risks related to personal injury shall not proceed
RRC 2 (yellow)	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 (green)	Acceptable risk level, but a review should be performed to see if risk could be reduced further

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."

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	Occurance 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%

Figure 8: Risk Matrix

3.2.2 PIMS Risk management

In PIMS the input is a description of the risk, title, risk owner and type of risk (operational, project, stakeholder, interface). The probability and the consequences are estimated based on the risk matrix. Actions are identified with a responsible person and deadline. In figure 9 PIMS risk registration window is shown.

Figure 9: PIMS registration of risk

The most critical risk that can harm the company should be lifted and followed up at a higher level in the organization.

3.3   Risk management in projects

Today risk management in Aibel is project based. Depending on type of project, different risk management tools are used. Each project gets assigned a quality & risk resource. This person along with the project manager and project management team has divided responsibility for the different activities in the risk management processes. They will follow up the risk register and are responsible for the different type of risk identification meetings. It will be both internal and external people working in the project responsible for the follow- up and closing of risk. There are regular meetings for following up risk. Critical risks that can harm the company will be lifted to a higher level.

There are several e- learning courses in Aibel. Only two of these involve risk management. It has not been identified other training on this topic. The e-learning courses available are quality in execution

and risk management processes in project control. The first course has duration of 30min and is mandatory for all employees. The second course has duration of 15 min and is only mandatory for project managers and QRM manager. This course is open for everyone to perform. Since there has not been identified other training this seems to have lack of focus. This leaves the responsibility on the projects to ensure risk is handled according to company requirements. It also involves making sure the project team are familiar with processes, tools and methods. The focus and awareness towards risk, within the project management will reflect on the entire team. This will result in variation in knowledge and experience among the employees.

The review is showing that there is missing a common understanding and way to handle risk. The processes in W3 are missing descriptions and it appears unfinished in layout and definitions. The risk management process is project based and provides little relation and ownership towards risk. There is no risk management policy in Aibel. There is lack of information about risk management, in both W3 and the internal website. The available information is not easy to find. This sends a signal that risk management is not prioritized. The management is the basis for determine the core values and risk awareness by having a proper, strategy, policy, framework, processes and tools for risk management. They also have a responsibility to make sure the rest of the organization has focus on risk management and gets proper training.

3.4   Survey: Review of present risk management in Aibel

A survey is quantitative method to gather information. For this type of method it is important that the survey has a defined clear purpose. To get an overview of present situation of the risk management process in Aibel a survey has been performed. This method was chosen to get an impression of how attitude towards risk and knowledge among the employees are. It will also show if the tools and process are working. It was desired to get large part of the organization thoughts about risk management not just the dedicated risk resources. Risk is the responsibility for anyone who works in a project, and is not limited to one or two persons. This survey will also back up or disprove findings from the review.

The survey was sent to 128 employees working in Aibel Haugesund engineering. The group chosen had a good mix of managers, engineers and other personnel and from different projects to get the most reliable and complementary answers. The survey included 14 questions and was made short, precise and consistent to get as many as possible to take the time to answer. The respond time was 4 weeks. Questback was chosen for the survey and collecting of data. This is an online survey used in Aibel. The survey as a whole can be seen in appendix 1.

3.4.1 Presentation of the answers from the survey

47 persons answered the survey. Despite a respondent's percent of 37%, the answers were quite concurring and unambiguous. Not all questions were responded to by all participants. Of the respondents 23.4% were managers, 42.6% discipline responsible engineers, 36,2% engineers and 2.1% others roles. Many of those who responded had been working in more than one type of project, the distinction between the various projects and experience/knowledge was evaluated to negligible. However there were huge difference in experience and knowledge between managers and discipline responsible engineers/engineers/others. Discipline responsible engineers had in many cases more knowledge and experience than engineers/other roles. The managers responded more complementary and they were the employees with most training. They also had been participating in more risk handling activities than the rest of the responders. Most of the respondents have been participating in workshops or reviews related to risk, the most mentioned methods were HAZOP, HAZID, ALARP, risk identification meeting, and risk café. Many of the answers about risk handling in projects was the same methods as just mentioned, some also mentioned weekly/monthly reports, meetings and risk handled according to the process in W3.

82.6% responded that they knew where to find the process for risk management in W3, however only 43.6% responded that they had completely or partly used the process. This means that over 50% of the respondents only know where to find the process but have never used it.

Training of personnel in risk management is according to most of the answers almost absent. A few managers mentions training in PIMS or Lotus Notes risk database, training sessions, quality in execution sessions and management in project. 70,2% answered that they have performed the e-learning courses.

68.9% knew where to find information about risk management in Aibel's systems. Furthermore, 25.5% of the respondents were familiar with both PIMS and Lotus Notes Risk Database, 4.3% only PIMS and 51.1% only Lotus Notes Risk Database and 19.1% none of them. The most unexpected answer was that so few were familiar with PIMS.

Almost all of the respondents states that they have high focus on risk in the daily work. The impression of risk management focus from the management in Aibel varies. Respondent's opinions were no focus, high focus, not sure and could be more proactive management. No one was familiar with how risks are handled on a higher level except a few managers.

There were many suggestions for improvements to achieve good risk culture and better handling of risks. Most of the respondents answering this question mentioned more training, some other

suggestions were: only one risk database, more multidiscipline risk focus, experience transfer between projects, more focus towards 3.part (suppliers) and external risks towards costumer, higher focus on positive risks, focus on handling/reducing of risks, similar work methods in different projects, more active use of the company's website inside and more focus from the top management. A graphic presentation of some answers can be seen in appendix 2.

4. Aibel's improved risk management strategy throughout the entire organization

Aibel is now in a process where the objective is to establish a new risk structure, and a common overall risk process. Implementation of appropriate IT tools for risk management is also included in this work. For risk management to be a good tool, it requires development of a risk management culture at all levels in the organization. The development of such a culture must start at the top ("tone at the top"). The board and senior management is the basis for determining the core values and risk culture. Their behaviour must, in other words reflect the values that are determined and stated. This chapter will address the new strategy, processes and tools for risk management in Aibel. The review is based on information and discussions with internal supervisor Jan-Rune Brox.

When it comes to risk management it is important to have a holistic view. Figure 10 shows that risk management shall cover all major objectives and include all types of risks. This includes risk related to assets, stakeholders, suppliers, project but also objectives, strategy, goals, audit and verification.
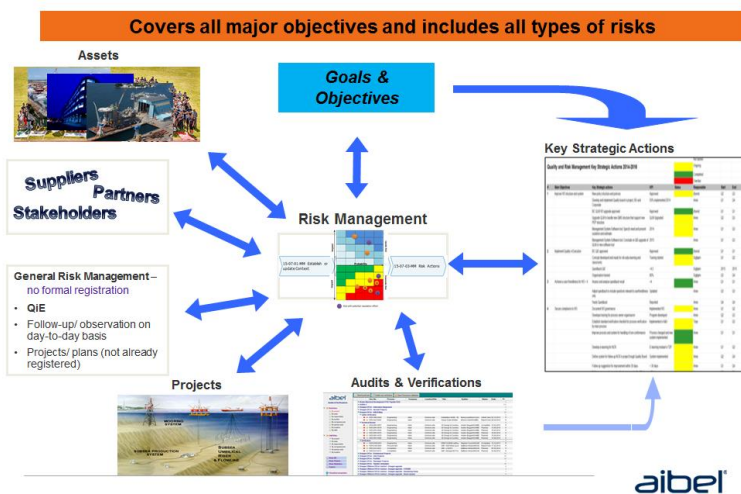
Figure 10: Holistic view of risk management

4.1   Risk management strategy

In the new risk management process, Aibel has defined a risk management policy statement. The new policy is described in15-PO-CM-01-A Risk Management Policy and is as followed: Aibel is committed to risk management as an integral part of its corporate governance and operations. The policy is now suitable for corporate level and the entire organization and not just project based as today. There is now focus on operational and strategic goals. Focus is also on how to increase the

probability for achieving the goals and how to reduce the risk of non-achievement. The top 10 most critical risks are presented to the board members monthly. The identification and management of risk is central to delivering on Aibel's objectives. By understanding and managing risk Aibel provides greater certainty and confidence owners, employees, customers and suppliers, and for the communities in which they operate. The effective management of risk is vital to the continued growth and success of the company.

Figure 11 shows risk management in practice. The policy provides the rules and guidelines for the implementation of risk management; specifying the scope of work / mandate of the risk management process. This involves defining risk management units / areas and rules for the aggregation of risk, specification of risk exposure (unit, area, enterprise level), providing of rules for reporting / communication of risk factors and specification of reporting frequency and reporting format (immediately, month, quarterly, etc.). It also describes the techniques to be used for risk assessment.

Figure 11: Risk management in practice

In the work of making a common overall risk process and establishing of a good risk culture in Aibel the company have clearly defined requirements and goals for how the process should be and work. These requirements and goals are listed below.

- All risk management processes and activities shall be performed according to requirements described in the Aibel Corporate Risk Management process
- Risks shall be identified and analysed, both upside and downside impact and consequence taken into account
- Risk shall be managed and treated in a systematic way, followed up and evaluated on a regular basis
- Risks shall be identified and communicated as early as possible

- Risk will be evaluated in terms of the impact on the following areas: people, HSE, assets, financial/business objectives, operations, quality and reputation
- Risk management shall be a part of all strategy and planning activities
- Risk ownership should be placed where the benefit or threat is the greatest
- Risks are to be evaluated towards defined tolerance/criticality limits
- Treat risk to a level As High/Low as Reasonably Practicable (AHLARP) - Cost/Benefit

It has also been defined roles and responsibility in general, for quality in execution and corporate processes in addition the audit and verification activities and communication of risk is described.

Roles and Responsibilities

It is the responsibility of all Board members, managers, staff, employees and temporary employees to identify, analyse, evaluate, respond, monitor and communicate risks associated with any activity, function or process within their relevant scope of responsibility and authority.

Risk Management in Quality in Execution

Risk management is a vital part of Quality in Execution. Managers at all levels are responsible for ensuring that risk management is an integrated part of all task and activities within their responsibility and scope of work.

Risk Management in Corporate Processes

If need for specific requirements within corporate processes, process owner may incorporate such requirements. Any such requirement must comply with the Aibel corporate risk management process.

Risk Management and audit/verification activities

The risk registers and risk assessments shall be a part of the identification and prioritisation of activities related to auditing and verification.

Communication of Risk

Risk maps shall be updated and presented regularly, at least at the following organisational levels:

- Board of Directors
- Corporate management
- Business Unit Management
- Project Management
- Staff units and process owners provide input on risk factors to owners of risk, or keep own risk registers with reference to business risks
- Risk factors should be managed at the lowest possible level in the organization, so that the risk management process is as efficient as possible

- Any risk relevant for a larger part of the organization or that may have impact on business objectives, are to be reported to higher organisational level for information and/or decision on risk treatment
- All employees are responsible for effectively managing risks in their area of responsibility and identifying and advising their manager of potential risks

4.2   Risk management process

The process for risk management has been update to comply with the new strategy. The process has been modified based on ISO 31000. Figure 12 shows the new risk management process. In ISO 31000 the process have five steps. Aibel has modified this into 3 steps by merging four of the steps into two. This process will be replacing the processes that are available in W3 today, ref figure 6.

15-A-01-A Establish/Update Context → 15-A-02-A Risk Assessment → 15-A-03-A Risk Control
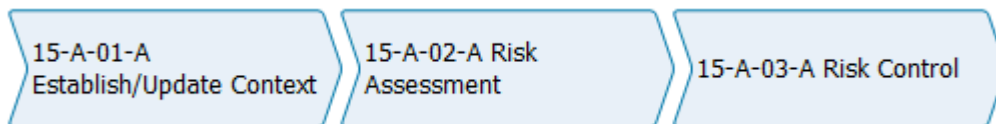
Figure 12: The new risk management process in Aibel

The new process has more focus on risk ownership and the upsides to risk than the old process. To have upside and positive focus the final step is named risk control and not risk treatment as ISO 31000. The word treatment is for many a negative charged word so the management selected a more positive approach. It is as important to find the upsides as well as the downsides to risk. The process is made more general and easier. It is now more suitable for all type of projects. If there are project specifics in terms of risk the projects needs to address this and it will be added for the project. There will be made guidelines for each of the steps in the process. These guidelines will be less text, more precise and easy to read. The few guidelines available today are loaded with text and not easy read.

15-A-01-A Establish/update context- In this step the main activities are to identify and understand internal and external context, identify the scope, goals and objectives and how to document context. Also the identification of criteria, scales and criticality levels is done in this first step in the risk management process.
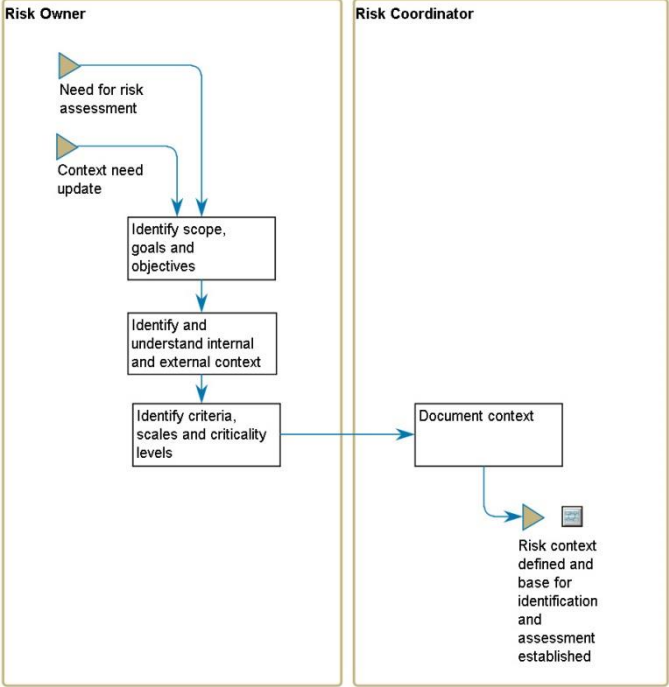
Figure 13: New flow diagram showing the process establish/update context

15-A-02-A Risk assessment- Identify risks with the use of different methods like brainstorming, SWOT, surveys, interviews, workshops, documented knowledge, risk lists, lessons learned etc. Analyse risks and identify object, activity or surroundings which may cause risk and any effect. Analyse and evaluation of upside and downside of each of the identified risks. A top 10 risk list will be ranked and established. Critical risks are reported to higher level.
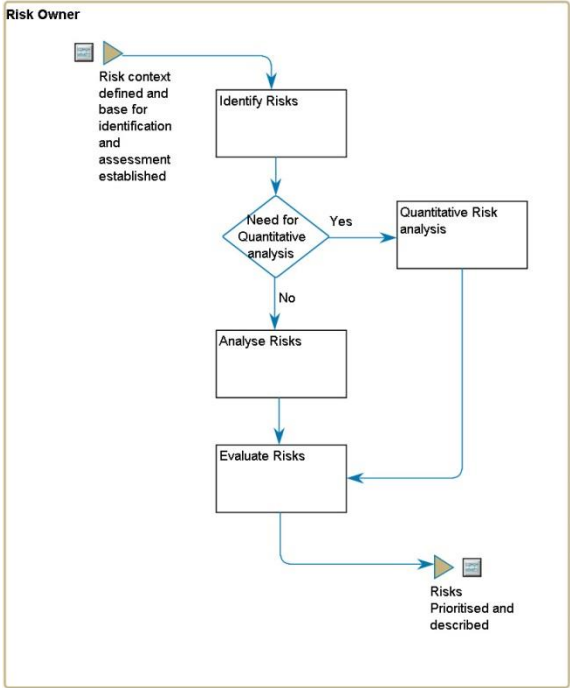
Figure 14: New flow diagram showing the process risk assessment

15-A-03-A Risk control- Identify possible actions and evaluate cost vs. benefit if relevant. For downside risk will be handled by treat, share, avoid/eliminate, substitute, accept or monitor. For upside risk will be handled by enhance, pursue, capture and seek. The next step is to prioritise and decide actions and to create an action plan. The actions will be followed up and risks monitored and reported. The final step is to implement actions according to plan.
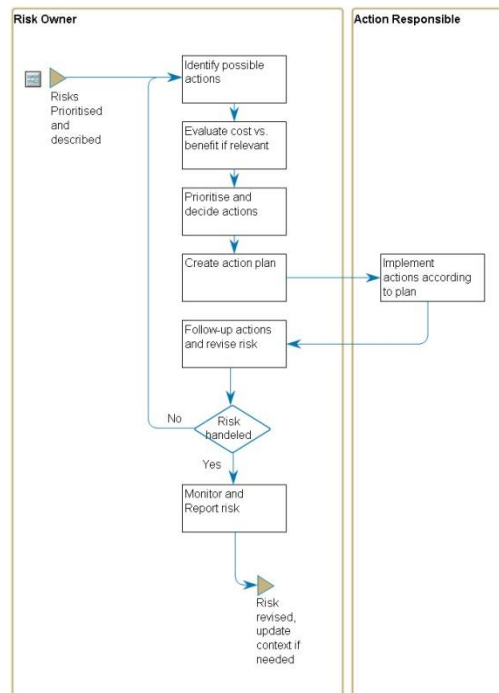
Figure 15: New flow diagram showing the process risk control

Communication- Is described in chapter 4.1

Monitoring and review- This will now be based on risk. Each risk will be followed up in meetings. The risks will be discussed and they may change from time to time and go from a critical level to a non-critical and vice versa. The risks will be followed up until the risk is closed and solved. This assessment will be performed in both projects and at higher level in the organisation, here will the most critical risks be reviewed. The projects will take care of the risks that is on lower levels and that can be closed within the project organization. The risks will be reviewed quarterly at the highest levels in the organization (board of directors, corporate management and business unit management) and monthly in projects.

4.3   Risk management tools

Only PIMS will be used as risk management tool. The reason for this is because only one tool is to prefer. An argument for choosing PIMS was that according to management many of the employees in Aibel are familiar with this tool. It will be necessary to register risks in both client and Aibel's PIMS risk base depending on either the risk is external or internal. Per today it is not possible with any transfer between PIMS in Aibel and PIMS used by client. It will be looked at if it is possible to get some kind of transfer so that input is only necessary in Aibel's PIMS risk base in the future. PIMS is described in chapter 3.2.2.

5. GAP analysis

In this chapter the result of the GAP analysis will be presented. The GAP analysis will look at the gap between present risk management and on theory from ISO 31000. This is due to the fact that Aibel's new risk management strategy is based on principles from this standard. Figure 15 show the purpose of a Gap analysis.
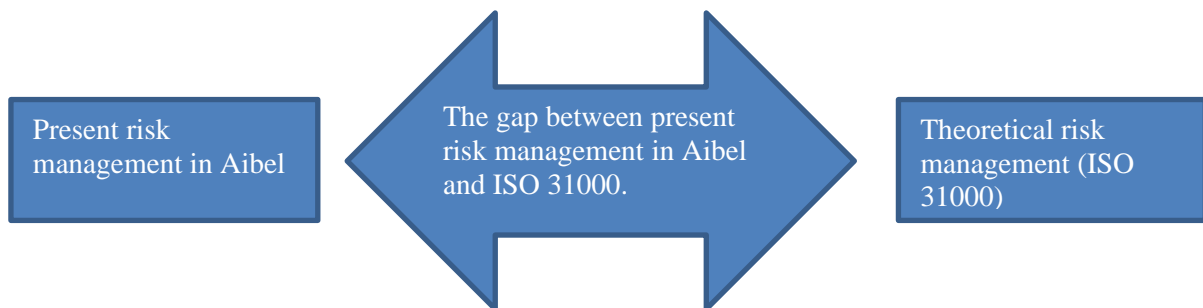
Figure 16: Purpose of a GAP analysis

5.1   The GAP analysis of risk management in Aibel and ISO 31000

A GAP analysis identifies the gap between the present risk management and theory. This way the organization is able to find constructive measures to close the gaps, if there are any identified. The analysis is based on theory from ISO 31000, the survey performed and review and checking/verification of documents, processes and systems. The gap analysis only verifies if the systems, process and documentation are in place not how appropriate they are. This gap analysis take bases in theory explained in chapter 3 and has a simple and easy appearance. The total analysis can be seen in appendix 3.

5.2   Results from the Gap analysis

The GAP analysis is showing that Aibel already has implemented many of the principles and tools recommended in ISO 31000, however the analysis revealed weaknesses and absents in present risk management. These are listed below:

- o Risk management needs to create value and protect them in the entire organization and not just in projects like today.
- o Risk management needs to be structured, systematic and timely.
- o The organization needs a risk profile for the entire company.
- o Commitment towards risk management at all levels in the organization is missing.

o   Establishment of a risk management policy.

When performing this analysis it showed the same as observed, Aibel is missing an overall corporate risk management. This analysis is not saying anything about whether the already implemented process and tools for risk management are functioning or being used.

 The total GAP analysis can be seen in Appendix 3.

6. Risk maturity model

In this chapter the risk maturity level in Aibel will be classified. The risk maturity model and the system for determining the level of the maturity in the organization will be presented. Own experience, review of documents, processes and the survey will be compared to the model. There are four attributers defined and the level for these will be determined.

6.1   Presentation of the risk maturity model

A risk maturity model can be used to measure the current level of risk culture in an organization. This is a measure of the quality of the risk management activities to witch extent they are embedded within the organization. Risk management activities are more embedded in the organization with a greater level of risk maturity (Hopkin 2014, p.114-115).

The model has a system for determining the level of risk maturity within an organization. This system has four levels of risk maturity, described as 4Ns, naïve, novice, normalized and natural. Each of the levels is described in figure 17(Hopkin 2014, p.116).

Level 1: Naive
Organizations are unaware of the need for the management of risk or do
not recognize the value of structured approaches to dealing with uncertainty.
Management processes are repetitive or reactive, with insufficient attempt to learn
from the past or to prepare for future threats or uncertainties.

Level 2: Novice
Organizations are aware of the potential benefits of managing risk, but have not
implemented risk processes effectively and are not gaining the full benefits. The
organization is either experimenting with the application of risk management or is in
operating a risk management process that has a fundamental weakness.

Level 3: Normalized
Organizations have built the management of risk into routine business processes and
implement risk management throughout the organization. Generic risk management
processes are formalized and the benefits are understood at all levels of the
organization, although they may not be consistently achieved.

Level 4: Natural
Organizations have a risk-aware culture with a proactive approach to risk
management in all activities. As a result, the consideration of risk is inherent to
routine processes. Risk information is actively used and communicated to improved
processes and gain competitive advantage.

Figure 17: Four levels of risk maturity

6.2 Comparing the present risk management with the risk maturity model and classification of levels

The four attributers that will be evaluated to determine the risk maturity level in the organization are leadership & organization, processes, experience & learning and tools. Each of the attributers will be classified to a risk maturity level from 1-4 ref figure 17.

Figure 18: Attributers to measure the risk maturity level

6.2.1 Leadership & organization

Aibel is missing a risk structure and a systematic way of looking at risk transversely between projects throughout the organization. This is one element that forms the basis for good risk management. This attribute has aim to see if the risk management has a clear strategy from corporate level and down. As well as to see if the management has focus on risk. To develop a risk-awareness culture this must start at the top in the organization. In the survey this was reflected in the suggestions for improvements that many of the respondents feels that management should have higher focus on risk and the way risk is handled. The survey also revealed that few of the people working in Aibel are familiar with how risk is treated except within the project they are working in. From the review it shows that it is insufficient information about the strategy and the objectives of risk management. This applies for both W3 and the internal website. There is also lack of information and the available information is not easy to find. The organization is missing a risk management strategy.

The maturity level for this attribute is classifed to level 2. The organization is aware of the potential risk benefit, but the risk management has fundamental weaknesses. The organization is not gaining the full benefits. There is no risk management policy which sets the frames and foundations for risk management.

6.2.2 Processes

The purpose of the attribute is to identify if Aibel has an implemented process for risk management and how this is used. The process for risk management is implemented in W3. The survey reflects that most personnel know where to find it. It also reflects that only about 40% of them have completely or partly used this. The responsibility for risks being intercept and identified lies on everyone in the project team, from discipline level to project management. So people should have knowledge about the process. The review of W3 and the guidelines seems to be missing a common understanding. The processes in W3 are missing descriptions and it appears unfinished in layout and definitions. The risk management process is project based and provides little relation and ownership towards risk. Each project is handling and has focus on risk even though it may not be performed in the same way and according to the same methods.

The level for this attribute is partly level 2 and 3. The processes are being used and each project is handling risk. The benefits are understood. But the largest error is that this risk management is not implemented throughout the entire organization, based on this level 2 is suggested for this attributer.

6.2.3 Experience & training

This attribute has a purpose to identify the level of experience of the personnel working in projects and the training they have got in risk management. It is important for an organization that the entire project team has good risk understanding and awareness. This can be achieved by training. The survey reflected that managers are more experience and have received more training than any of the other groups. Most of the respondents have been attending in risk identification activities. The impression from the survey is that employees have high focus on risk and is trying to be aware in their daily work. It appears that experience and knowledge vary. The company needs to have a risk process and frames to achieve a good risk culture throughout the entire organization. Generally there is lack of training in risk management in Aibel this was also one of the suggestions for improvements in the survey. Today there are two e-learning courses available, almost 70% of the respondents on the survey had performed this. Based on this todays level of training are interpreted as not sufficient.

The organization has dedicated workers and many of them with good experience and knowledge in risk management. Despite that the level in experience varies among the people working in the projects. Some of the respondents have little or no relations to risk at all. The majority from the survey responds that there is lack of training. And this is also the observations from the review. Based on this the level is set to level 2

6.2.4 Tools

The objective of this attribute is to determine if the tools for risk management are being used and if the personnel are familiar and knows how to use them. The review has identified two different systems for registering and follow- up risks, PIMS and Lotus Note Risk Database. The survey reflects that , most had experience in only Lotus Notes and a few in only PIMS, over 20% where familiar with both and as many as 20% none of them. It is the QRM resource that is responsible to maintain this database but the risks are almost exclusively closed by others. Especially in the beginning of a project there are many risks. It is important that each discipline is familiar with the risk database so they can register risk as they are identified. After registration they can be handled in the right matter. The methods and models for risk identification used are well-known and accepted. According to the survey many of these methods are used in all of the projects. Many of the methods are described in W3.

There is no consistent risk management tool, two systems are used and the experience and knowledge vary among the employees. This is clearly a weakness and is showing that the systems are not fully implemented. The level of suggestion for this attribute is level 2.

The maturity level for the organization is classified to level 2. The classification of maturity levels for the four chosen attributers is reflecting that the risk management in Aibel has potential to improve. This is also in accordance with observations from the review, the survey and the gap analysis.

7. Discussion

In this chapter findings and observations about risk management in Aibel will be discussed. Factors on how to achieve good risk management, benefits, area of improvements and further work will also be presented.

In this thesis several methods have been used to get an overview of the risk management in Aibel. In addition a review of processes and documents has been done. Theory and principles for risk management and authority regulations will be discussed in this chapter as well.

Findings show that Aibel has a system for risk managing. In the organization there are established processes and tools for risk management based on principles and theory. The overall impression about risk management in Aibel is that is has several shortcomings and a huge potential for improvement.

7.1 Findings and area of improvements

Here findings within different areas of risk management will be discussed, as well as suggestions for improvements to achieve a more effective and sufficient risk management. These suggestions can also be seen as success factors for achieving good risk management. Improvements are based on the review of the risk management in Aibel.

7.1.1 Training

Training and education of employees are one of the most obvious key factors for success. Without training how will the employees gain knowledge, experience and be able to handle risk as required? To achieve this, there is a need for a good system within the entire organization on how to educate and increase the knowledge. With proper training the employees can work on handle risk according to regulations and principles. It will contribute positively, increase the focus and attitude towards risk if people have knowledge about the entire risk management process. The review has showed that the training in risk management is poor and it seems that this has not got a high enough focus from top management. Only two e-learning courses have been identified as training. According to the survey a few employees have conducted other forms for training. No other training was identified in the review. More training was also suggested as improvements among every responded in the survey. Risk maturity level for this attributer was classified to level 2. This factor is quite concrete to improve and will be easy to measure. Aibel has a huge potential for improvements within training in risk management.

7.1.2 Experience transfer/lessons learned

Both good and bad experience from each project should be collected in a database. This should be available information for everyone in the organization. The experience should be presented to the entire project team inn all projects. Risk is something that concerns all project members. Lessons learned can be valuable for saving both time and money in a project. This will make sure that there is less chance of repeating mistakes. The same goes for things that work, there will then be a greater chance for this to be a success in the next project. Systems for handling lessons learned have not been a part of this thesis, but the writer has not during her time in the company been familiar with such system. The company should focus on reusing good and bad experience within risk management from one project to another.

7.1.3 Leadership & organization

Risk management needs to start at the top in the organization for it to be efficient. The management needs to set a good example and their behaviour must reflect the values that are determined and stated. The review has showed that the management has not been able to implement risk management in the entire organization. The organization is also missing a risk management strategy and an overall common risk management structure. It is necessary to have an efficient and systematic way of looking at risk transversely between projects to be able to succeed in managing risk. The impression of the focus on risk at management level in the company varies among the employees. Some have the opinion that there is high focus but almost as many have the impression of insufficient attention to this topic. The risk maturity level is classified to level 2 for the organization which underpins findings discussed above. The management need to be proactive and show that risk is on their agenda every day. This involves update and improving the already implemented processes and tools for risk management and make sure it fits the entire organization. Let's not forget that it is important to make sure that the implementation of the new risk management reaches everyone. The management shall also show that they are seeking to improve at all times. Risk management should also be a part of all strategy and planning activities and more focus on upside risk. There is a need for a strategy and defined goals.

7.1.4 Communication

Communication and information is an important factor for success. The more enlighten and aware people are the more focus risk will get. The company's internal website is a great platform for publish and communicate information, but also to educate employees. This website reaches all the employees every day. There is lack of information about risk management on the internal website and other

platforms. Particularly important information can be communicated by email to all employees, information meetings or in training sessions to mention some other communication platforms. Communication and a proper platform for this are also mentioned as an important factor in the book Aven (2014, p177): Risk communication can be seriously hampered if the risk assessment and management lack a proper platform. More active communication will help the awareness of people and put risk on the agenda. The fact that the organization is now reversing the risk management strategy is stating the fact that the process, tools and way of working today is not sufficient enough. The organization also needs to have more focus on risk at all levels, not just in the projects. The review has showed that there is potential for improvement in communication and information.

7.1.5 Continuous improvement

When it comes to risk it is important to not lose focus or think that this is a good as it can get. This topic needs high focus at all times. It is important to always try to get better; therefor constantly improvements will be an important factor for success. Risk management in Aibel needs to followed up and verified internal to make sure it is functions. There should be a system for measures and improvements to be intercept. This system should be available for everyone to give feedback on process, tools and methods. In W3 there is already an improvement system, where it is possible to give feedback on the processes in the management system. This system should be made more visible and make sure people have knowledge in using it. Feedback is easier to give if the employees know how to report them. There should also be a system to report suggestions for improvements on tools, methods and project specifics. A system like this should be available for everyone. This factor definitely has potential for improvements and new thinking.

7.1.6 Tools

There should only be one tool used as risk database, not two as it is today. In the new risk management (ref 4.3) only PIMS will be used. The survey emerges that many of the employees are not familiar with this tool. So it will be important to communicate this change in a good way and provide sufficient training in use of the database. Most people working in a project should have knowledge in using the risk database. Especially in the start-up phase the project identifies many risks. The action to close risks is often done on discipline level, so it is important that the team members are familiar with the tool. There may off course be a few exceptions of people in a project that don't need to have knowledge in risk management.

The methods and models for risk identification used are well-known, accepted and according to principles. The risk maturity level for tools was classified to level 2. As mentioned it is important to

have a good platform for risk assessment. More than one platform this is not seen as a proper, so is clearly potential for improvements. The training and focus will then be on one tool. The knowledge and experience in this risk database will then increase.

7.1.7   Processes

As identified as a gap in the analysis risk management needs to be systematic, structured and timely. The process for risk management has potential for improvements and needs to be suited for the entire organization. The processes are missing descriptions and it appears unfinished in layout and definitions. It is important that the risk management has a proper platform. The survey showed that many of the project members are not using the process and that the process is not well implemented. The process for risk management is one of the main principles from theory that needs to be well defined and implemented. The process is showing the entire risk management from start to end and sets the premises for how it is carried out. It covers framework, risk identification, analysis, monitoring and review for risk management. Level 2 was classified as the risk maturity level for this attributer. The risk management process is project based and provides little relation and ownership towards risk. The process will be improved in the new risk strategy (ref 4.2). It is important for the organization to ensure that the new process is better than the present one. Follow up, feedback, verifications and measures will be necessary to ensure good implementation. It will also be an advantage if the entire organization works by the same methods across projects.

7.1.8   Follow up and compliance

When implementing something new in an organization it is important to follow up the implementation and take action if needed. This applies regardless of the activity or work. Follow up is needed. The review of present risk management shows that this has not been done. It is also important that the management have focus on getting the employees to comply with risk management. There is need for a system to follow up risk management internally and to increase the focus on compliance.

7.1.9   Risk-aware culture

To get a good risk-aware culture there are many factors influencing (ref 2.5). Many of these have already been suggested as areas of improvements in this chapter. It is important to keep having high focus on risk in the entire organization to achieve a risk-aware culture. The impression from the review is that people want to contribute in managing risk but the frames, tools and processes are not adapted and good enough. There for risk management is not working as the tool it can be. In the survey almost everyone responded that they have focus on risk in their everyday work. It also reveals

that there are potential for improvements and that Aibel has not achieved a good enough risk- aware culture. The management should continue to build positive attitudes, compliance and increase knowledge. Risk management is only effective if the organization is risk-aware.

7.2 What will Aibel benefit from improving risk management

In this chapter the benefits from improving the risk management strategy will be discussed. Will Aibel gain something with improvements on the areas discussed above?

The organization will have a risk management that will comply with client requirements and at the same time ensure to fulfil principles for good risk management. Risk management will provide additional relevant information to assist in decision making. A proper system will be in place to identify risks and handling of these. It will also ensure that the business processes and strategy are efficient. The company will have a more strengthened marked position and will show that they are a serious player in the industry. This will show the clients, owners, suppliers and the community that risk is taken seriously and has a high focus. Good risk management will be an advantage and contribute to make the company more competitive when bidding on new contracts. The competition in contract winning for the service companies in the industry is fierce. Effective risk management is also vital to the continued growth and success of the company. By improving the risk management it will protect the company and its reputation. In addition it will help the company to reach their goals and make sure that other activities like strategic, operational and tactics are protected. If no benefits are identified it will not be easy to evaluate to what extent risk management is a success. Therefor it is important to have a clear set of benefits of the risk management to achieve success.

7.3 PSA Framework HSE requirements

PSA have some guidelines, principles and regulations for risk management in the petroleum industry (ref 2.6). The framework HSE regulation is applicable for all contractors performing activities on an installation, not just the operators. Aibel is there for responsible to make sure that their risk management is in compliance with this regulation. In this chapter section 11 risk reduction principles will be discussed and seen in relations to see whether the organization complies with these requirements or not (PSA, 2015).

A short description of the requirements to risk reduction is listed below (PSA, 2015):

o Entails that the established minimum level for health, safety and environment, including acceptance criteria for major accident risk and environmental risk, shall be met regardless of costs.

o Entails that the risk shall be further reduced beyond the established minimum level for health, safety and environment.

o Principle regarding best available technology (the BAT principle).

o Precautionary principle.

- o Reflects a substitution philosophy whereby alternative solutions shall be chosen that do not entail the relevant risk factor.

There has not been found any information about the PSA requirements in the review of risk management in Aibel. This applies to the review of Aibel's internal documents, information and processes. Based on this it will not be possible to say to what extend the company are complying with the PSA requirements. PSA has a different and more complementary definition (ref 2.1) than Aibel. Therefor it is not within to claim that the risk definition according to PSA is reflected in Aibel's risk management. However it has been revealed that risk management in the organization is following many of the recommended principles so it is not unlikely that the PSA requirements are covered after all. The same applies for the possibility that the risk definition according to PSA is reflected in the company's risk management.

7.4   Suggestions for further work

The findings are based on a review of the risk management. One suggestion for further work is to look at risk management in other business units and compare to this thesis. This will give an overview of how the risk management is functioning in other business units. Another suggestion will be to take area of improvements into consideration when planning and in the implementation of the new risk management. The last suggestion is for the organization to make sure that the risk management is in compliance with the PSA requirements and that the risk definition is reflected.

8. Conclusion

In this thesis the risk management in Aibel has been reviewed. This review is based on analysis of existing documents, processes and tools and a survey among employees. The survey only gives information about the present risk management in the company. It has in addition been looked at a new risk management strategy that will be implemented at some point for the company.

A GAP analysis is performed. In the analysis principles for good risk management according to ISO 31000 are compared to the present risk management. The GAP analysis is showing that Aibel already has implemented many of the principles and tools recommended in ISO 31000. There were also identified gaps. The gaps identified were: risk management needs to create value and protect them in the entire organization. The processes need to be structured, systematic and timely. An overall risk profile and commitment towards risk is missing. The company has no risk management policy. The risk maturity level of four attributers was classified. The attributes were leadership/organization, processes, experience/training and tools. The review was the basis for the classification of risk maturity level. All of the attributers have been classified to risk maturity level 2.

The overall impression made is that many of the principles for good risk management are implemented. However the review has revealed weaknesses and absents in present risk management. The main findings in the review concluded in some areas of improvements. The suggested areas with potential for improvements were training, experience transfer, leadership/organization, communication, continuous improvement, tools, processes, follow up/compliance and risk-aware culture. These findings were also supported in the survey. The answers from the survey showed weaknesses and potential of improvement on many of the suggested areas. With improvements in these areas the risk maturity level for the organization will move to the highest levels 3 or 4. The review has not given any information about whether the PSA requirements are covered in the risk management. Since the risk management is based on many of the principles for good risk management so it is not unthinkable that the requirements already are covered and that the risk definition is reflected.

Benefits by improving risk management have been identified. Some of these are compliance with client requirements, ensuring to fulfil principles for good risk management, assist in decision making, more strengthened marked position, contribution to make the company more competitive, protection of reputation, strategic, operational and tactics. Suggestion for further work is to look at risk management in other business units, take area of improvements into consideration when planning the implementation of the new risk management and make sure that PSA requirements and risk definition are reflected in the risk management for the organization.

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15-PO-CM-01-A Risk Management Policy

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Books:

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Hopkin Paul. (2014), Fundamentals of Risk Management 3rd edition , Kopang Page

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Appendices

APPENDIX 1- Survey

APPENDIX 2- Graphic presentation of some answers from the survey

APPENDIX 3- GAP analysis

APPENDIX 1-Survey

Review of present risk management in Aibel

In relation with writing my master thesis for Aibel and the University in Stavanger, I want to get a overview of the present risk management in Aibel. Until today it has been primarily focused on risk management in individual projects in Aibel. The organization is missing a common risk structure and an efficient and systematic way of looking at risk transversely between projects and organization units throughout the organization. Aibel is now in a process where the objective is to establish such a risk structure, and a common overall risk process. This survey is anonymous. Thanks for your answers and contribute!

1) What is your role in Aibel?

☐ Manager

☐ Discipline responsible engineer

☐ Engineer

☐ Other

2) Which project have you been working on during your time in Aibel ?

☐ V&M projects

☐ Smaller modification projects

☐ Larger modification projects

☐ Renewable projects

☐ Field developement projects

3) How is risk management handeled in the projects you have been working with?

4) Do you know where to find the process for risk management in W3?

○ Yes

○ No

5) If yes in question 4, Have you completely or partly used this process for risk management in your project work?

○ Yes

○ No

6) Do you know where to find information about risk management in Aibel's systems like inside etc?

○ Yes
○ No

7) Are you familiar with / or have used PIMS risk management or Lotus Notes Risk database?

○ Yes both PIMS and Lotus Notes Risk database
○ Yes, only PIMS
○ Yes, only Lotus Notes Risk database
○ None of them

8) Have you in your work within projects been participating in workshops, reviews etc related to risk?(eks. risk identification meeting, ALARP). Please explain

9) During your time in Aibel have you received any training in risk management? Please explain

10) Have you preformed Aibel's e-learnings courses about risk management in training portal?

○ Yes
○ No

11) How will you describe you attitude and focus towards risk in your daily work within projects?

12) What is your impression of the management in Aibel's focus on risk handeling?

13) Do you know the process for handeling risks at a higher level in Aibel?Please explain
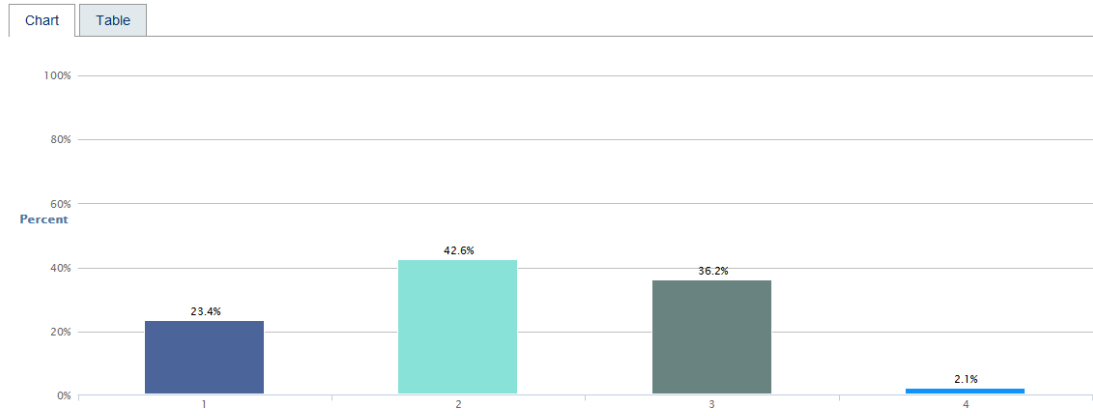
14) Do you have any suggestions for improvements to achieve good risk culture and handeling of risks in Aibel?

APPENDIX 2- Graphic presentation of some answers from the survey

Question 1:

What is your role in Aibel?

| Chart | Table |

Question	Number of respondents
What is your role in Aibel?	47

#	Name
1	Manager
2	Discipline responsible engineer
3	Engineer
4	Other

Question 2:

Which project have you been working on during your time in Aibel ?

| Chart | Table |
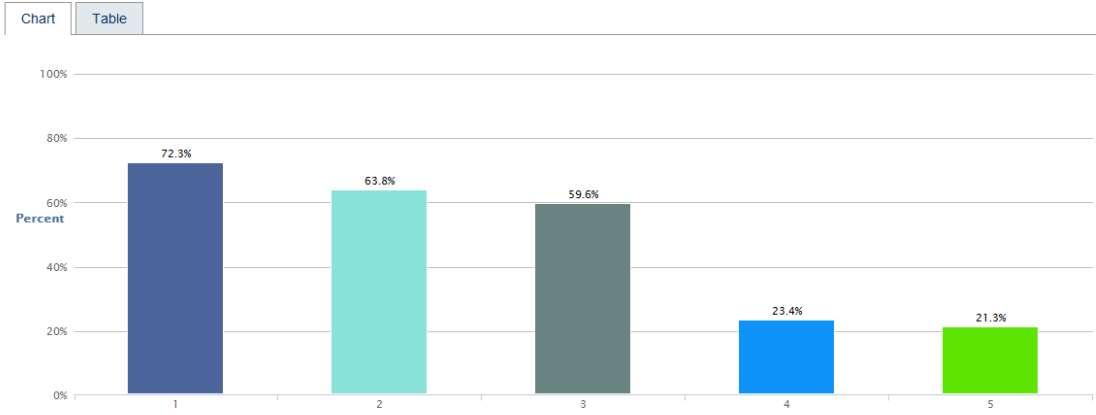
Question	Number of respondents
Which project have you been working on during your time in Aibel ?	47

#	Name
1	V&M projects
2	Smaller modification projects
3	Larger modification projects
4	Renewable projects
5	Field developement projects

Question 4:

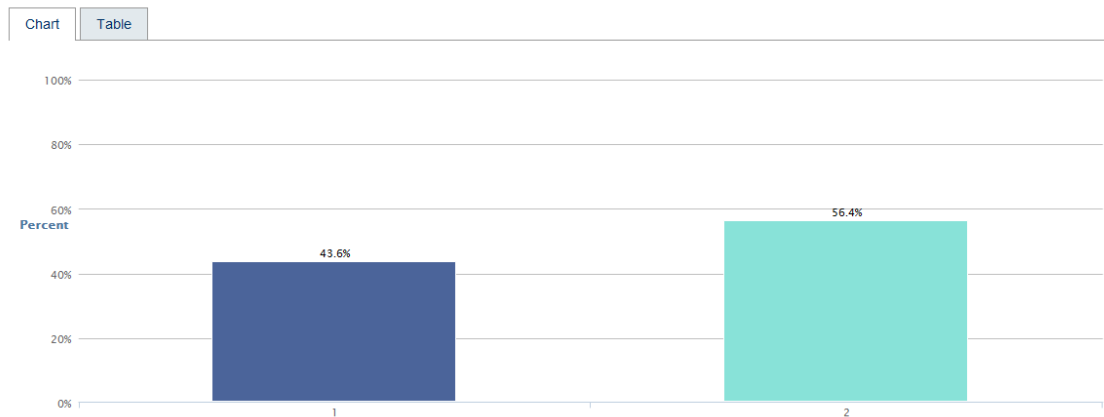Do you know where to find the process for risk management in W3?
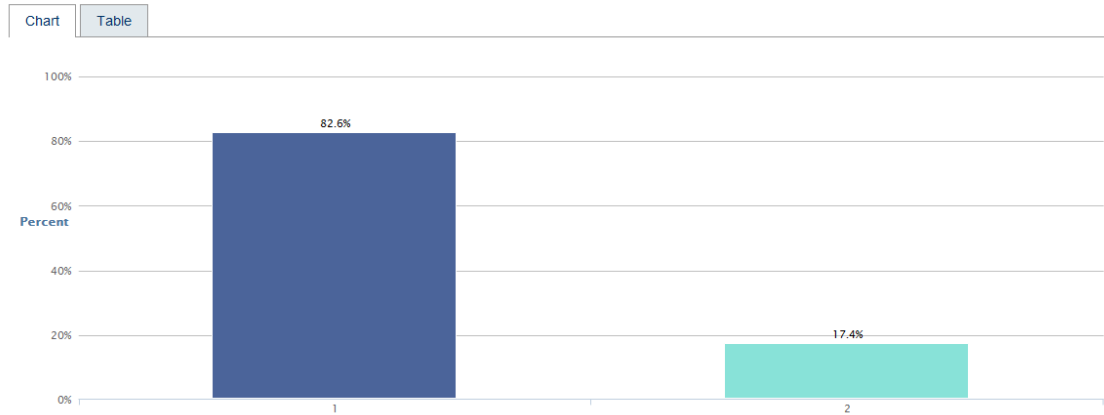
| Chart | Table |

100%

82.6%

80%

60%
Percent

40%

20%
17.4%

0%
1   2

Question	Number of respondents
Do you know where to find the process for risk management in W3?	46

#	Name
1	Yes
2	No

Question 5:

If yes in question 4, Have you completely or partly used this process for risk management in your project work?

| Chart | Table |

100%

80%

60%
Percent
56.4%

43.6%
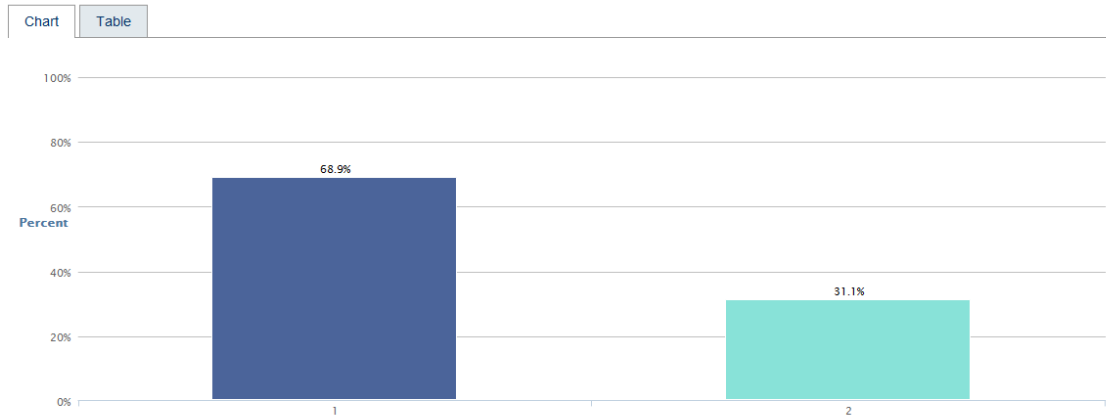40%

20%

0%
1   2

Question	Number of respondents
If yes in question 4, Have you completely or partly used this process for risk management in your project work?	39

#	Name
1	Yes
2	No

Question 6:

Do you know where to find information about risk management in Aibel's systems like inside etc?
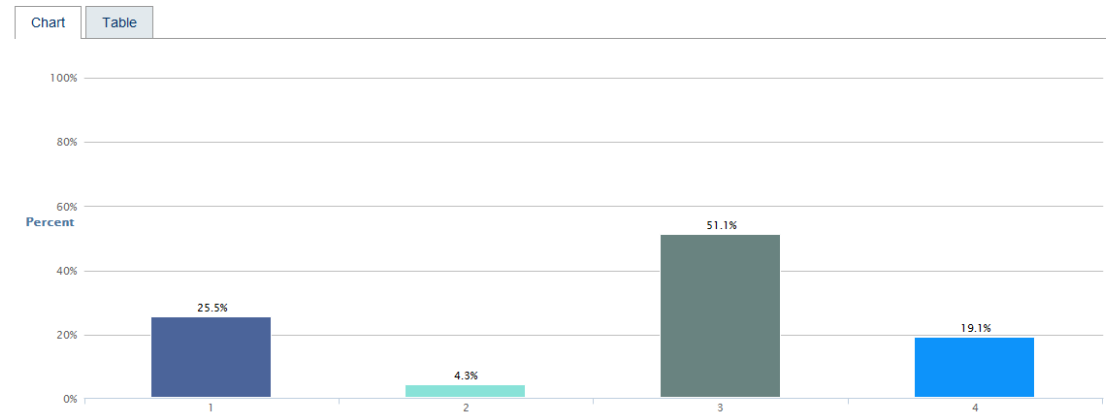
| Chart | Table |

Question	Number of respondents
Do you know where to find information about risk management in Aibel's systems like inside etc?	45

#	Name
1	Yes
2	No

Question 7:

Are you familiar with / or have used PIMS risk management or Lotus Notes Risk database?

| Chart | Table |

Question	Number of respondents
Are you familiar with / or have used PIMS risk management or Lotus Notes Risk database?	47

#	Name
1	Yes both PIMS and Lotus Notes Risk database
2	Yes, only PIMS
3	Yes, only Lotus Notes Risk database
4	None of them

Question 10:

Have you preformed Aibel's e-learnings courses about risk management in training portal?

| Chart | Table |
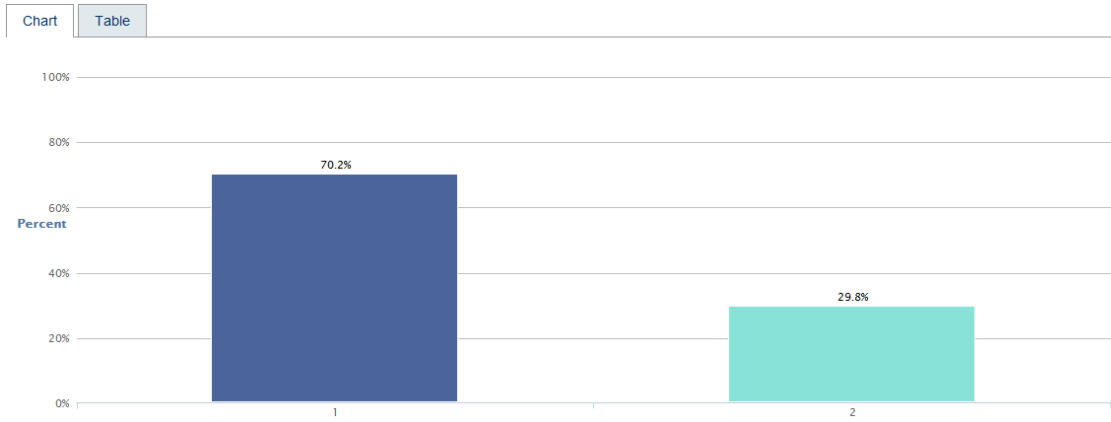
Question	Number of respondents
Have you preformed Aibel's e-learnings courses about risk management in training portal?	47

#	Name
1	Yes
2	No

APPENDIX 3-GAP Analysis

Reference in ISO	Description	Compliance with present risk management in Aibel		Comments
		Yes	**No**	
3	**Principles for efficient risk management**			
	Creates value and protects value		x	Risk managemnt is project based and not suitable at a corporate level. No focus on strategic or operational risks
	Intergal part of organizational processes	x		Implemented in Aibel's management system W3 but is is not a integated part of the enitre organization. The process in W3 is project based on can only be used in projects not concern level. No strategic planning.
	Part of decision making	x		Is a part of desision making at project level
	Explicity addresses uncertanties	x		
	Systematic, structured and timely		x	Risk management is missing structure and appears as unsystematic
	Based on best available infomation	x		
	Is tailored		x	Today there is missing a organization risk profile at all levels
	Takes human and cultural factors into account	x		QRM resourses on each project.
	Is transparent and inclusive	x		
	Dynamic, iterative and responsive to change	x		Risk handling and follow up in projects and implementation of new/improved risk management
	Facilitates improvements of the organization	x		Possible to give feedback in W3, new/improved risk management strategy is developed
4	**Framework**			
4,2	Mandate and commitment		x	No comittment at all levels in the organization
4,3	**Design of framework for managing risk**			
4,3,1	Understanding of the organization and its context	x		
4,3,2	Establishing risk management policy		x	Missing a risk management policy
4,3,3	Accountability		x	Risk management at all levels in the organization is not ensured.
4,3,4	Integration into organizational processes	x		Ref integral part of organizational processes ch 3

GAP analyse ISO 31000, present risk management in Aibel

4,3,5	Resourses	x		Aibel has a QRM department, QRM resources in each project	
4,3,6	Establishing internal communication and reproting mechanisms	x		W3 is updated continuous, inside is used communicate information about risk management	
4,3,7	Establishing extarnal comminication and reporting mechanisms	x			
5	**Process**				
5,2	Communication and consultation	x			
5,3	**Establishing the context**				
5,3,2	Establishing the external context	x			
5,3,3	Establishing the internal context	x			
5,4	**Risk assessment**				
5,4,2	Risk identification	x		Described in W3,accepted and wellknown methods are used to identify risk. Several tools are used as risk register	
5,4,3	Risk analysis	x		Described in W3	
5,4,4	Risk evaluation	x		Described in W3	
5,5	Risk treatment	**x**		Risks are treated(reduced, mitigated,sharing etc),followed up and closed by an allocated responsible person. The prson needs to close the action for the risk with an explaination	
5,6	Monitoring and review	x		Risk register is updated and monitored in projects by QRM resourse and project management team	