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Development and Evaluation of an Instrument for Identification of Competence Needs in Project Management

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Project Management

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Development and evaluation of an instrument for identification of competence needs in project management

Utvikling og verifisering av et verktøy for måling av kompetansebehov i prosjektledelse

This master thesis is an extension of the specialization project assignment delivered fall 2013. The objective of this assignment is to further refine the prototype of the instrument for identifying and measuring competence needs in project management on both individual level and organizational level. The assignment aims also to test and evaluate the reliability and validity of the instrument in the case company. The assignment shall include the following tasks:

- Conduct a condensed literature review about competence development, design and evaluation of tools to identify and measure competence needs. Investigate and discuss related previous and published work covering similar topic.
- Refine the preliminary prototype of the instrument created in the specialization project. Develop the final list of competences and specify the requirements in each competence area for the different positions in the host company.
- Identify how the reliability and validity of the instrument shall be evaluated and tested.
- Conduct necessary testing and evaluation of the instrument on a selected sample in the host company.
- Based on the results obtained suggest improvements to the current competence development programs or methods in the host company.

The assignment solution must be based on any standards and practical guidelines that already exist and are recommended. This should be done in close cooperation with supervisors and any other responsibilities involved in the assignment. In addition it has to be an active interaction between all parties.

Within three weeks after the date of the task handout, a pre-study report shall be prepared. The report shall cover the following:

- An analysis of the work task's content with specific emphasis of the areas where new knowledge has to be gained.

- A description of the work packages that shall be performed. This description shall lead to a clear definition of the scope and extent of the total task to be performed.
- A time schedule for the project. The plan shall comprise a Gantt diagram with specification of the individual work packages, their scheduled start and end dates and a specification of project milestones.

The pre-study report is a part of the total task reporting. It shall be included in the final report. Progress reports made during the project period shall also be included in the final report.

The report should be edited as a double-spaced high quality research paper with abstract, keywords, introduction, literature review, research method, findings/results, discussions, conclusions and references, in addition to appendices. Referencing and formatting should comply with for example the International Journal of Project Management, the Project Management Journal or any other project management journal.

The recommended size of the paper (abstract-conclusions) should be around 12 000 words.

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If the candidate encounters unforeseen difficulties in the work, and if these difficulties warrant a reformation of the task, these problems should immediately be addressed to the Department.

The assignment text shall be enclosed and be placed immediately after the title page.

Deadline: 10th June 2014

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ABSTRACT

Increasingly more organizations manage and execute projects, and the performance and deliverables of the project will be dependent on the competence of the project manager and team members and their ability to apply their knowledge and experience. In this sense, employers must identify the competences required to execute the tasks successfully, and any gap between the available and the required competence level should be addressed.

Grounded on this idea, the general objective of this master thesis was to develop and evaluate an instrument to identify competence needs in project management for the Project Control and Analysis (PCA) department in Statoil. For this purpose, a literature review was conducted in order to establish a theoretical framework of previous published work in the fields of competence development, project management competence standards, and design and evaluation of tools for competence assessment.

Then, the initial competence assessment tool was designed based on the internal processes and on the descriptions of positions from the department, taking into consideration the findings from the literature review, which indicate that attention should be put to the wording, sequencing and categorization of items, and that a competence scale needs to be created with well-described levels.

For evaluating the reliability and validity of the instrument designed, 22 semi-structured interviews were executed spanning all the position types and portfolios in the department, eliciting the opinions from employees with more than 5 years of experience within the PCA functions. Consequently, the results from the interviews were analyzed according to the convergence among participants and with the theoretical framework, and the final competence assessment tool was created. Furthermore, it was suggested to include the competence assessment as part of the People@Statoil process, which is a corporate process for people development, deployment, performance and reward.

Finally, it was identified that the development programs in an organization should include both formal and informal learning activities. Therefore, improvements to the current competence development methods in the PCA department were suggested, proposing a combination of courses, on-the-job training, mentoring and coaching, use of collaborative IT tools and networking.

The competence assessment tool created in this thesis is considered very important and useful for the PCA department, since it will help to determine the competence strengths and weaknesses from the individuals and implement improvement plans that will enhance overall performance. In addition, the methodology used and the recommendations presented can be followed by other organizations that intend to implement a competence assessment process.

Keywords: competence assessment tool, competence development, project management, project control and analysis

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LIST OF ABBREVIATIONS

ACHE: American College of Healthcare Executives

AIPM: Australian Institute of Project Management

APM: Association for Project Management

ARIS: Statoil's management system tool

BBC: British Broadcasting Corporation

CCE: Current Control Estimate

CCS: Current Control Schedule

CII: Construction Industry Institute

CVP: Capital Value Process

DG: Decision Gate

ECITB: Engineering Construction Industry Training Board

EVM: Earned Value Management

FTS: Fast Track and Subsea projects

GP: Greenfield projects

HSE: Health, Safety and Environment

IBSA: Innovation and Business Skills Australia

ICB: IPMA Competence Baseline

ICE: Institution of Civil Engineers

ICI: Individual Competency Index

IPMA: International Project Management Association

IT: Information Technology

ITT: Invitation to Tender

MCE: Master Control Estimate

MCS: Master Control Schedule

MIS: Management Information System

MPP: Manpower Projection Plan

NASA: National Aeronautics and Space Administration

OBF: Offshore Brownfield projects

OCP: Onshore, Cessation and Pipeline projects

PCA: Project Control and Analysis

PCB: Project Control Basis

PCP: Project Change Proposal

PDS: Project Detailed Schedule

PIMS: Project Information Management System

PMBOK: Project Management Body of Knowledge

PMCD: Project Manager Competency Development

PMI: Project Management Institute

PMS: Project Master Schedule

PPB: Project Planning Basis

PPB: Project Planning Basis

PSR: Procurement and Supplier Relations

PWP: Project Work Plan

QRM: Quality and Risk Management

SAP: Enterprise Resource Planning software

SOX: Sarbanes-Oxley Act

SPA: Shell Project Academy

SWO: Service Work Orders

WBS: Work Breakdown Structure

1. INTRODUCTION

This chapter gives a general introduction to the thesis by describing the theoretical and academic background of the project, explaining the relevance in terms of organizational importance, defining the purpose and the objectives of the work, presenting a general description of the case company, stating the limitations of the work, and detailing the structure of the report.

1.1 THEORETICAL BACKGROUND

The term competence dates back to the 1980s, with one stream originated in the United States called attribute-based competency approach, and another stream called performance-based competency approach initiated in the United Kingdom (Crawford, 2005). The first approach defines competence as a combination of knowledge, skills and personal characteristics, based on the agreement of authors like Spencer and Spencer (1993), Alam et al. (2008) and Succar et al. (2013).

The second stream describes competence as what employees are expected to do according to a required performance level (Young and Conboy, 2013), and there are several world known project management competence standards that recognize this requirements, for example the Project Management Body of Knowledge, the Project Manager Competency Development Framework, the IPMA Competence Baseline and the APM Competence Framework (Crawford, 2004).

Since more and more organizations are moving to the project structure, it is fundamental that employers identify the project management competences required by the employees, in order to address any competence gap and provide opportunities for learning and development, which will also increase the overall performance (Armstrong, 2003).

1.2 ACADEMIC BACKGROUND

The specialization project assignment was delivered fall 2013 and the general objective of this project was to develop a prototype for an instrument to identify and measure competence development in project management for the Project Control and Analysis (PCA) department in Statoil.

This is considered a very interesting work because it provides the opportunity to review previous research within the topic and to apply this theoretical understanding and the project management knowledge to offer a solution suitable to the needs of the case company, by creating a competence assessment tool that can be used to identify development needs on both individual level and organizational level. This tool will help the department to pinpoint and improve the weak areas and therefore enhance the overall performance in the execution of their functions.

For this purpose, a literature review was conducted in order to establish an initial theoretical framework of previous published work in the fields of competence development and project management competence standards. The literature review was compiled from published articles, journals, books and world-known standards.

Furthermore, the data collection during the specialization project assignment consisted of reviewing internal processes and the descriptions of positions within the department. Consequently, the organizational information was analyzed and the competence areas were suggested based on the PCA functions and according to the project management knowledge areas proposed in the literature.

Finally, a prototype for the instrument was proposed, including the competence assessment as part of the People@Statoil process, which is a corporate process for people development, deployment, performance and reward.

1.3 RELEVANCE

The Statoil book, which represents the foundation of how the company conducts the business, recognizes the people as one of the most important assets to achieve the goals, highlighting the importance of skills, personal commitment and effective leadership. In order to develop the expertise required to fulfill the business needs, they have established processes for people development, deployment, performance and reward, integrated in a corporate process called “People@Statoil”.

In this sense, it is important for the Project Control and Analysis (PCA) department to have a tool for identifying the competences required for their employees to execute their tasks successfully, with the purpose of instituting a systematic assessment process to detect strong performance areas as well as possible gaps, and offer opportunities for learning and improving.

In addition, most of the previous research in this field emphasizes the general competences required for a project manager, while this thesis proposes and describes a detailed process for the design and evaluation of a competence assessment tool applied to a particular case company, and offers general suggestions for other organizations on how to do this as well.

1.4 PROJECT DESCRIPTION AND OBJECTIVES

This master thesis is an extension of the specialization project assignment. The objective of this assignment is to further refine the prototype of the instrument for identifying and measuring competence needs in project management on both individual level and organizational level. The assignment aims also to test and evaluate the reliability and validity of the instrument in the case company.

The assignment has the following objectives:

1. Conduct a condensed literature review about competence development, design and evaluation of tools to identify and measure competence needs. Investigate and discuss related previous and published work covering similar topic.
2. Refine the preliminary prototype of the instrument created in the specialization project. Develop the final list of competences and specify the requirements in each competence area for the different positions in the host company.
3. Identify how the reliability and validity of the instrument shall be evaluated and tested.
4. Conduct necessary testing and evaluation of the instrument on a selected sample in the host company.
5. Based on the results obtained suggest improvements to the current competence development programs or methods in the host company.

1.5 COMPANY AND DEPARTMENT PRESENTATION

Statoil is a multinational energy company headquartered in Norway, with operations in more than 30 countries, approximately 23000 employees worldwide and 40 years of experience in oil and gas production. The company is committed to create innovative business solutions in a responsible manner to meet the energy demands.

The department of Project Control and Analysis (PCA) manages project costs, plans, project changes, risk and estimation. They are responsible for providing cost forecasts, schedules, project status analysis and managing schedule risks in all the projects to ensure that the right targets have been established and that the projects are on track.

The PCA department is organized according to the different portfolios of projects that the company has, which are:

- GP: Greenfield projects
- OBF: Offshore Brownfield projects
- OCP: Onshore, Cessation and Pipelines projects
- FTS: Fast Track and Subsea projects

The department has also four leading advisors in the following areas:

- Project control
- Planning
- Cost control
- Project economy

In addition, there is a Competence Center (CC) that gathers employees with extensive knowledge and experience within the PCA functions to provide professional support and advice to the projects.

The organizational structure for the PCA department is illustrated in Figure 1.

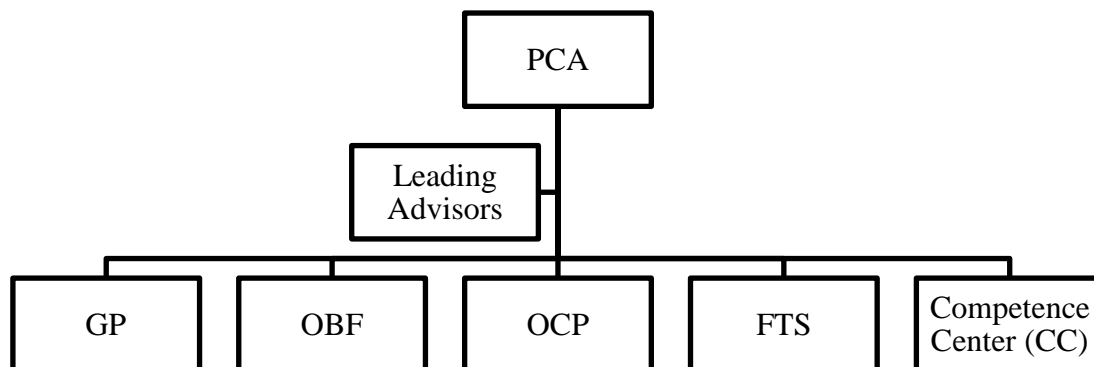


Figure 1. PCA organizational chart

1.6 LIMITATIONS

The competence assessment tool that will be designed and evaluated in this thesis is based specifically on the functions and responsibilities of the Project Control and Analysis (PCA) department in Statoil, therefore the main limitation of the study concerns the fact that the instrument cannot be generalized to be applied in other units or companies.

However, the methodology followed offers a comprehensive and systematic process for competence identification, which can be used by other organizations interested in implementing a competence development plan. In addition, the same basic structure (headlines) of the tool could be employed, but keeping in mind that the competences (knowledge and skills) must be derived from the tasks of the specific organization.

1.7 PROJECT PLANNING AND CONTROL

Project planning and control was an important process during the execution of the thesis, with the purpose of applying the knowledge gained throughout the studies in the Master of Science in Project Management. Therefore, a Pre-study report (see Appendix 1) was submitted at the beginning of the semester in order to describe the objectives of the assignment and its relevance, identify the tasks that were going to be performed and present the work plan.

Moreover, a Progress report (see Appendix 2) was submitted at the end of the ninth week since project start-up to summarize the work that had been carried out until then and compare the progress with the schedule established. It is important to highlight that there was continuous contact with the supervisor throughout the execution of the activities to receive feedback and guidance regarding the formal and academic aspects of the thesis.

1.8 OUTLINE OF THE THESIS

This report is divided into five different chapters:

1. INTRODUCTION

In this chapter a brief introduction to the work was given by defining the background, objectives and relevance of the thesis.

2. METHODOLOGY

This chapter provides a detailed description of the research process followed in the thesis.

3. LITERATURE REVIEW

This chapter offers a theoretical framework for the research topic by investigating and discussing published work related to competence development, project management competence standards, and design and evaluation of tools for competence assessment.

4. RESULTS AND DISCUSSION

This chapter describes the findings from the data collection process, presents the tool created for competence assessment in the Project Control and Analysis (PCA) department in Statoil, and offers suggestions for improving the competence development methods in the aforementioned department.

5. CONCLUSIONS

In this chapter the conclusions of the work are presented, as well as recommendations for future research in the topic.

2. METHODOLOGY

This chapter describes the research process that was followed to achieve the objectives of the thesis, explaining how the data was collected and analyzed in order to develop and evaluate the instrument for identification of competence needs for the Project Control and Analysis (PCA) department in Statoil.

Based on the framework from Crowther and Lancaster (2008), the research process for the execution of this master thesis included six different stages, which will be explained with detail in the following sections.

2.1 ESTABLISH THE RESEARCH OBJECTIVES

As indicated in the Introduction chapter, the objectives of this assignment were to:

1. Conduct a condensed literature review about competence development, design and evaluation of tools to identify and measure competence needs. Investigate and discuss related previous and published work covering similar topic.
2. Refine the preliminary prototype of the instrument created in the specialization project. Develop the final list of competences and specify the requirements in each competence area for the different positions in the host company.
3. Identify how the reliability and validity of the instrument shall be evaluated and tested.
4. Conduct necessary testing and evaluation of the instrument on a selected sample in the host company.
5. Based on the results obtained suggest improvements to the current competence development programs or methods in the host company.

2.2 SELECT THE RESEARCH APPROACH

According to the definitions provided by Kothari (2004), the research approach followed can be classified as qualitative, considering that the work is based on gathering theoretical and organizational information to design a competence assessment tool suitable to the specific department in the case company, and to further evaluate the instrument developed generating results in a non-quantitative form.

Qualitative research offers the advantages of gaining deep understanding of the issue under study with more flexibility for interpretation, with the disadvantage that assumptions are made based on the opinion of a small selected sample (Dawson, 2009). On the other hand, quantitative research allows a larger number of participants and the compilation of results is easier due to its structured numerical form, however it is not suitable in this case because quantification and statistical analysis are not the purpose of this thesis.

2.3 CONDUCT LITERATURE REVIEW

A literature review was conducted to collect information and investigate previous published work about competence development, project management competence standards, and design and evaluation of tools for competence assessment, consequently achieving the first objective of the thesis.

This literature was selected with the intention of having a solid theoretical foundation for developing the instrument and to identify appropriate methods for its evaluation, besides offering a framework for linking, comparing and judging the opinions received during the evaluation process.

The literature review was compiled from published articles, journals, books and world-known standards, by using the electronic databases ScienceDirect and Scopus with inclusion criteria that corresponded to the research topics: competence development,

competence mapping, competence tool, competence instrument, competence gap, competence model, competence evaluation, performance evaluation, organizational competence, business competence, project management competence, instrument design, questionnaire design, reliability and validity. This allowed locating and selecting relevant sources, which are detailed in Table 1, and it was additionally accompanied by physical bibliographic research.

Table 1. Description of sources from the electronic database research

Type of source	Name of the source
Project management journals	International Journal of Project Management Contemporary Management Research
Human resource journals	Human Resource Development Review Personnel Review
Education journals	Educational Research Review International Journal of Educational Development Advances in Health Sciences Education
Psychology journals	Psychological Review Educational Psychology Review
Engineering and technology journals	Journal of European Industrial Training Journal of High Technology Management Research Scientia Iranica Automation in Construction Technovation International Journal of Production Economics
Business journals	Journal of Business Research
Conference proceedings	Procedia – Social and Behavioral Sciences
Project management books	Various
Human resource management books	
Research methods books	

The pre-selection of the references was based on the information contained in the abstract/preface, and the final selection was done according to the information required for covering the objectives of the thesis. Therefore, the literature review process consisted in identifying, appraising, selecting and synthesizing pertinent research evidence.

2.4 DEVELOP THE INSTRUMENT

This stage involved first gathering and reviewing organizational information from the following sources:

- **Statoil Book:** this is an official organizational document that describes the most important policies and requirements for the company, offering a framework for managing the business.
- **ARIS:** this is Statoil's management system tool, which provides both a holistic view of the processes for performing the activities and a detailed description of the workflows and governing documents that standardize the operations.
- **Governing documents:** these are official internal documents that describe the requirements for executing the different activities in the company.
- **Workflows:** these are illustrations that depict the sequence of activities in the different phases of a project.
- **PCA documents and presentations:** several internal documents and presentations were gathered with the intention of gaining insight and understanding of the PCA department's functions.
- **PCA description of positions:** the descriptions of the different positions in the PCA department were obtained to examine the functions of the employees and be able to determine the knowledge areas required to perform their roles.

All the procedures in the company are documented, standardized and followed by the employees in the execution of their activities, therefore offering readily and unbiased information about all the responsibilities of the PCA department.

After conducting the literature review and collecting the organizational information, the competence assessment tool was designed by analyzing the processes and functions of the employees in the PCA department, identifying the knowledge and skills required, and linking these with the project management knowledge areas suggested in the theoretical framework.

Furthermore, an evaluation scale was designed taking into consideration the recommendations from the literature review, and the requirements for the different positions were assigned according to the job descriptions and responsibilities. In addition, several collaborative meetings were carried out with the company contact and with one of the leading advisors in order to develop the instrument, securing that it reflected the actual functions from the department.

The second objective of the thesis was fulfilled with the completion of this stage.

2.5 EVALUATE THE INSTRUMENT

Reliability can be defined as the consistency and stability of a measure, and validity refers to whether or not a measure of a concept really measures that concept (Bryman, 2012). These two issues needed to be evaluated to guarantee the quality of the instrument designed. In this sense, the experts' opinions were required, meaning obtaining feedback from the employees regarding the elements from the competence assessment tool.

Several methods were available in order to collect the data: interviews, questionnaires and focus groups. Interviews allow obtaining detailed information about perceptions and opinions and offer adaptability to follow and clarify particular issues of interest due to the

direct contact without being influenced by other persons, with the disadvantage of being highly time-consuming (Bryman, 2012).

Questionnaires permit a larger sample in comparison to interviews and they are easier to analyze because of the standardized collection of data, but it is more difficult to control the administration process because of their impersonal character, for example respondents might leave questions in blank or complete them incorrectly, or the response rate might not be representative (Dawson, 2009).

Focus groups have similar benefits comparing to the interviews and they can save time because of obtaining multiple answers at the same time. However, it is difficult to control the participation in this method ensuring that everyone contributes and that no one dominates the discussion constraining others' opinions. In addition, disagreements can arise between the participants and the results will be more complicated to analyze (Dawson, 2009).

Having discussed the advantages and disadvantages of these methods, the interview is considered to be the most appropriate one for the purpose of this thesis, since it represents a useful and effective method for data collection to elicit the opinion of the employees regarding all the elements from the competence assessment tool without any group restrictions.

Furthermore, there are three main types of interviews: structured, semi-structured and unstructured. The structured interview entails specific questions with pre-defined answers, being used in quantitative research because of its high degree of standardization; hence it is not suitable in this case. On the contrary, the unstructured interview allows extensive freedom because the idea is to ask as few questions as possible and just let the participant talk about what he or she considers important; therefore, it is also not appropriate to achieve the objectives of this thesis (Dawson, 2009).

Finally, the semi-structured interview is the selected type because a list of open-ended questions is prepared in order to ensure that specific topics are discussed throughout all the

interviews and that the information can be compared between them, but also keeping the flexibility for other issues to arise and to investigate particular subjects without restricting the answers. The interview guide created to evaluate the instrument is presented in Appendix 3.

The next methodological concern refers to the sampling strategy, meaning how to select the participants for the interviews. Ritchie et al. (2003) state that qualitative research uses non-probability samples, in which participants are selected to reflect specific features or represent particular groups within the population, and the probability of each person being selected is not known.

Symon and Cassell (2012) express that own judgement is required to choose the persons that will best enable the researcher to meet the objectives of the research. For this purpose, the managers of each portfolio in the PCA department were asked to propose one person with more than five years of experience for the interview process, ensuring that all the different types of positions and portfolios were represented and that the participants had enough working experience to give well-founded opinions regarding the instrument.

The possible participants were contacted by email to confirm their availability and to schedule the interview, sending also the interview guide (see Appendix 3) and the initial competence assessment tool (see Appendix 5) for them to have enough time to read it carefully and prepare their comments before the planned date.

The length of the interview was expected to be approximately one hour, and depending on the location of the participant the interview would be carried out either in person or by video-call using internal software Microsoft Lync 2010. In total, 22 interviews were executed spanning all the five position types and portfolios within the department, as it can be seen in Table 2.

Table 2. Description of the informants

		Position type (number of informants)					Total
		Project Control Manager	Project Control Engineer	Planner	Cost Control Engineer	Project Economist	
Portfolio	GP	1	1	1	2	1	6
	OBF	1	1	1	1	0	4
	OCP	1	1	1	1	1	5
	FTS	1	1	1	1	1	5
	CC	0	0	1	0	1	2
	Total	4	4	5	5	4	22

Where:

- GP: Greenfield projects
- OBF: Offshore Brownfield projects
- OCP: Onshore, Cessation and Pipelines projects
- FTS: Fast Track and Subsea projects
- CC: Competence Center

From the total of 22 interviews, 17 were done through Microsoft Lync 2010 because the participants were located in a different city than the interviewer, and the other 5 were done in person.

For the analysis of the data, thematic and comparative analyses were applied. Dawson (2009) expresses that these types of analyses are frequently used together because with thematic analysis the topics emerge from the data, and with comparative analysis data from different people is compared according to the issues that have arisen, which makes this a suitable combination.

In order to recognize the patterns in the answers of the participants, coding was implemented, which means labeling and categorizing data moving through the transcripts and notes from the interviews, tabulating this and then interpreting the results based on the literature and on the judgement of the researcher (Flick, 2014).

Microsoft Excel 2010 was used for the tabulation process, which allowed gathering, grouping and filtering the results from the interviews according to the questions from the interview guide (see Appendix 3) and to the categories established in the coding process.

Both the third and the fourth objective of the thesis were accomplished during this stage.

2.6 RESULTS

After analyzing the results and based on the literature and on the convergence of the opinions from the participants, the final competence assessment tool was created (see Appendix 6). In addition, various remarks and suggestions were made regarding the current competence development methods in the department, hence achieving the last objective of the thesis.

The main source of uncertainty related to methodological or data errors comes from the qualitative nature of the study and the judgements made by the participants and by the researcher. However, the reliability and validity of the information presented in this thesis can be assured since the literature review was compiled from published articles, journals, books and world-known standards related to the research topic; the organizational information was obtained from official internal sources, and the results are based on the convergence of both the theoretical and organizational information, with the input from experienced employees (from 5 to 35 years of experience with PCA functions, with an

average of 13 years) to guarantee that the competence assessment tool reflects the actual functions, responsibilities and competence requirements of the PCA department.

It is essential to highlight that the competence assessment tool presented in this thesis is specifically designed for the Project Control and Analysis (PCA) department in Statoil and therefore should not be generalized or used directly in a different organization. However, the research process can be generalized to be applied in other departments and in other companies.

The research process that has been described is depicted in Figure 2.

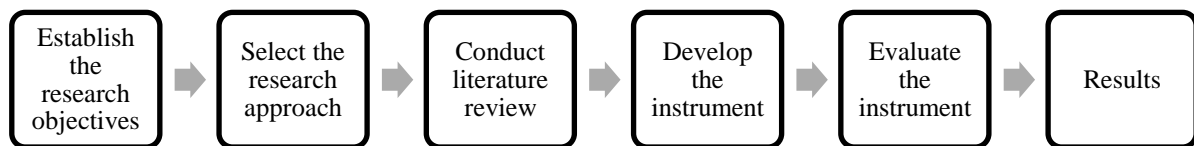


Figure 2. Research process

It is relevant to emphasize that all matters related to business affairs, operating results and personnel information are bound by confidentiality, adhering to the company's ethical guidelines and security regulations.

3. LITERATURE REVIEW

3.1 COMPETENCE DEVELOPMENT

Human resources are one of the most important assets for any organization. Projects are executed and delivered by people, and as increasingly more organizations manage and execute projects, both in the public and in the private sector, there is a rising demand for competent project managers and team members (Vathanophas and Thai-ngam, 2007). Firstly, it is therefore important to explain what is meant by competence.

Crawford (2005) investigated the background of the term competence, finding two different streams that date back to the 1980s. The first stream is the competency model or attribute-based competency approach, originated in the United States from the work of McClelland and McBer, reported by Boyatzis and expanded by Spencer and Spencer.

In this approach, a competence is defined as “an underlying characteristic of an individual that is causally related to criterion-referenced effective and/or superior performance in a job situation” (Spencer and Spencer, 1993). This means that the competence of an individual stems from having a set of attributes to execute specific tasks (Young and Conboy, 2013).

According to Spencer and Spencer (1993), the concept of competence comprises five characteristics:

- **Motives:** the things a person wants or thinks about that drive and direct the behavior towards certain actions or goals
- **Traits:** general disposition to respond to situations or information in a certain way
- **Self-concept:** a person’s attitudes, values and self-image
- **Knowledge:** the information a person has in a particular content area
- **Skill:** the ability a person has to perform a certain physical or mental task

Knowledge and skills can be characterized as surface competences because they tend to be identifiable and visible, and they are relatively easy to develop through training and experience. On the other hand, motives, traits and self-concept are core personality characteristics, which are more hidden and are difficult to assess and develop (Alam et al., 2008). These concepts are presented graphically in Figure 3.

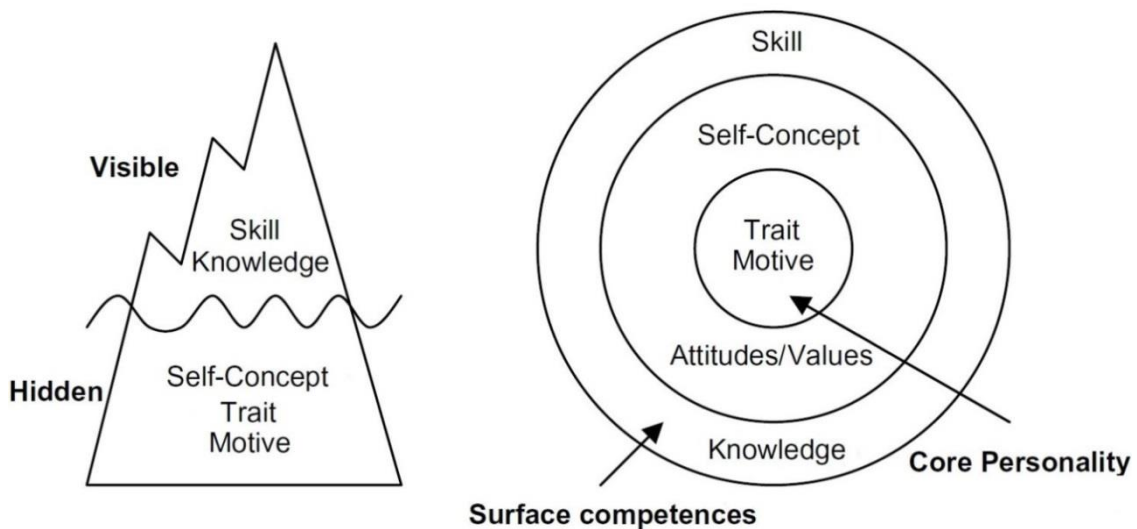


Figure 3. Competence structure

Source: Alam et al. (2008)

Succar et al. (2013) offer a similar definition of competence, indicating that it is constituted by three components: knowledge (conceptual or theoretical knowledge), skills (procedural or applied knowledge) and personal traits (personality characteristics, for example attitude, behavior and physical ability). In this classification, motives, traits and self-concept are gathered in one group denoting the deeper personality characteristics.

The second stream is the competency standards or performance-based competency approach, which was initiated in the United Kingdom. This approach specifies competence as what individuals are expected to do in their working roles according to a required level of performance. Performance-based competency standards are explicitly designed with the

purpose of assessment and recognition of an individual's current competence (Young and Conboy, 2013).

Crawford (2005) addresses the overall concept of competence by integrating both of the approaches described before, and proposes the integrated model of competence illustrated in Figure 4. The attribute-based competency approach is represented in the model by the knowledge and skills as input competences and the personality characteristics as personal competences. The performance-based competency approach is denoted in the model as output competences and is based on demonstrable performance in accordance with the expectations.

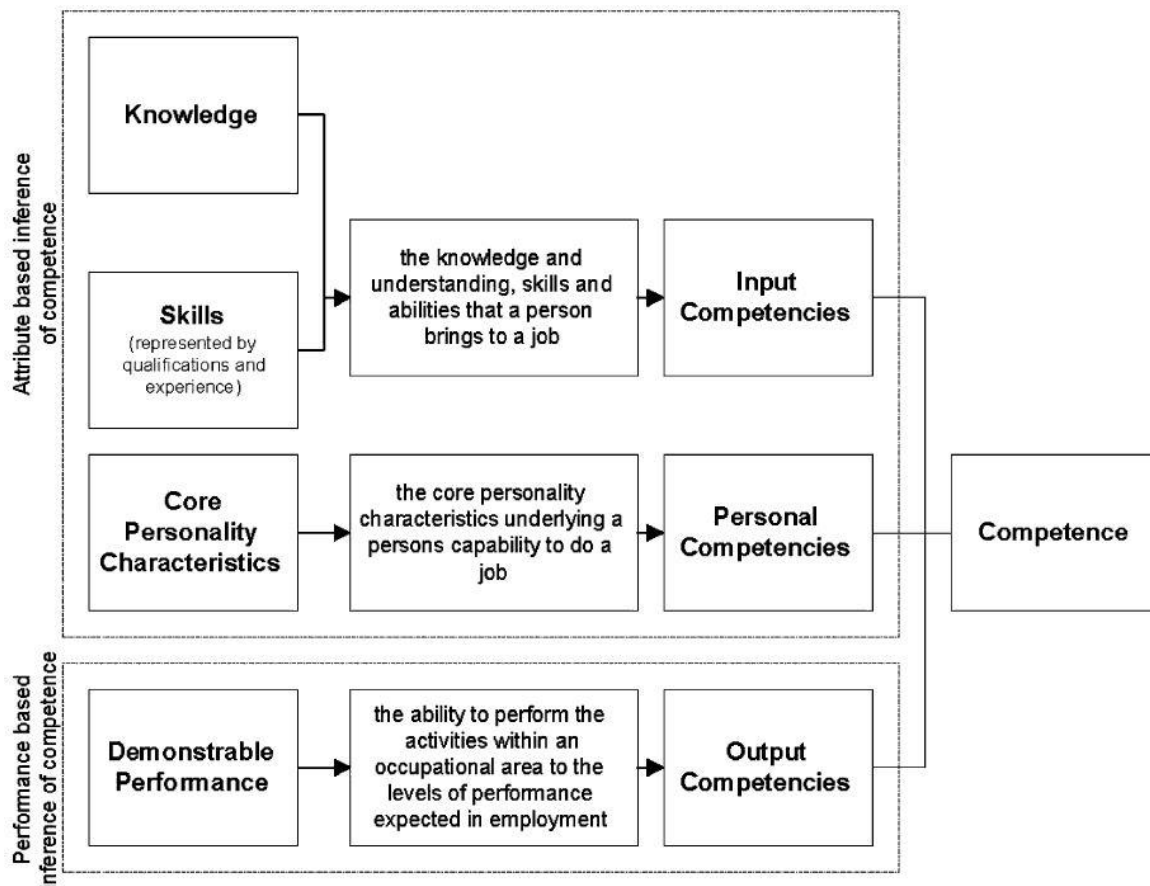


Figure 4. Integrated model of competence

Source: Crawford (2005)

Gale (2007) also agrees with this model, defining competence as a holistic concept that involves the integration of attitudes, skills, knowledge and performance, concerned with the capacities to undertake specific tasks. This author suggests that each individual must demonstrate the necessary capabilities to perform a particular job in order to have the desired results, which are the requirements of the task according to the environmental constraints (organizational culture and availability of resources). This link between competence and job performance is depicted in Figure 5.

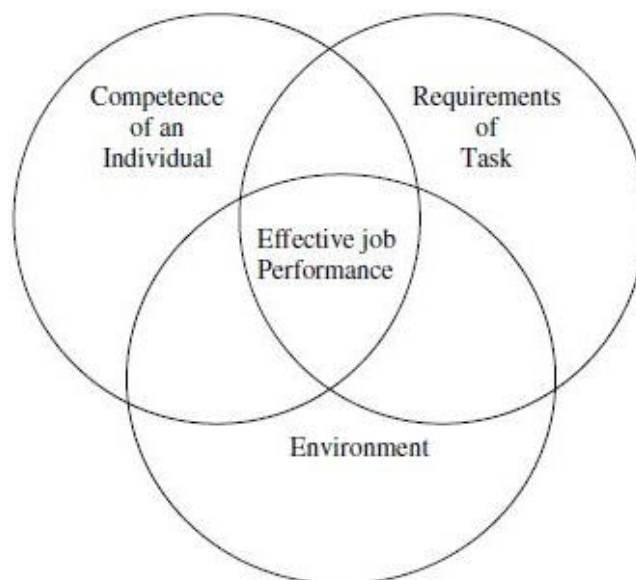


Figure 5. Relationship between competence and job performance

Source: Gale (2007)

Furthermore, project management competence is considered fundamental since it will have an impact on project performance and consequently in the organizational performance. This is illustrated in Figure 6. Accordingly, the organizational efforts to organize, motivate, support and develop the employees are essential for the success of the projects and the overall performance (Morris and Pinto, 2004).

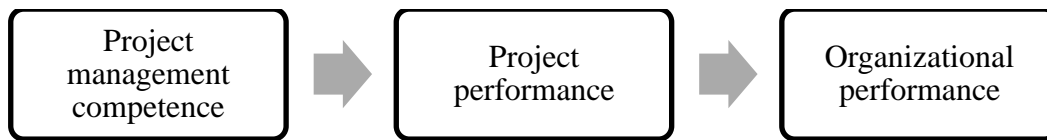


Figure 6. Relationship between project management competence and organizational performance

Source: Crawford (2005)

Considering this, employers must identify the competences required to execute the tasks and deliver projects successfully (Shahhosseini and Sebt, 2011), taking into account the context in which the business operates, as well as the corporate structure and culture, and use this competence model for hiring, assessing and training the employees (Jamshidi et al., 2012).

The project deliverables will be dependent on the competence of the project team and their ability to apply their knowledge and experience, and any gap between the available and the required competence level should be addressed, because it represents a source of risk (ISO 21500:2012).

In order to establish a competence development plan in an organization, the first step is to identify the competence requirements for the project team and design a competence assessment tool. Section 3.3 is devoted to this topic. Then, the performance in these competences needs to be assessed to identify strengths and weaknesses.

Any gaps between the required performance and the actual performance must be acknowledged with the aim of establishing and implementing an appropriate competence development plan, prioritizing the critical areas to the individual and the organization. The goal is to increase the capabilities and potential of the employees by addressing the development needs through providing learning and continuous development opportunities (Armstrong, 2003).

The competence development process is depicted in Figure 7.

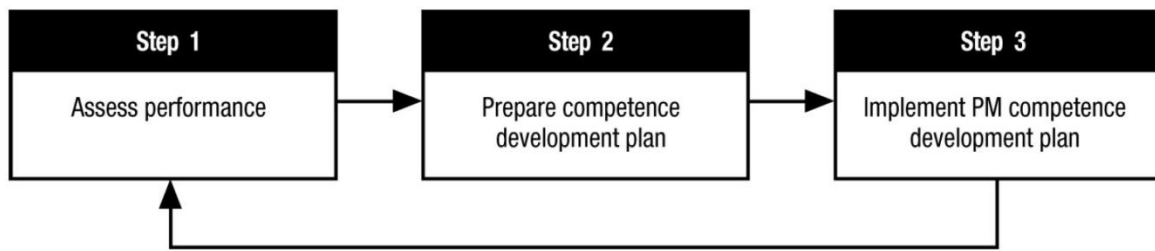


Figure 7. Competence Development Process

Source: PMI (2007)

Professional project management competences are attained with the combination of formal education and knowledge acquired during training, and skills developed through experience gained by the application of the knowledge (Turner and Huemann, 2000). It is therefore important to review the different ways of addressing development needs.

Great attention has been placed in the competence development activities described as “planned”, but it is also essential to keep focus on the “unplanned” consequences a particular activity can have. As a result, a classification of development activities can be made into two broad groups according to the degree of planning and organizing (Kock and Ellström, 2011):

- **Formal learning:** refers to planned and organized learning activities, mainly as internal or external training programs financed by the employer that occur during working hours. Formal learning usually leads to the participants getting a certification or grade (Kock and Ellström, 2011). The following factors should be considered for planning and implementing an effective training program (Kirkpatrick and Kirkpatrick, 2008):
 1. Determining needs
 2. Setting objectives

3. Determining subject content
 4. Selecting participants
 5. Determining the best schedule
 6. Selecting appropriate facilities
 7. Selecting appropriate instructors
 8. Selecting and preparing audiovisual aids
 9. Coordinating the program
 10. Evaluating the program
- **Informal learning:** refers to learning that occurs in the daily work, for example, through participation in projects, team-based work, staff-meetings, job rotations, among others. This means that the learning process has a low degree of planning and organizing because the main purpose is the execution of the functions and tasks.

This classification between formal learning and informal learning is in accordance with the perspectives of “learning as acquisition” and “learning as participation” respectively. In the “learning as acquisition” perspective, learning is viewed as a process of gaining new knowledge through a course or structured program under the guidance of another person. Alternatively, in the “learning as participation” perspective, learning is a process that involves interacting with people and happens naturally as part of the work process (Fenwick, 2006).

Zangiski et al. (2013) suggest that formal training programs can generate a competitive advantage for organizations, however they become merely a complementary tool once individuals gain more experience in the execution of their functions.

Organizations that are looking to improve their performance must therefore provide the opportunities to perform both types of learning activities. In this sense, the learning environment in an organizational setting can be classified as enabling or constraining,

depending on the conditions offered and the degree to which they are present. These conditions are (Kock and Ellström, 2011):

- Learning potential of the work tasks, in terms of scope, variety and complexity
- Opportunities for feedback, evaluation and reflection on the outcomes of the work
- Formalization of work processes, supporting cooperation and learning
- Employee participation in the planning and implementation of competence development activities
- Learning resources, including time and management support for competence development

Thiry (2004) agrees with these conditions, highlighting the importance of management support, structures and processes that ensure successful implementation of the learning activities, and securing the funding for the development plans, including the analysis of development needs and the evaluation of results.

A parallel distinction is made by Fuller and Unwin (2006) with their definition of expansive and restrictive learning environments. A restrictive learning environment is distinguished by the lack of organizational support towards learning and presenting barriers for executing tasks that are stimulating and that provide the opportunity for learning. In contrast, an expansive learning environment supports individual and organizational learning, and offers opportunities for new and stimulating tasks.

It is interesting to note the separation of the terms individual learning and organizational learning. Individual learning in an organization may not be translated into organizational learning unless individuals act as “learning agents” (Suikki et al., 2006). This denotes, as stated by Turner et al. (2000), that capturing, documenting and disseminating experience are key issues for developing organizational competence, and an organization

needs to implement practices to ensure the possession and retention of knowledge. With specific emphasis in the project management field, these practices are (Turner et al., 2000):

- **Internal project management procedures:** internal project management procedures can be used for capturing knowledge, experience and establishing best practices across an organization.
- **Post-project reviews:** reviews conducted at the end of a project to collect information about the performance and gather suggestions, with the purpose of capturing experience, improving the procedures and helping future projects.
- **Benchmarking:** process that allows organizations to compare different aspects of the current practices against best practices. The idea is to analyze the internal processes, compare with the performance of other organizations, learn and improve (Ibbs et al, 2004).
- **Centers of excellence:** a smaller organization within the company that offers advice on operating issues, provides training, and institutes mechanisms for retaining and disseminating knowledge. This is mainly useful for international companies operating in many countries.
- **Project management self-support groups or conferences:** providing formal mentoring and organizing conferences for sharing experience among peers that work in different locations.
- **The use of the intranet:** utilize Information Technology (IT) tools for document and knowledge sharing, for example e-rooms that function as a virtual project office.
- **Moving people around the organization:** strategy used for spreading and transferring experience across an organization.

Furthermore, the Project Management Institute (PMI) in its Project Manager Competency Development (PMCD) Framework proposes different ways of addressing development needs (PMI, 2007):

- **Mentoring:** a mentor is assigned to provide support, assistance and advice, and is considered as a “go to” person to discuss issues and concerns. This improves knowledge sharing and cross functional cooperation, and it is usually a relationship-oriented long-term activity with focus on development.
- **Coaching:** a coach is appointed to help the person learn about specific tasks; the focus is on concrete issues in order to improve the performance on the job. This means that this is usually a task-oriented short-term activity.
- **Peer-to-peer:** this is a situation where project managers have similar capabilities and can provide support to each other, creating a positive and collaborative environment.
- **Role playing:** this is a technique used to explore human dynamics in order to address specific behaviors in project situations.
- **On-the-job training:** performing the actual tasks in order to gain experience, confidence, and be able to execute more complex tasks gradually.
- **Group training:** consists of providing educational training to individuals with similar development needs.
- **In-house training:** consists of delivering a training course by an experienced person within the organization to tackle general improvement areas.
- **Computer-based training:** the training is provided through a computer software, usually for individuals to use it at their own pace and convenience. This tool can also be used as “refresher” material.

- **Individual training:** obtain the training in a specific knowledge area from an external provider, given that the resources are not readily available internally in the organization.
- **Conferences:** formal gatherings to discuss relevant and current topics which provide information that can help improve the job performance of an individual

The selection of the appropriate strategy will depend on individual and organizational needs, and will be constrained by the availability of resources, cost and time.

3.2 PROJECT MANAGEMENT COMPETENCE STANDARDS

The increasing concern in project management competence has originated the development of standards and certification processes that can be used for assessment, improvement and recognition (Crawford, 2013). These competency standards describe the scope of the discipline by specifying the tasks and knowledge required by the project team to execute their roles (Chen et al., 2008).

Crawford (2004) presents a comprehensive description of the current principal project management standards and guides for project management knowledge and performance. Likewise, Morris et al. (2006) and Sanjuan and Froese (2013) offer an overview of the different project management standards. These standards are of great importance since they provide the foundation for determining project management competence; hence they will be explained to detail in this section.

Project Management Body of Knowledge (PMBOK Guide) from the Project Management Institute (PMI)

The PMBOK Guide defines concepts related to project management and provides guidelines for managing projects, describing the project management lifecycle and its processes as follows (PMI, 2013):

- **Initiating Process Group:** this includes processes performed to define a new project or a new phase of an existing project. For example, defining the initial scope and committing the initial financial resources, approving the business case and aligning the stakeholders' expectations with the project's purpose.
- **Planning Process Group:** these are the processes needed to establish the project scope, refine the objectives and define the course of action. For example, developing the project plan and other documents that will be used to execute the project. Updates to these documents are expected, as more information is gathered and greater precision becomes possible.
- **Executing Process Group:** this comprises the processes performed to complete the work defined in the plan, satisfying the project specifications. It involves coordinating people and resources, managing stakeholder expectations, and integrating and performing the activities of the project in accordance with the plan. Also during project execution changes might be required, entailing planning updates.
- **Monitoring and Controlling Process Group:** these are the processes required to track, review, and control the progress and performance of the project, identifying and initiating any necessary changes. This continuous monitoring gives the project team insight into the performance of the project and allows the identification of any areas requiring additional attention in order to implement any preventive or corrective actions.

- **Closing Process Group:** this includes the processes performed to finalize all activities across all process groups and formally close the project or phase and any contractual obligations.

These process groups are illustrated in Figure 8.

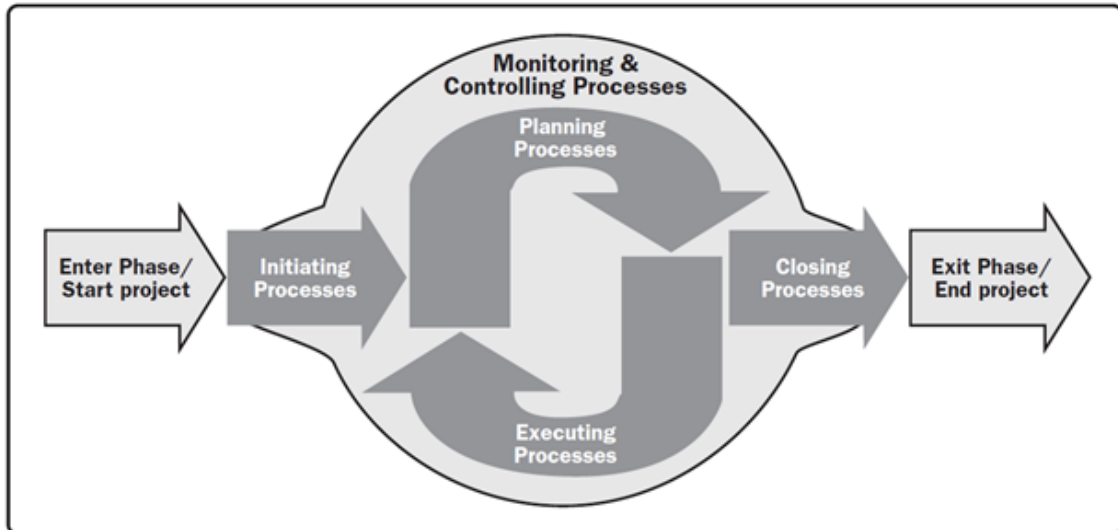


Figure 8. Project Management Process Groups

Source: PMI (2013)

The PMBOK Guide also suggests ten knowledge areas and identifies the important aspects of each of them throughout the five process groups that have been described. These knowledge areas involve the management of integration, scope, time, cost, quality, human resources, communications, risk, procurement, and stakeholders (PMI, 2013). More specification can be found in Table 3.

Table 3. Project Management Process Group and Knowledge Areas

Source: PMI (2013)

Knowledge Areas	Project Management Process Groups				
	Initiating Process Group	Planning Process Group	Executing Process Group	Monitoring and Controlling Process Group	Closing Process Group
4. Project Integration Management	4.1 Develop Project Charter	4.2 Develop Project Management Plan	4.3 Direct and Manage Project Work	4.4 Monitor and Control Project Work 4.5 Perform Integrated Change Control	4.6 Close Project or Phase
5. Project Scope Management		5.1 Plan Scope Management 5.2 Collect Requirements 5.3 Define Scope 5.4 Create WBS		5.5 Validate Scope 5.6 Control Scope	
6. Project Time Management		6.1 Plan Schedule Management 6.2 Define Activities 6.3 Sequence Activities 6.4 Estimate Activity Resources 6.5 Estimate Activity Durations 6.6 Develop Schedule		6.7 Control Schedule	
7. Project Cost Management		7.1 Plan Cost Management 7.2 Estimate Costs 7.3 Determine Budget		7.4 Control Costs	
8. Project Quality Management		8.1 Plan Quality Management	8.2 Perform Quality Assurance	8.3 Control Quality	
9. Project Human Resource Management		9.1 Plan Human Resource Management	9.2 Acquire Project Team 9.3 Develop Project Team 9.4 Manage Project Team		
10. Project Communications Management		10.1 Plan Communications Management	10.2 Manage Communications	10.3 Control Communications	
11. Project Risk Management		11.1 Plan Risk Management 11.2 Identify Risks 11.3 Perform Qualitative Risk Analysis 11.4 Perform Quantitative Risk Analysis 11.5 Plan Risk Responses		11.6 Control Risks	
12. Project Procurement Management		12.1 Plan Procurement Management	12.2 Conduct Procurements	12.3 Control Procurements	12.4 Close Procurements
13. Project Stakeholder Management	13.1 Identify Stakeholders	13.2 Plan Stakeholder Management	13.3 Manage Stakeholder Engagement	13.4 Control Stakeholder Engagement	

Project Manager Competency Development (PMCD) Framework from the Project Management Institute (PMI)

The PMCD Framework is based on the processes described in the PMBOK Guide. In this standard it is said that effective project management requires the following competences (PMI, 2007), which are in line with what has been proposed by the authors cited in the previous section:

- **Knowledge:** refers to the knowledge about project management
- **Performance:** refers to what the individuals are able to accomplish while applying their project management knowledge
- **Personal:** refers to the behavior when executing the project, comprising attitudes, core personality characteristics, interpersonal skills and leadership.

These dimensions are depicted in Figure 9.

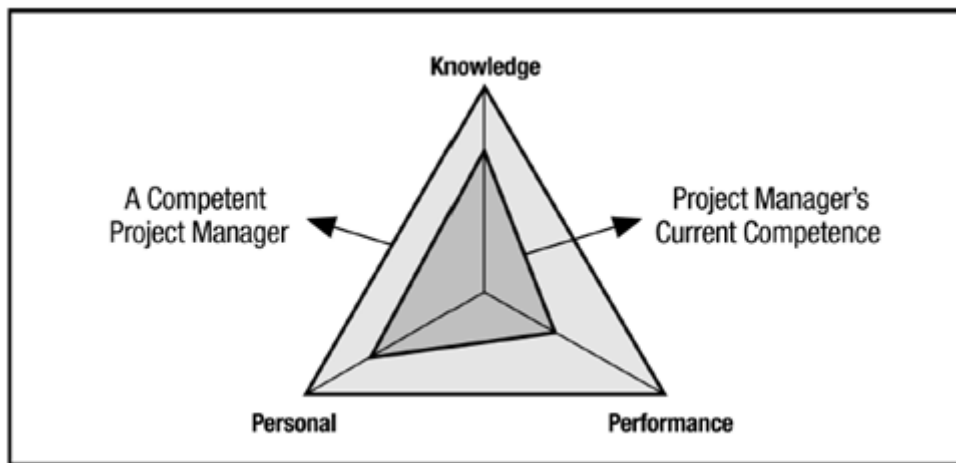


Figure 9. PMCD Framework dimensions of competence

Source: PMI (2007)

The performance competences and the personal competences suggested by the PMCD Framework are presented in Figure 10 and Figure 11 respectively.

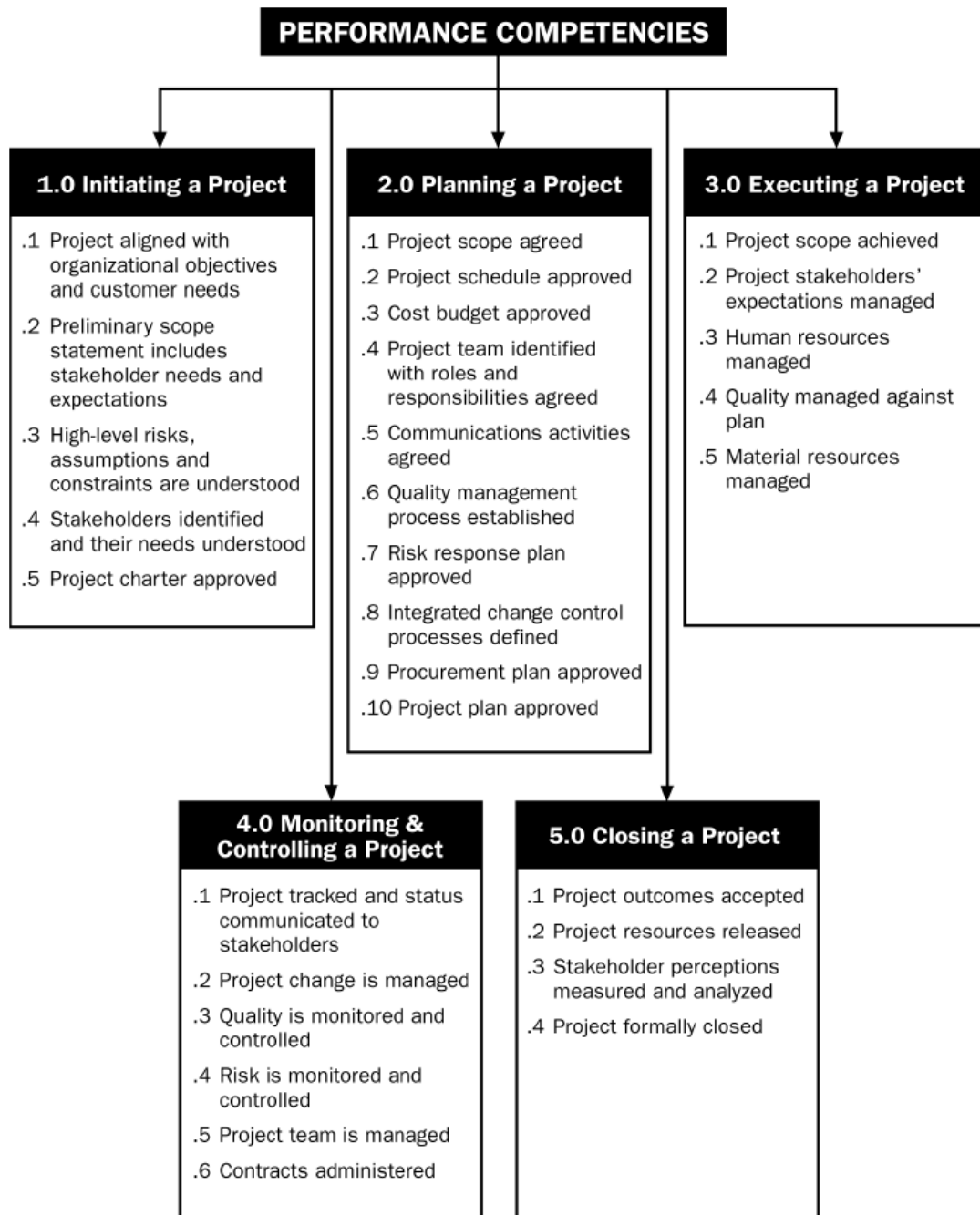


Figure 10. Elements of Performance Competence

Source: PMI (2007)

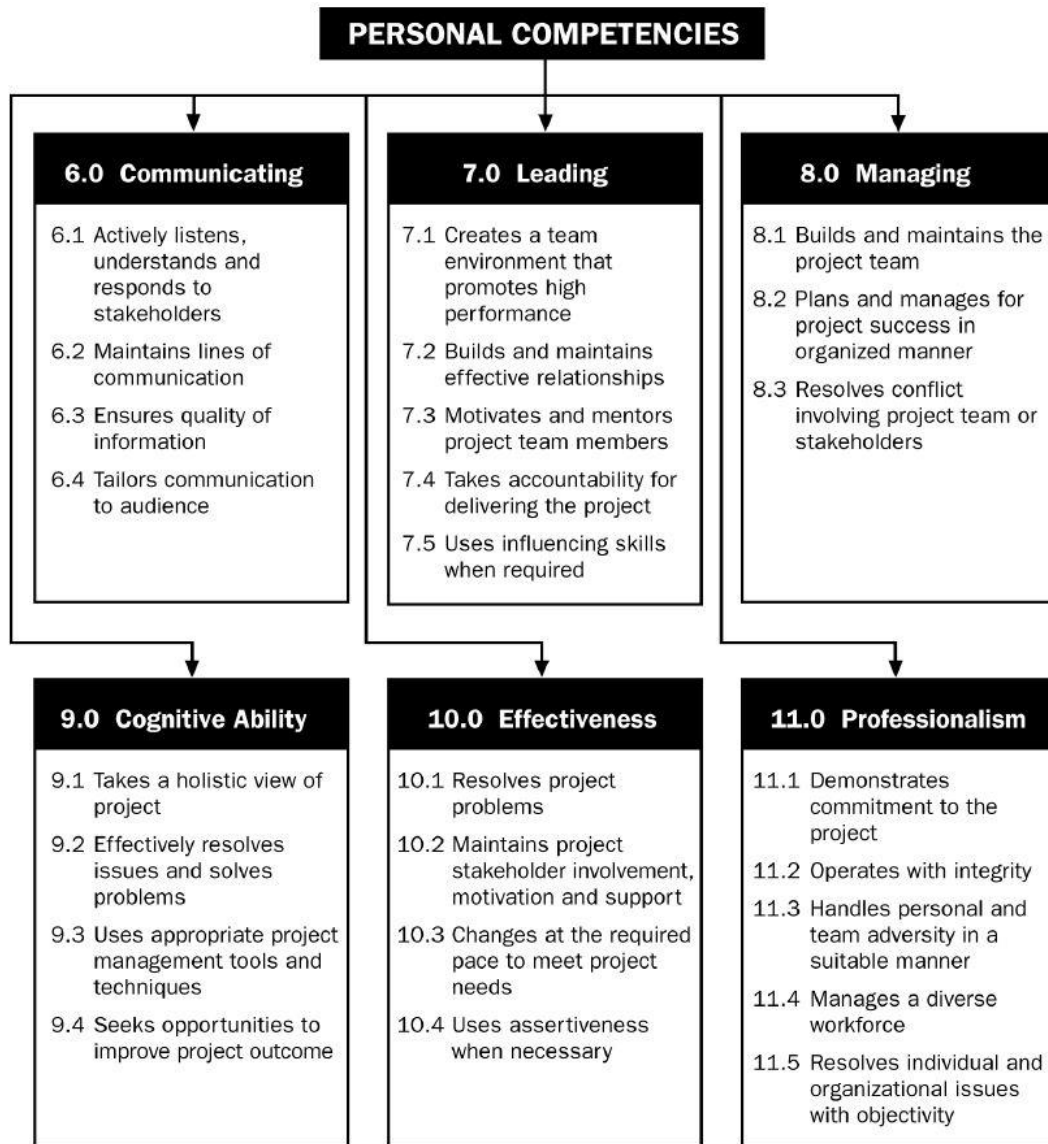


Figure 11. Elements of Personal Competence

Source: PMI (2007)

Additionally, the PMCD Framework states that organizations need to supplement these generic competences with industry-specific competences that are required to meet their specific needs. Therefore, considering that this master thesis is carried out within the Project Control and Analysis (PCA) department in Statoil, Figure 12 offers an overview of the project control processes, which will be explained in the next chapter.

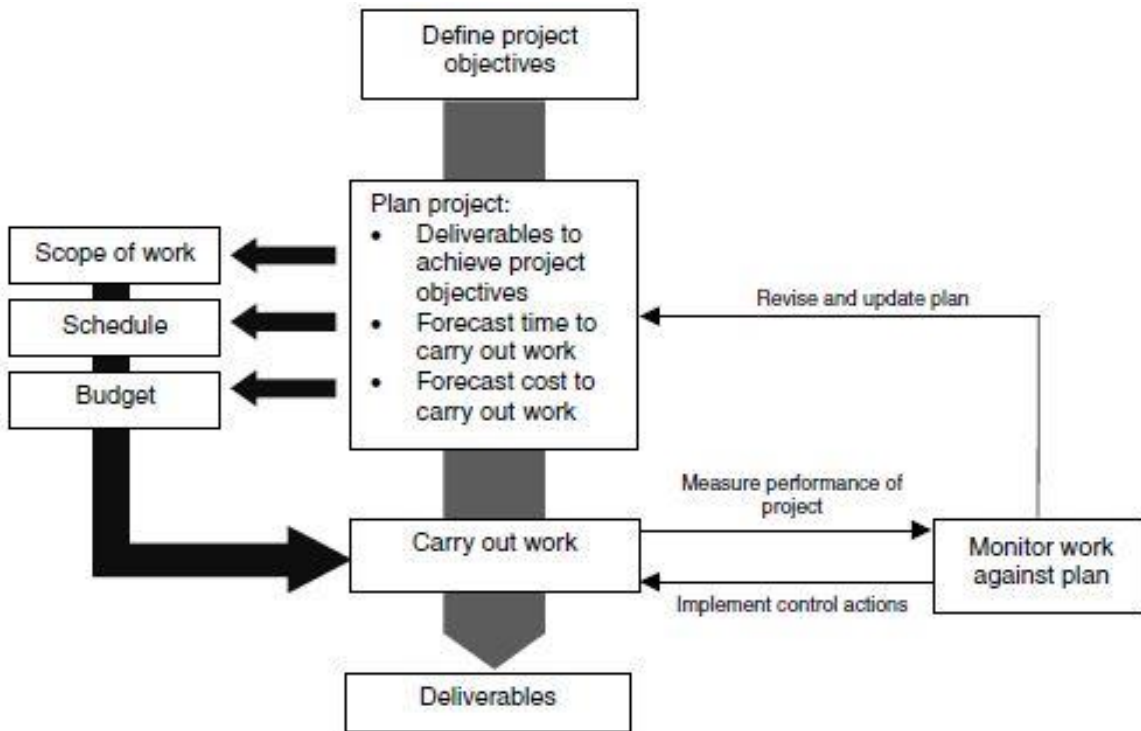


Figure 12. Project control process

Source: Harpum (2007)

IPMA Competence Baseline (ICB) from the International Project Management Association (IPMA)

The ICB proposes “The Eye of Competence”, which represents the integration of the project management elements when evaluating a specific situation, seen from the project manager’s perspective and with the eye symbolizing clarity and vision (IPMA, 2006). As illustrated in Figure 13, this standard divides competences within three different groups:

- **Technical competences:** they cover the project management content on which the professionals work, describing 20 technical competence elements.
- **Behavioral competences:** they contain personal aspects and attitudes, describing 15 behavioral competence elements.

- **Contextual competences:** they deal with the interaction of the project team with the permanent organization within the context of the project, describing 11 contextual competence elements.

The specific elements contained in each competence group are presented in Figure 14.

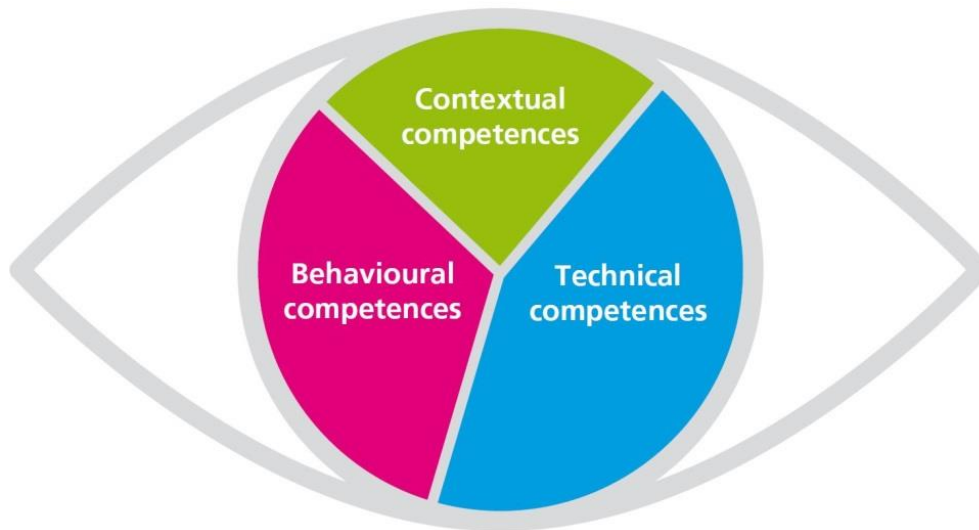


Figure 13. The Eye of Competence

Source: IPMA (2006)

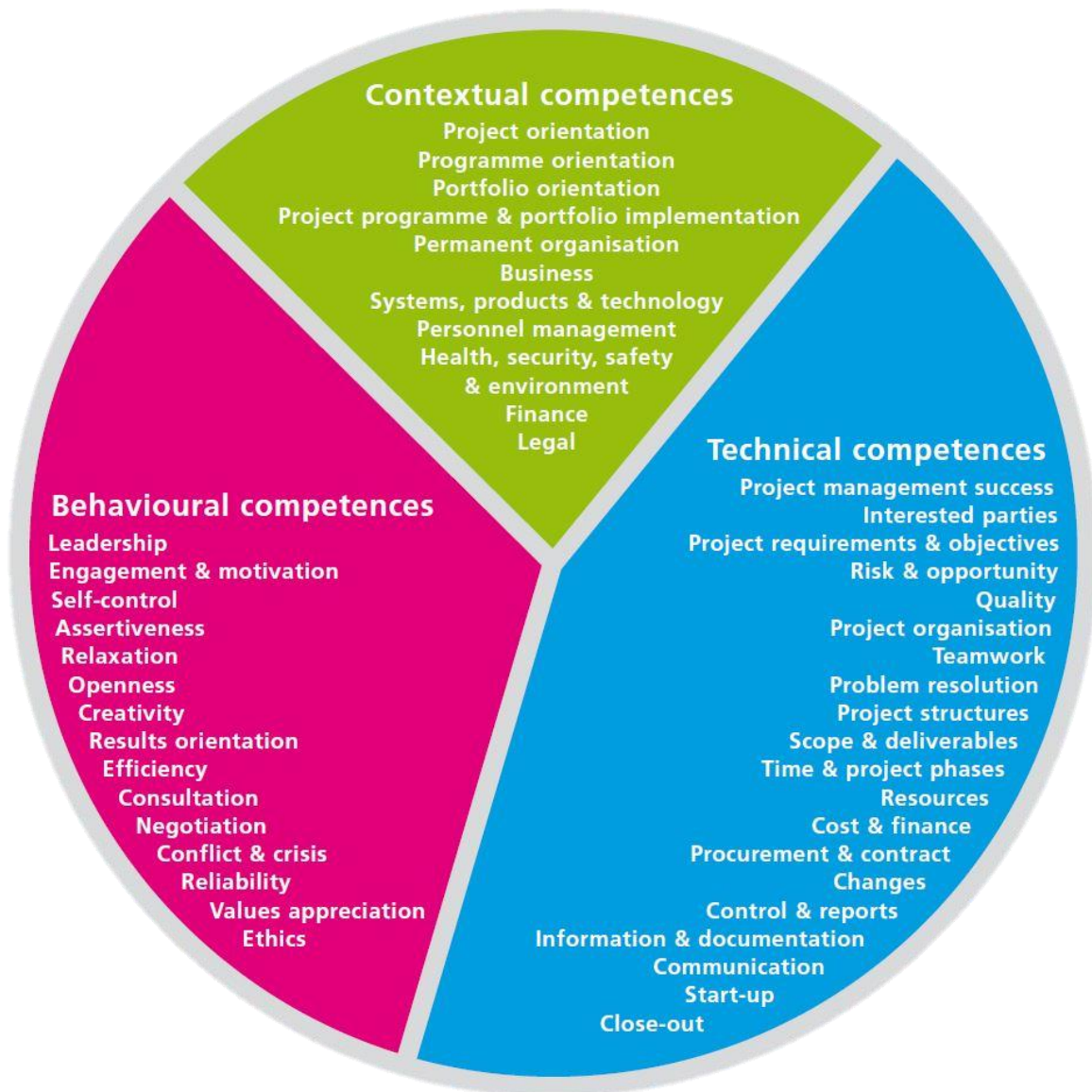


Figure 14. Competence elements from the ICB

Source: IPMA (2006)

It can be noticed that the behavioral competences proposed in the ICB are consistent with the personal competences from the PMCD Framework, but are divided into more specific elements. The same occurs with the contextual and technical competences compared to the performance competences from the PMCD Framework.

Professional Competency Standards for Project Management from the Australian Institute of Project Management (AIPM)

This standard details the elements of competence in project management across nine different units, which are integration, scope, time, cost, quality, communications, human resources, risk and procurement (AIPM, 2010). In addition, this is supported by the Project Management Competency Standards from the organization Innovation and Business Skills Australia (IBSA), comprising specific performance criteria, required knowledge and skills for each of the elements within these units (IBSA, 2004).

Even though the AIPM is a member association of the IPMA, it can be observed that this standard is consistent with the areas that are proposed in the PMBOK Guide instead.

APM Competence Framework from the Association for Project Management (APM)

The APM is the certification body in the United Kingdom for the IPMA, and its Competence Framework is grounded both on the APM Body of Knowledge and on the ICB, proposing “The Wheel of Competence”, which is based on the same concept as “The Eye of Competence” and divided in the same three competence domains: technical competences, behavioral competences and contextual competences (APM, 2008). Moreover, the competence elements are centered by five key concepts: project management, program management, portfolio management, project context, and project office. This is depicted in Figure 15.

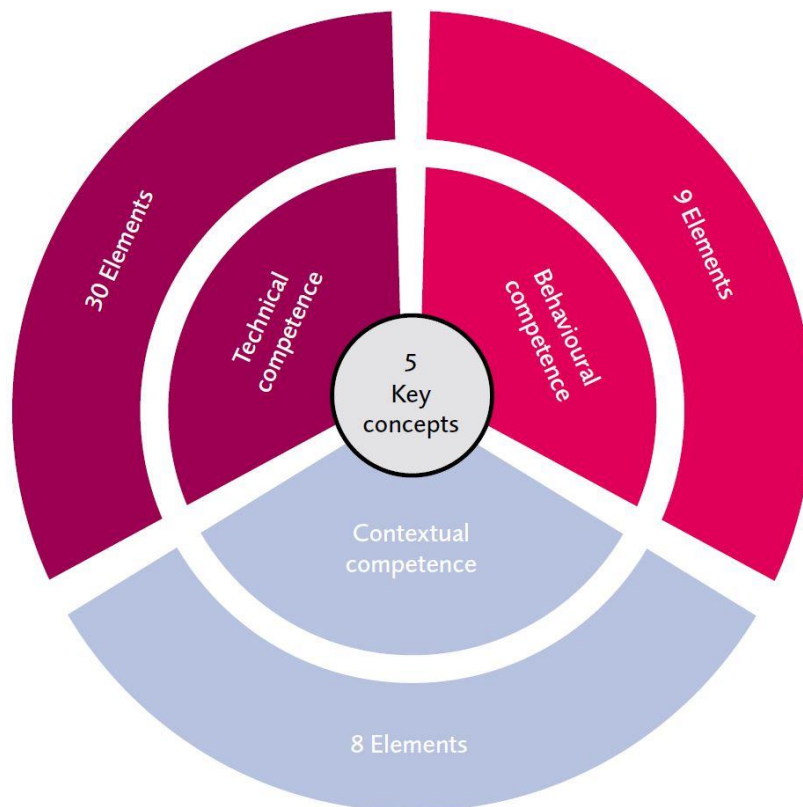


Figure 15. The Wheel of Competence

Source: APM (2008)

The main difference with the ICB is the number of competence elements considered in each group:

- 30 technical competence elements (instead of 20 from the ICB)
- 9 behavioral competence elements (instead of 15 from the ICB)
- 8 contextual competence elements (instead of 11 from the ICB)

The specific elements contained in each competence group are presented in Table 4.

Table 4. Competence elements from the APM Competence Framework

Source: APM (2008)

Technical competence (TC)		Behavioural competence (BC)		Contextual competence (CC)	
TC01	Concept	BC01	Communication	CC01	Project sponsorship
TC02	Project success and benefits management	BC02	Teamwork	CC02	Health, safety and environmental management
TC03	Stakeholder management	BC03	Leadership	CC03	Project life cycles
TC04	Requirements management	BC04	Conflict management	CC04	Project finance and funding
TC05	Project risk management	BC05	Negotiation	CC05	Legal awareness
TC06	Estimating	BC06	Human resource management	CC06	Organisational roles
TC07	Business case	BC07	Behavioural characteristics	CC07	Organisation structure
TC08	Marketing and sales	BC08	Learning and development	CC08	Governance of project management
TC09	Project reviews	BC09	Professionalism and ethics		
TC10	Definition				
TC11	Scope management				
TC12	Modelling and testing				
TC13	Methods and procedures				
TC14	Project quality management				
TC15	Scheduling				
TC16	Resource management				
TC17	Information management and reporting				
TC18	Project management plan				
TC19	Configuration management				
TC20	Change control				
TC21	Implementation				
TC22	Technology management				
TC23	Budgeting and cost management				
TC24	Procurement				
TC25	Issue management				
TC26	Development				
TC27	Value management				
TC28	Earned value management				
TC29	Value engineering				
TC30	Handover and closeout				

Project Management Competence Framework for the Engineering Construction Industry from the Engineering Construction Industry Training Board (ECITB) in the United Kingdom

This framework highlights generic project management competences across the project life cycle and offers a self-assessment tool to identify the competence level required in different aspects, which are grouped into two broad areas (ECITB, 2010):

- Systems and processes, with 25 elements
- Leadership, with 33 elements

In this standard it is stated that the competences proposed are based on the framework from the PMI and the APM. However, the categorization and division of the elements in comparison to the standards from the aforementioned organizations is done differently.

In addition, the ECITB has issued the National Occupational Standard for Project Control, which includes several units within the areas of technical skills, working with people and managing oneself, project development, implementation and close-out (ECITB, 2004).

3.3 DESIGN AND EVALUATION OF COMPETENCE ASSESSMENT TOOLS

Cicmil et al. (2006) indicate that the process of learning, developing and mastering project management competences requires context-dependent reflection about knowledge and experiences. Hence, self-assessment is an essential element for project managers and team members, as this allows individuals to become aware of their own practice and need for improvement, and to seek opportunities for professional development to enhance their competence (Jabar et al., 2013).

Within this context, the self-assessment tool entails a questionnaire where individuals appraise their current level of knowledge and skills in different areas. Therefore, it is

important to review the characteristics for designing and evaluating questionnaires as competence assessment tools.

There has been extensive research on how questionnaires should be designed, and many authors have methodically manipulated the design of questionnaires with the intention of examining the impact of particular design aspects. Braun et al. (2012) have investigated the results of these studies and proposed guidelines on how to design a self-rating questionnaire, focusing on the context in which a question appears, the way a question is expressed, and the range of possible answers.

It has been identified that the context in which a question appears seems to have an influence in the way individuals interpret items in questionnaires. This means that special attention should be put in the order, categorization and grouping of items. Moreover, questions should be worded precisely and all the terms used should be familiar to the survey population (Braun et al., 2012).

Regarding the response alternatives, Lusthaus et al. (1999), express that it is useful to implement a rating scale as this standardizes the answers and allows collecting information efficiently. Lucas and Baird (2006) suggest using only positive numerical values when implementing a numerical response scales, due to the fact that individuals are inclined to not choose negative values because they seem to have a certain connotation. For example, if a scale ranges from “-2” to “2”, respondents are likely to interpret the lower end as “very incompetent” and the upper end as “very competent”. In contrast, if the scale ranges from “0” to “4”, respondents are likely to interpret the endpoints as “less competent” and “very competent” (Braun et al., 2012). Therefore, Richardson (2004) also recommends using verbal descriptors to avoid any struggle with the interpretation of numbers.

The foundation for generating the items in the competence assessment tool is the information about the organizational processes, meaning the activities that need to be

executed and that require specific knowledge and skills, embodied in procedure manuals, flowcharts and job descriptions, and the best way to develop the competence list is with a top-down approach, going from general to specific (Cooper, 2000).

Shermon (2004) has determined that the main reason why people do not perform on their jobs is because they do not know what is expected or how to do it, they do not get feedback about performance quality, they are punished when they do it right, rewarded when they do it wrong or are just ignored. Therefore, the employer needs to establish the requirements in each competence for the type of job the individual holds, offer timely and appropriate feedback, and provide opportunities for professional development (Sanghi, 2004).

Succar et al. (2013) express that individual competence cannot always be designated as “competent” or “incompetent”; instead it is more appropriate to use different competence increments or levels. As a result, Succar et al. (2013) propose the Individual Competency Index (ICI), which includes five different competence levels assessing both knowledge and experience and following the previously explained recommendations from Lucas and Baird (2006) and Richardson (2004), as described below:

- **Level 0 (none):** lack of competence in a specific area or topic
- **Level 1 (basic):** understanding of fundamental concepts and some initial practical application
- **Level 2 (intermediate):** intermediate conceptual understanding and some practical application
- **Level 3 (advanced):** good conceptual knowledge and practical experience in performing to a consistently high standard
- **Level 4 (expert):** extensive knowledge and prolonged experience in performing to the highest standard

A graphical representation of the ICI is presented in Figure 16.

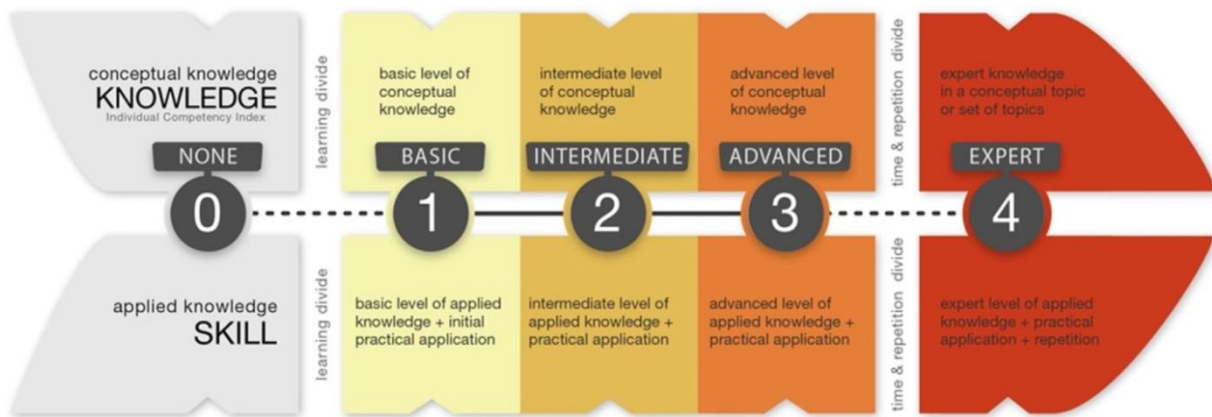


Figure 16. Individual Competency Index (ICI)

Source: Succar et al. (2013)

The ICB and the APM Competence Framework offer a similar approach, by defining a scoring matrix with four different levels that also consider both knowledge and experience, as follows:

- **None:** no knowledge or experience related to the competence, with a score of 0
- **Low competence:** limited knowledge and experience, indicating conceptual knowledge and some practical experience, ranging on a scale from 1 to 3
- **Medium competence:** significant knowledge and experience, denoting a solid level of knowledge and considerable experience, ranging on a scale from 4 to 6
- **High competence:** extensive knowledge and experience, representing excellent knowledge and broad experience, ranging on a scale from 7 to 10

The ECITB Competence Framework has also a five level scoring mechanism with similar definitions as the ones found on the ICI:

- Level 0: no knowledge
- Level 1: knowledge
- Level 2: comprehension/understanding

- Level 3: application
- Level 4: strategic application

Concerning the evaluation of competence assessment tools, the main criteria that define the quality of the instrument designed are the reliability and validity. Braun et al. (2012) define reliability as the need for a questionnaire to produce consistent results when used repeatedly under the same circumstances with the same participants, being relatively unaffected by errors of measurement. The same authors define validity as the degree to which a test measures what it is supposed to measure.

Bryman (2012) proposes similar definitions, stating that reliability entails the stability of the instrument (little variation when administering and re-administering the questionnaire to a group) and the consistency of the scale used, and that validity refers to whether or not a measure of a concept really measures that concept. Borsboom et al. (2004) express that an instrument is valid for measuring an attribute if the attribute exists and if variations in the attribute causally produce variation in the measurement outcomes.

In other words, reliability represents the consistency and repeatability of a measure and validity is the accuracy of the measure. This means that reliability is a necessary condition for validity, but not sufficient (Lee, 1999). Hence, it is important to recognize how to guarantee the validity and reliability of the competence assessment tool.

Braun et al. (2012) specify that “in order to generate valid and reliable answers from the respondents, both the questions and the response alternatives should be clear, unambiguous, and easily cognitively accessible to the respondent”. Van der Vleuten (1996) suggests that structuring and standardization of the competence assessment tool has a positive impact on the reliability of the instrument, and that validity is greatly improved when the instrument is evaluated in a review process, including item analysis and testing.

Van der Vleuten (1996) also states that it is nearly impossible to write a flawless questionnaire regardless of the methodology. Nevertheless, even the simplest reviewing process will have positive consequences. In this sense, it is valuable to investigate previous work covering the competence assessment topic and the methodology used to ensure reliability and validity.

The objective of the work from Thomas et al. (2008) was to develop and validate a questionnaire as a self-assessment tool to identify the competence from physiotherapists undertaking respiratory on-call duty. The questionnaire was developed by creating a comprehensive list of competences based on competence literature and related guidelines. The initial draft was piloted and further interviews with open questions were conducted to identify the value of the tool, evaluate the validity, clarity, unambiguity and comprehensiveness of the items in the tool, and to obtain recommendations for changes and additions.

In the study from Robinson et al. (2007) the methodology used involves preliminary interviews and the application of a questionnaire, and the input from these phases is used to create the final competence framework. Similarly, Jabar et al. (2013) conducted semi-structured interviews to identify the different competences of a construction manager, and a questionnaire was sent by email to each individual prior to the interview session to improve the understanding and communication.

Likewise, the work from Edum-Fotwe and McCaffer (2000), Chen et al. (2008), Patanakul and Milosevic (2008), and Young and Conboy (2013), is based on conducting interviews with experts to identify project management competences. Peacock and Rawson (2001) also use a collaborative approach to identify, categorize and review competence criteria.

On the other hand, a recent study from the Construction Industry Institute (CII) to identify future competences for delivering projects successfully based its methodology on an extensive literature review within the topic and the execution of one-day training sessions among project professionals, identifying their views on project management competences through team exercises, games and the simulation of project situations (CII, 2012). This research approach was classified as “unique” by the CII, given that it did not include classical interviews to collect the opinions from the practitioners.

After the competence assessment tool has been designed and evaluated taking into consideration the aspects that have been described in this section, the final version can be used for implementing the competence development process described in Section 3.1 and depicted in Figure 7, characterized by continuous review and improvement. According to Erricker (2010), the establishment of a competence framework offers the following organizational benefits:

- Creation of a common competence language
- Creation of role profiles across an organization
- Visibility of required competences
- Identification of personal strengths and weaknesses
- Identification of trends in organizational training needs
- Creation of personal development plans
- Improved career development
- Improved performance management
- Improved organizational capability

More organizations are becoming aware of these benefits and consequently developing and implementing competence assessment tools. Some examples will be

presented of companies from the public and private sector working in different industry areas, for instance health, justice, media, engineering, and oil and gas.

American College of Healthcare Executives (ACHE)

The American College of Healthcare Executives (ACHE) Competencies Assessment Tool offers a self-assessment instrument for the healthcare management area, divided into five domains: communication and relationship management, professionalism, knowledge of the healthcare environment, business skills and knowledge, and leadership. It is used for identifying strengths as well as gaps in the necessary skills, with the purpose of designing and adequate training and development plan (ACHE, 2013).

Institution of Civil Engineers (ICE)

The Institution of Civil Engineers (ICE) in the United Kingdom has created the Competency Framework for Professional Development, which provides a self-assessment tool to identify the competence of the members within 3 competence groups: practice competences, behavioral competences and contextual competences, evaluated according to a scale of five competence levels: none, low, good, informed and model (ICE, 2011). This framework is in line with the ICB and with the APM Competence Framework.

Ministry of Justice in the United Kingdom

The Ministry of Justice in the United Kingdom has developed the Professional Skills Framework for Program and Project Management, which provides the basis for assessing the skills of the employees in four categories: business case and financial management, control and assurance, people and process, and according to three levels: awareness, practitioner and

expert (Ministry of Justice UK, 2007). This framework does not seem to be based in any of the standards described in the previous section, although it presents some similar elements.

Shell

Shell has created a competence development scheme through the Shell Project Academy (SPA), in order to address the individual learning needs identified through a formal self-assessment that compares the individual's current competence level with the target level, including input from the line manager (APM, 2011). The SPA learning program is aligned with the APM Body of Knowledge and holds the APM Corporate Accreditation.

National Aeronautics and Space Administration (NASA)

The NASA Project Management and Systems Engineering Competency Framework consists of five project management competence areas (project conceptualization, resource management, project implementation, project closeout, and program control and evaluation), three systems engineering competence areas (system design, product realization and technical management) and five common competence areas between the two fields (internal and external environments, human capital management, security, safety and mission assurance, professional and leadership development, and knowledge management) (NASA, 2012).

It can be noticed that the project management areas from this framework are consistent with the process groups proposed in the PMBOK Guide and the PMCD Framework.

British Broadcasting Corporation (BBC)

The British Broadcasting Corporation, best known by its acronym BBC, developed the BBC Project Management Competency Framework, which defines the core competencies

required by each of the 6 project, program and portfolio management roles present in the company. This tool is based on the APM Competence Framework and on the ICB, and is tailored to the functions and processes of the organization (BBC, 2010).

The competences are divided into four different groups: technical competences, context competences, commercial, finances and resources competences, and behaviors and leadership competences. Each element in these groups is defined and assessed according to a scale of five capability levels: awareness, working knowledge, practitioner, expert and innovator.

Rolls-Royce

According to an investigation from Gale (2007), Rolls-Royce plc. utilizes an electronic questionnaire for competence assessment related to project management roles. This questionnaire considers knowledge and experience based on the APM Competence Framework and the IPMA certification levels, and is designed to not take more than twenty minutes to answer. This tool is applied in self-assessment and reviewed by the manager, and the details remain confidential between the employee and the manager.

It can be noted that these organizations do not specify the methodology they have followed to develop their competence assessment tool, but they have done it based both on internal processes and on applicable standards, for example the PMCD Framework, the ICB and the APM Competence Framework. This is in line with the suggestion from Buganza et al. (2013), stating that it is more appropriate for companies to create a specific competence model instead of solely implementing an existing standard.

4. RESULTS AND DISCUSSION

This chapter describes the processes for the execution of the functions in the Project Control and Analysis (PCA) department, and presents the initial competence assessment tool designed based on these functions and on the project management competence literature. Furthermore, this chapter explains the results of the evaluation of the instrument, containing the final competence assessment tool and offering suggestions regarding the competence development methods in the department.

According to Crawford (2005) and supported by Yound and Conboy (2013), it is fundamental to identify what employees are expected to do in their working roles and what is the required level of performance in these tasks as a first step to assess and recognize the competence of an individual.

Consequently, it is necessary to gain a deep insight into the overall functions and responsibilities of the organization under study, and review the description of the five different position types that are found in the department, which are:

- Project Control Manager
- Project Control Engineer
- Planner
- Cost Control Engineer
- Project Economist

Hence, the next section is dedicated to explain the tasks from the PCA department and Appendix 4 presents the job descriptions.

4.1 PCA PROCESSES

The Capital Value Process (CVP) is Statoil's decision process for investment projects, providing a structured and comprehensive approach to project identification, planning and execution. Throughout the different decision gates (DG), an investment project is developed from a business opportunity into profitable operations for the total value chain of the company (Statoil, 2013).

The CVP is illustrated in Figure 17.

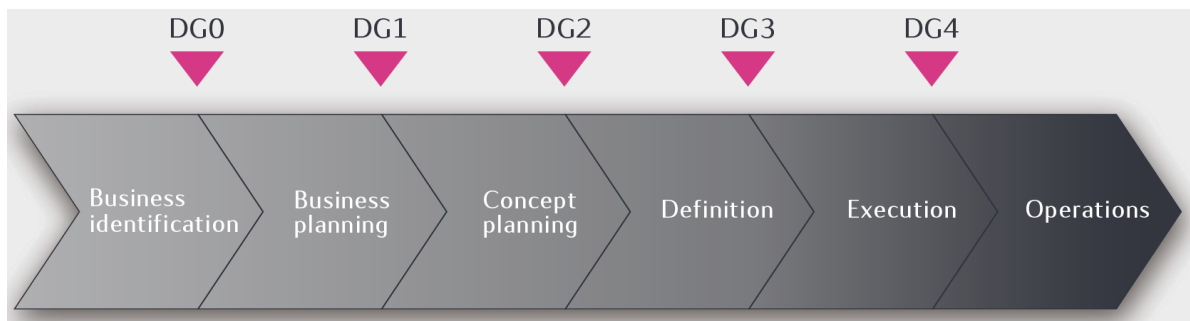


Figure 17. Capital Value Process (CVP)

In each of the phases of the CVP there are different processes to be performed; these are specified in Figure 18. These processes are presented interactively in ARIS, which is Statoil's management system tool, available in the intranet of the company. By clicking each of them in the computer system one can access the corresponding workflows and associated governing documents and guidelines.

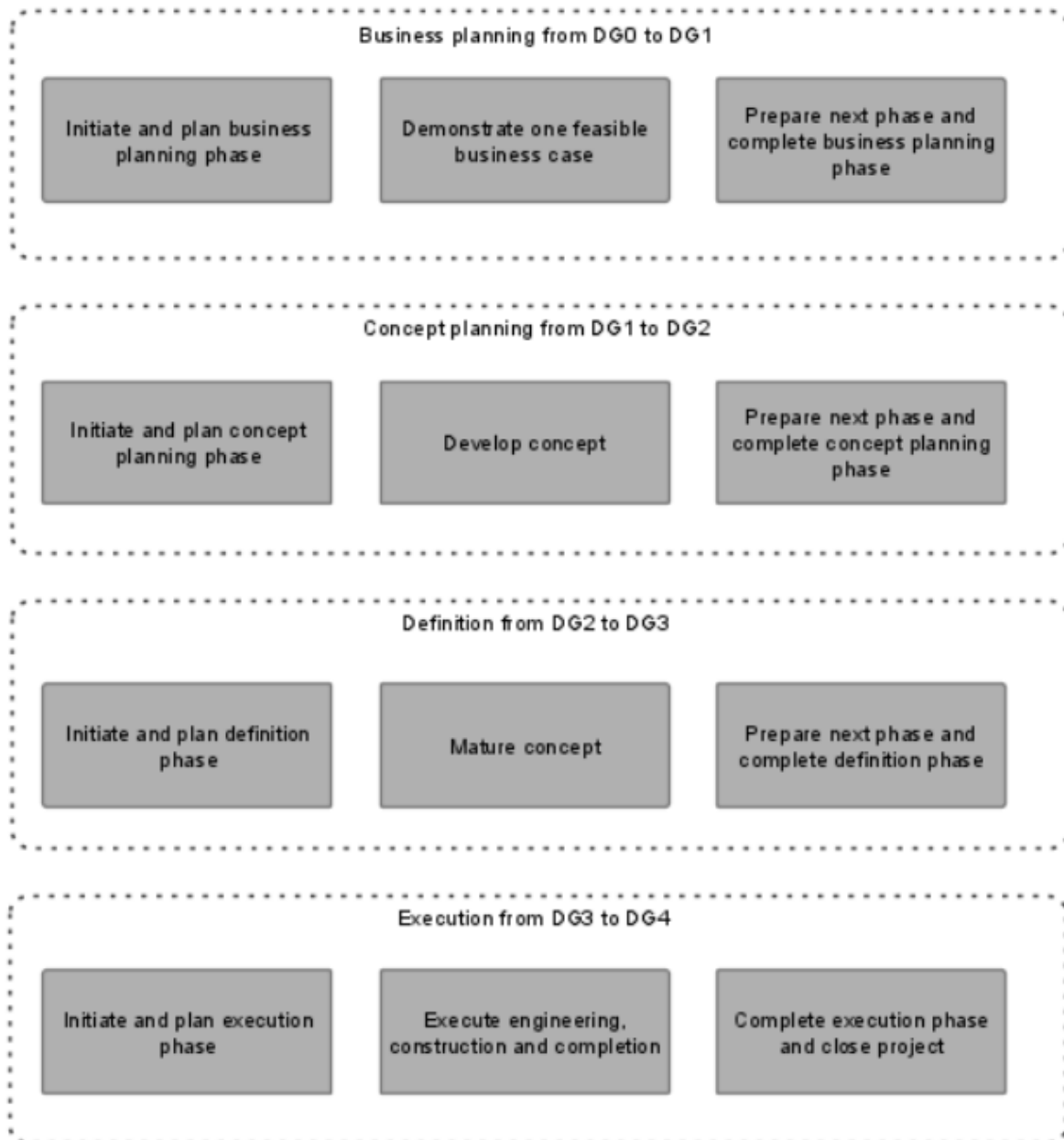


Figure 18. Processes inside the phases of the CVP

During the phases of Business planning, Concept planning and Definition of the investment project, the PCA department has the following responsibilities:

- Provide discipline planning input to the Project Work Plan (PWP), including the establishment of the Work Breakdown Structure (WBS)

- Establish the Project Planning Basis (PPB), including Manpower Projection Plan (MPP), Project Master Schedule (PMS), interface, drilling and contract schedules, critical path and float development, and schedule risk analysis
- Establish and maintain cost control system (using the software SAP)
- Follow up and analyze time and cost
- Establish the Project Control Basis (PCB), including the Project Planning Basis (PPB) and cost estimates.

However, most of the PCA involvement comes in the Execution phase of the projects. Inside the process of “*Execute engineering, construction and completion*” (see Figure 18) there is a process called “*Perform project control*”. This includes workflows and guidelines specifically for the functions of the PCA department, divided in four phases:

- Follow up cost and time periodically
- Create periodic report in execution phase
- Update project baseline
- Update contract baseline

These phases will be explained further, after reviewing and synthesizing the information contained in the multiple applicable governing documents and guidelines.

4.1.1 Follow up cost and time periodically

The workflow for this process is presented in Figure 19. During this phase, PCA must:

- Collect and verify progress and cost reports
 - Schedule control and forecasting based on status reporting of the Project Detailed Schedule (PDS) and risk assessments.

- Project status reporting. This includes progress on the Project Master Schedule (PMS), Project Detailed Schedule (PDS) and Earned Value Management (EVM).
- Analyze schedule and cost performance
 - Perform cost risk assessment and analyze current status, based on performance and risk picture
 - Schedule forecasting, based on schedule analysis
- Report progress and cost status and forecast

4.1.2 Create periodic report in execution phase

The workflow for this process is presented in Figure 20. During this phase, PCA must:

- Collect status information
 - Collection, verification and registration of status data
 - Analysis of trends
 - Establishment of forecast and currency impact
- Verify overall status and prepare periodic report
 - Monthly reporting. This includes aspects from Health, Safety and Environment (HSE), Quality and Risk Management, actual cost of work performed, schedule progress, deviations and forecasts.
- Update MIS (Management Information System)
 - Project status data are collected, verified and registered as part of the monthly reporting routines.

4.1.3 Update project baseline

The workflow for this process is presented in Figure 21. A baseline means rescheduling the remaining scope of work and updating the project cost estimate. During this phase, PCA must:

- Establish plan for baseline
 - Detailed schedule for this work process
- Perform baseline and update current control estimate and schedule
 - Review and update WBS and forecast of man-hours
 - Perform risk assessment
 - Update schedules, including interface and supervision schedule
 - Update cost estimate
 - Perform time phasing (schedule the remaining work and cost)
- Approve and update the Project Control Basis (PCB)

4.1.4 Update contract baseline

The workflow for this process is presented in Figure 22. This includes the same activities from the “*Update project baseline*” process, but it is done at the contract level. This requires a close dialog between the company and the contractor to secure high quality and timely delivery, and the characteristics for this baseline are specified in the contract.

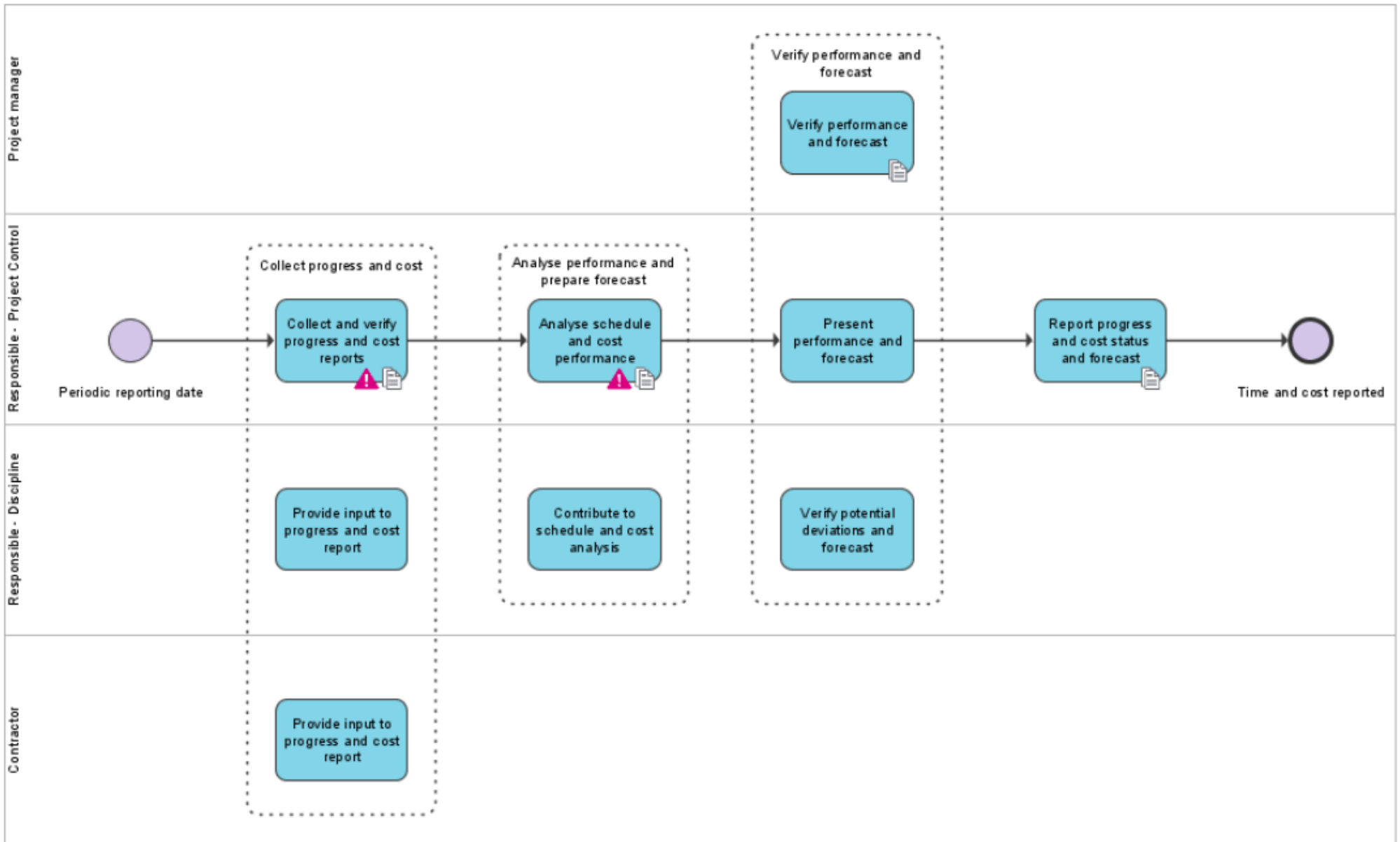


Figure 19. Workflow 1 - Follow up cost and time periodically

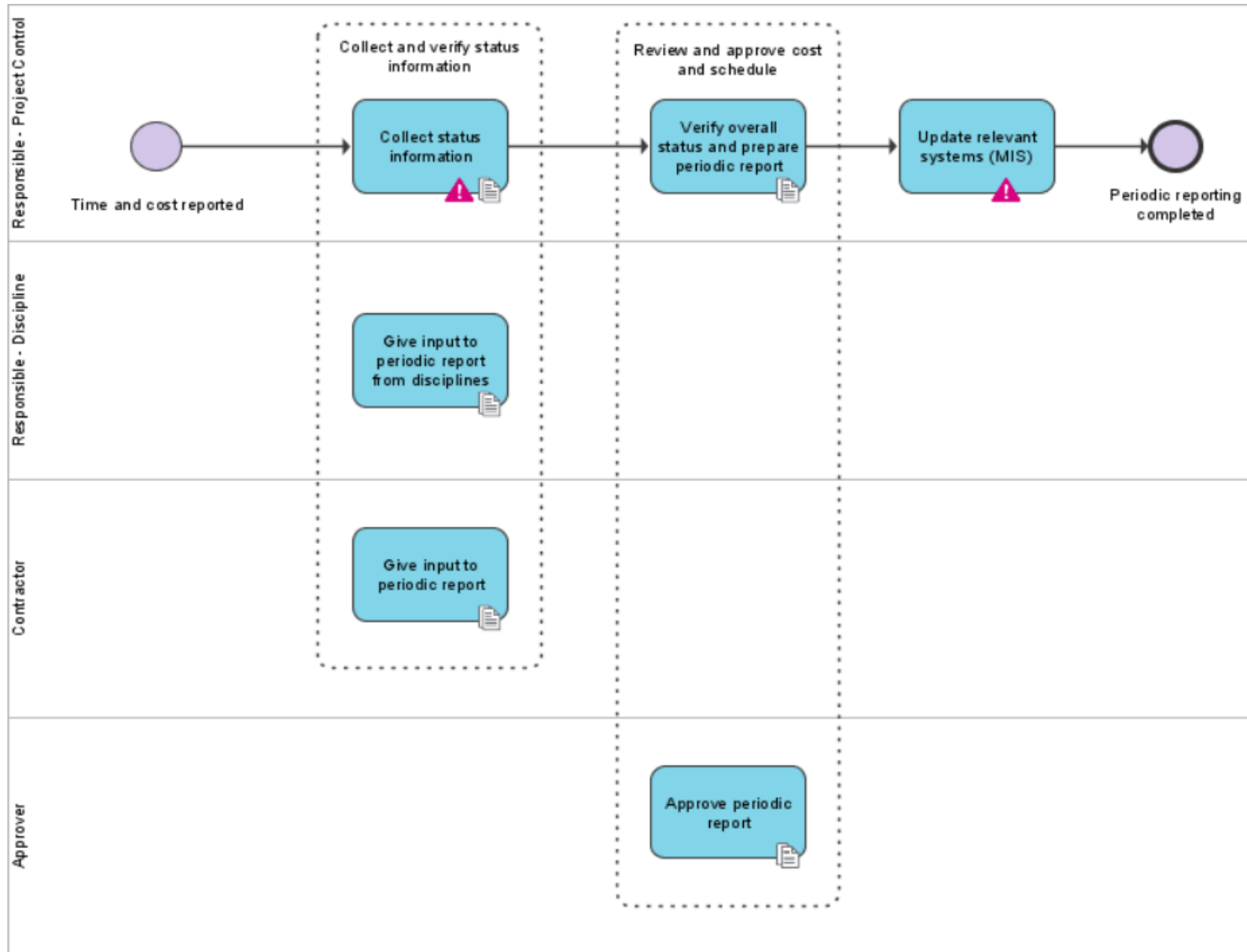


Figure 20. Workflow 2 - Create periodic report in execution phase

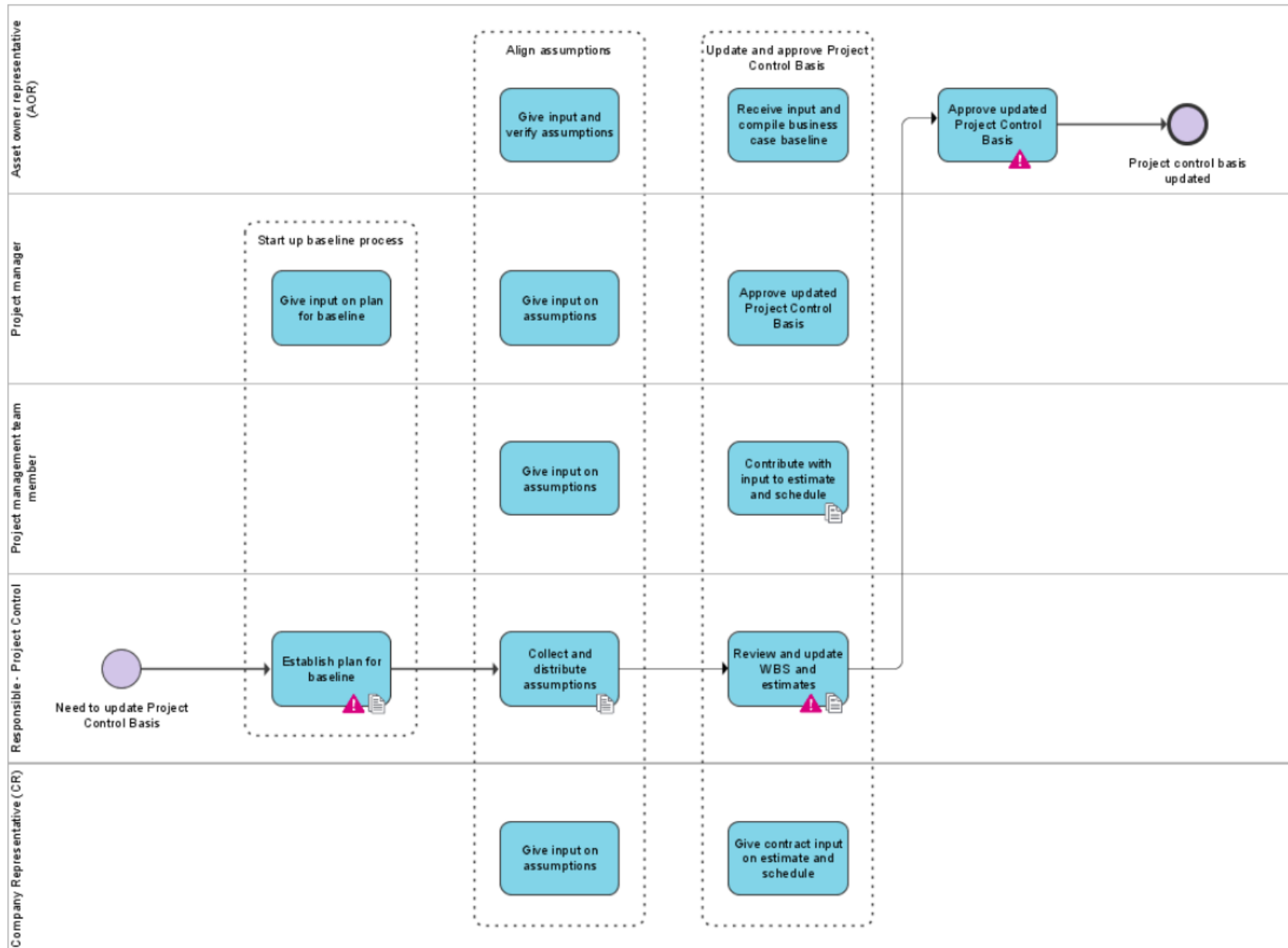


Figure 21. Workflow 3 – Update project baseline

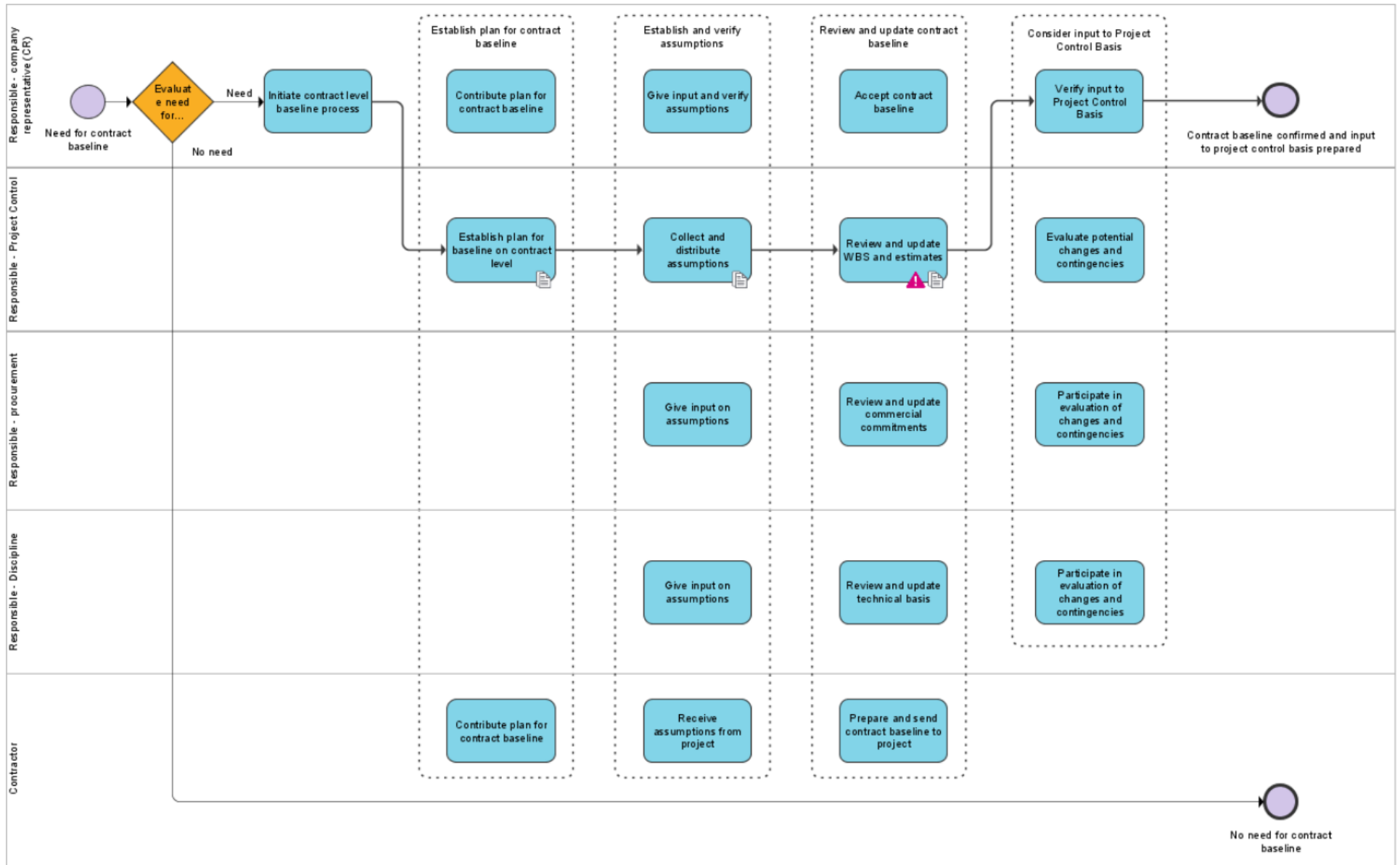


Figure 22. Workflow 4 – Update contract baseline

The Information Technology (IT) tools that are used for carrying out the activities are:

- SAP
- PIMS
- Safran Planner SQL
- ProCoSys
- E-rooms and team sites, for collaborative work and document management

After the project has finished Execution and has entered the Operations phase, the PCA department must perform the close-out of the cost control system to ensure that no further costs are charged to the project.

4.2 DESIGN OF THE COMPETENCE ASSESSMENT TOOL

As it has been described in the Literature Review (see Chapter 3, section 3.3), public and private organizations across multiple industry sectors have developed and implemented competence assessment tools based on a specific project management competence standard. For example, Rolls-Royce has created a competence assessment questionnaire founded on the APM Competence Framework and the IPMA certification levels (Gale, 2007); BBC bases its competence assessment on the APM Competence Framework and on the ICB (BBC, 2010); Shell has created a project academy that is aligned with the APM Competence Framework (APM, 2011); and the competence framework from NASA is consistent with the PMBOK Guide and the PMCD Framework (NASA, 2012).

During the review of the organizational information, it was noticed that Statoil's main governing document for project development and the subsequent documents and guidelines are based on the knowledge areas suggested by the PMBOK Guide. Therefore, it is

considered appropriate to align the competence assessment tool with the PMBOK Guide and the PMCD Framework.

Consequently, the competence groups to be included in the instrument are suggested by the author based on the tasks executed by the department and taking into account the knowledge areas and elements described in the PMBOK Guide (PMI, 2013), adding a competence group called “Management system” to identify the organizational knowledge since this is paramount for the execution of the functions, as well as a competence group related to the use of Information Technology (IT) tools.

This is in line with the suggestion from Buganza et al. (2013), who state that it is more appropriate for companies to create a specific competence model instead of solely implementing an existing standard. Thus, the competence groups for the assessment tool are as follows:

- Management system
- Scope management
- Human resource management
- Time management
- Cost management
- Procurement management
- Integration management
- Quality management
- Risk management
- Stakeholder management
- Information Technology (IT) tools

As stated in the work from Spencer and Spencer (1993), Crawford (2005), Gale (2007) and Succar et al. (2013), the concept of competence includes not only the knowledge and skills that an individual needs to have within the project management areas suggested

before, but also the personality characteristics required to do the job. In this sense, the employees in the PCA department are expected to have the following personal qualities:

- High focus on HSE, ethics and Statoil's values
- Cultural openness
- Strong collaborative and communication skills
- Structured, systematic and target driven with well-defined goals
- Ability to understand the value chain and project totality
- Multidiscipline understanding and ability to work across all areas in the project
- Ability to handle responsibility and periodically high work loads
- Solution and results orientation
- Curiosity, motivation and capability to drive improvements
- Leadership skills and ability to motivate and develop results through others, if the employee holds a management position

This list was brought together from the information provided in the description of positions and in other internal documents from the department, and covers in general the elements from the personal competences proposed by the PMCD Framework (PMI, 2007) and the behavioral competences comprised in the ICB (IPMA, 2006) and in the APM Competence Framework (APM, 2008).

These personal aspects are very important for carrying out the functions and for building up the organizational culture. However, as indicated by Alam et al. (2008) these characteristics are more hidden and are difficult to assess, verify and develop; and since the scope of the work is directed to performance in the execution of the tasks in the PCA department, they will not be included in the instrument for competence assessment.

Cooper (2000) states that the foundation for generating the items in the competence assessment tool is the organizational information, and that the best way to develop the

competence list is with a top-down approach, which means going from general to specific. Additionally, Braun et al. (2012) identified that special attention should be put in the order, categorization and grouping of items. Considering this, it was deemed appropriate to break down the general competence groups listed before into specific competence elements with a smaller span in order to categorize the knowledge and skills required. These can be found in the initial competence assessment tool, presented in Appendix 5.

The competence elements were suggested based on the classifications made in the department's guidelines, and the knowledge and skills list was developed from the organizational processes explained in section 4.1 and the job descriptions presented in Appendix 4. The project management competence standards described in section 3.2 also provided valuable input for creating the competence list, especially the PMBOK Guide and the PMCD Framework.

Moreover, the items were organized according to the progression of the execution of the tasks (from project startup until project closeout) and all the terms used are familiar to the employees in the department. This complies with the propositions from Cooper (2000) and Braun et al. (2012).

The author of this work also considered useful to include in the instrument the deliverables from the department and the applicable governing documents according to each competence element (see Appendix 5), in order to provide a quick guide for the employees to find the most used requirements, guidelines and processes.

Furthermore, a scale needs to be established for the assessment of the competences as this standardizes the answers and allows collecting information efficiently (Lusthaus et al., 1999). Lucas and Baird (2006) suggest using only positive numerical values when implementing a numerical response scale, due to the fact that individuals are inclined to not choose negative values because they seem to have the connotation of someone being "very

incompetent” instead of “less competent”. For this reason and to avoid any struggle with the interpretation of numbers, Richardson (2004) also recommends using verbal descriptors.

The suggested scale for the competence assessment tool is presented in Table 5. This scale was taken from the Procurement and Supplier Relations (PSR) department in Statoil, which has already implemented a competence identification instrument. It was considered appropriate to apply this scale because it fulfills the criteria explained before, using only positive numbers (Lucas and Baird, 2006) and having a verbal descriptor (Richardson, 2004), besides providing a comprehensive assessment according to different well-described competence levels. In addition, the responsible for the competence assessment process in the PSR department has received good feedback regarding the scale.

Table 5. Initial competence scale description

Scale	Competence level	Description
1	No knowledge	- No knowledge or experience related to the competence.
2	Basic knowledge	- Sufficient knowledge and skills to work under guidance and to take simple decisions. - Limited experience and knowledge of where to find information. - General practical and theoretical skills.
3	Qualified/can work independently	- Good knowledge and skills to work independently and secure. - Can take responsibility for decisions and performance. - Able to provide guidance. - Good practical and theoretical skills.
4	Expert	- Excellent knowledge and skills in addition to extensive experience. - Considered a resource person within the area. - Could be used in training situations as an instructor.

Shermon (2004) and Sanghi (2004) agree that the employer needs to establish the requirements in each competence for the type of job the individual holds in order to clarify what is expected. In this sense, the requirements for the five different positions in the PCA department were assigned based on the job descriptions and according to the competence scale from Table 5.

The initial competence assessment instrument can be found in Appendix 5 including all the components that have been described: competence groups, competence elements, knowledge and skills, deliverables, applicable governing documents and competence level required for the various roles.

It is important to highlight that several collaborative meetings were carried out with the company contact and with one of the leading advisors in order to develop the instrument, securing that it reflected the actual functions and needs from the department.

4.3 EVALUATION OF THE COMPETENCE ASSESSMENT TOOL

After designing the competence assessment tool, it is important to guarantee the quality of the instrument developed by evaluating its reliability and validity. Reliability refers to the stability of the instrument, producing consistent results when used repeatedly under the same circumstances with the same participants (Bryman, 2012). Validity is the degree to which the instrument measures what it is supposed to measure (Borsboom et al., 2004).

Van der Vleuten (1996) proposes that structuring and standardization of the competence assessment tool has a positive impact on the reliability of the instrument, and that validity is greatly improved when the instrument is evaluated in a review process to analyze the items and the competence scale.

Authors like Edum-Fotwe and McCaffer (2000), Peacock and Rawson (2001), Robinson et al. (2007), Thomas et al. (2008), Jabar et al. (2013) and many others have used

the interview technique as a method to evaluate the reliability and validity of an instrument; and this work follows this approach as well.

A semi-structured interview of approximately one hour was carried out with 22 employees of the PCA department with more than 5 years of experience and spanning all the different types of positions and portfolios, as it was explained in the Methodology chapter (see Table 2). The objective of these interviews was to evaluate the reliability and validity of the initial competence assessment tool (see Appendix 5) by eliciting the opinion and feedback from the experts through a series of questions contained in the interview guide (see Appendix 3).

The results of the interview process helped to improve the instrument and obtain the final competence assessment tool, which is presented in Appendix 6. The suggestions concerning each specific element of the tool and the subsequent changes made to the instrument will be explained further.

In relation to the competence groups, 2 participants proposed to include the “Integration management” group inside “Scope management”, given that integration management comprises the change management process, which is an issue that affects the scope of the project. Even though this is an accurate statement, as it can be seen in the PMBOK Guide (PMI, 2013), the project management literature and all the project management competence standards that were explained in the literature review divide these areas despite their close relationship; therefore they will be kept separate.

Additionally, 3 participants suggested changing the name of the “Procurement management” group for “Contract management”, because the department takes care of managing the cost and schedule issues at the contract level and does not handle other procurement issues. However, the project management competence standards and the

governing documents and guidelines from Statoil classify this as procurement; hence no changes were done in this matter.

Finally, one participant deemed as not necessary to have the “Stakeholder management” group because “this is only the responsibility from the management”, as he stated. This can be contradicted by the project management literature and competence standards, which indicate that the project team needs to identify and handle the expectations from the stakeholders since they can have an impact on the project’s success (Sanjuan and Froese, 2013). For this reason, it is important to maintain the “Stakeholder management” group in the competence assessment tool.

Regarding the competence elements, 4 participants advised to move the “Work Breakdown Structure (WBS)” competence element from “Scope management” to “Cost management”, because the WBS is generally seen only as a cost issue within the department. Nonetheless, the WBS is created to represent the deliverables from the project and identify the scope of the work (APM, 2008), providing a structured vision of what has to be delivered (PMI, 2013). The scope of the project embodied in the WBS constitutes the base to later calculate the cost for each of the work units (IPMA, 2006); hence, the WBS belongs to the scope management process and it was kept this way in the competence assessment tool.

The same occurred with the “Manpower Projection Plan (MPP)” competence element, which 2 participants suggested to move from “Human resource management” to “Cost management”, given that the MPP is also mainly used for calculating the cost of the project. Then again, the MPP is established to identify the human resources needed in the project and plan the involvement and responsibilities of the team members (PMI, 2013), thus belonging to the human resource management process.

Moreover, 4 participants recommended adding a competence element within the “Information Technology (IT) tools” competence group for the eRoom PCI, which is a tool

used for managing project change. The suggestion was followed and this new competence element was included in the competence assessment tool.

For the knowledge and skills section, 4 participants highlighted the importance of the templates that have been established for creating the WBS and of maintaining the WBS and the MPP updated; consequently, changes were done to the competence assessment tool to reflect this aspects. Additionally, an item related to preparing the bid papers and the invitation to tender (ITT) was added inside the “Contract preparation and strategy” competence element after the recommendation from 2 participants.

All the participants expressed that the knowledge and skills list is understandable, relevant and that it describes thoroughly the responsibilities from the PCA department. In this sense, 21 from the 22 participants consider appropriate to keep the list as single items instead of grouping them within the competence element, since it allows determining the specific areas that need improvement, as well as pinpointing the strong competences. This is consistent with the findings from Braun et al. (2012), specifying that in order to have a valid and reliable competence tool the items should be clear, unambiguous and easy to answer.

The deliverables and governing documents section was improved based on the input from the participants, by adding the following:

- Establish project routines for control and administration (PD404) inside the “Cost control, analysis and reporting” competence element.
- Accruals (R-90236) inside the “Funding and accounting” competence element.
- Contract follow-up (SCM244) and Invoice handling control (GL0460) inside the “Contract follow-up” competence element.
- Contract specific strategy, contract model, compensation format and Invitation to tender (ITT) as deliverables for the “Contract preparation and strategy” competence element.

- Schedule Risk Analysis/Assessment (SRA) and Cost Risk Analysis/Assessment (CRA) inside the schedule and cost risk analysis/assessment competence groups respectively.

Regarding the competence scale, 6 participants suggested to start the rating in “0” instead of “1”, because they consider that it would represent better the level of “No knowledge” and it is easier to identify its meaning without looking at the description. This is in line with how the ICB (IPMA, 2006), the APM Competence Framework (APM, 2008) and the ECITB Project Management Competence Framework (ECITB, 2010) start their competence scale rating. Moreover, Braun et al. (2012) and Succar et al. (2013) also use “0” to indicate no knowledge or experience in the competence.

In addition, 3 respondents expressed the need to separate “limited experience” from “knowledge of where to find information” in the “Basic knowledge” level, given that these sentences together might become confusing and imply “limited knowledge of where to find the information”, which is not what this level is intended to denote.

Taking into consideration these valuable comments, the two issues previously described have been modified in the competence scale, and the final version is presented in Table 6.

In general, all the participants stated that the scale is understandable, well described and suitable to identify the competence gaps both individually and in the department, hence no more competence levels are required and no problems should arise during the self-assessment process.

Table 6. Final competence scale description

Scale	Competence level	Description
0	No knowledge	- No knowledge or experience related to the competence.
1	Basic knowledge	- Sufficient knowledge and skills to work under guidance and to take simple decisions. - Limited experience related to the competence. - Knowledge of where to find information. - General practical and theoretical skills.
2	Qualified/can work independently	- Good knowledge and skills to work independently and secure. - Can take responsibility for decisions and performance. - Able to provide guidance. - Good practical and theoretical skills.
3	Expert	- Excellent knowledge and skills in addition to extensive experience. - Considered a resource person within the area. - Could be used in training situations as an instructor.

Lastly, the competence requirement for the positions of Project control manager and Project economist was increased from “Basic knowledge” to “Qualified/can work independently” in both the WBS and MPP competence elements, based on the opinion from 11 participants. The requirement for the Project economist needed to be lifted because this role has the responsibility of establishing the WBS and the MPP, even though this was not specifically stated in the description of the position. The Project control manager also requires a higher competence in these elements to be able to understand the scope of the project and manage successfully the project team.

There was a lot of controversy among the participants related to the overall competence requirements for the Project control manager. Summarizing the opinions, it can be concluded that the Project control manager must be proficient either in cost management

or time management (or in both), with extensive experience and leadership skills. Nevertheless, the specific requirements will highly depend on the type of project and on the availability of resources to support the manager.

For example, as one of the participants stated, “if it is a smaller project, the project control manager has less resources and needs to take care of more things, but in a bigger project he (the project control manager) has more people working for him and the most important is to know how to manage the contribution from everyone”. In addition, as another participant said, “the leadership and management skills from the project control manager need to be higher in bigger projects comparing to smaller projects”. This is in accordance with Sanchez (2004), who affirms that “managers are responsible for effective and efficient use of an organization’s assets”, coordinating the variety of inputs towards value creation.

As specified by Thomas et al. (2008), the interview process helped to evaluate the reliability, validity, clarity, unambiguity and comprehensiveness of the items in the tool, and to obtain recommendations for changes and additions that resulted in an improved final competence assessment tool, found in Appendix 6.

A summary of the suggestions received during the interview process and the subsequent changes made to the competence assessment tool is presented in Table 7.

In the next section, the competence assessment process suggested will be explained, along with further suggestions regarding the competence development methods in the PCA department.

Table 7. Summary of suggestions from the interview process and changes made to the competence assessment tool

Item from the competence assessment tool	Suggestions from the interview process	Changes to the competence assessment tool
Competence groups	Include “Integration management” inside “Scope management”	None
	Change “Procurement management” to “Contract management”	
	Remove “Stakeholder management”	
Competence elements	Move “Work Breakdown Structure (WBS)” from “Scope management” to “Cost management”	None
	Move “Manpower Projection Plan (MPP)” from “Human resource management” to “Cost management”	
	Add a competence element called “eRoom PCI” to “Information Technology (IT) tools”	
Knowledge and skills	Add “following the coding requirements from the templates” to the competence from “Work Breakdown Structure (WBS)”	
	Add competence for maintaining the WBS and the MPP structure updated	
	Add competence for preparing the bid papers and the invitation to tender (ITT) inside “Contract preparation and strategy”	
Deliverables	Add Contract specific strategy, contract model, compensation format and Invitation to tender (ITT) to “Contract preparation and strategy”	
	Add Schedule Risk Analysis/Assessment (SRA) and Cost Risk Analysis/Assessment (CRA)	
Governing documents	Add “Establish project routines for control and administration (PD404)” inside “Cost control, analysis and reporting”	
	Add “Accruals (R-90236)” inside “Funding and accounting”	
	Add “Contract follow-up (SCM244)” and “Invoice handling control (GL0460)” inside “Contract follow-up”	
Competence scale	Start the rating in “0” instead of “1”	
	Separate “limited experience” from “knowledge of where to find information” in the “Basic knowledge” level	
Competence requirements	Increase requirement for Project control manager and Project economist in the WBS and MPP	

4.4 COMPETENCE DEVELOPMENT METHODS IN PCA

The process of learning, developing and mastering project management competences requires individual reflection about knowledge and experiences (Cicmil et al., 2006), and the competence assessment tool provided in Appendix 6 will allow employees to become aware of their own practice and need for improvement, and to seek opportunities for professional development in order to enhance their competence (Jabar et al., 2013).

As it was mentioned previously, the Procurement and Supplier Relations (PSR) department in Statoil has already implemented a competence assessment tool, using a specific module in the intranet of the company for carrying out the self-assessment with the possibility to aggregate the results and obtain overall reports.

In this sense, it is considered suitable, easier and more efficient for the PCA department to adapt and use the same system, providing the opportunity to start creating a company standard for competence assessment. An example of the competence assessment IT tool from the PSR department is presented in Appendix 7.

Furthermore, People@Statoil is a corporate process for people development, deployment, performance and reward, and the People@Statoil dialog is a conversation between the employee and the manager to establish performance goals for delivery and behavior during the year, evaluate the previous year performance, and define actions for development plans. Thus, the competence assessment offers a great tool for this and should be included within this process, involving carrying out the self-evaluation once a year and discussing the results with the manager as part of the People@Statoil dialog.

After the gaps have been identified, the goal is to increase the capabilities and potential of the employees by addressing the development needs through providing learning and continuous development opportunities, prioritizing the critical areas to the individual and the organization (Armstrong, 2003). This stems from the fact that the organizational efforts to

organize, motivate, support and develop the employees are essential for the success of the projects and the overall performance (Morris and Pinto, 2004).

It is therefore important to review which competence development methods are considered useful by the employees in the PCA department and the suggestions for improvements according to the opinions received in the interview process.

Initially, the participants affirmed that “courses are important to have the theoretical foundation needed” and that the training programs offered in the department are good and span all the knowledge areas, but that “gaining experience through performing the tasks is more valuable”.

7 participants emphasized the importance of on-the-job training besides the courses offered, given that performing the actual tasks helps to gain experience, confidence, and to be able to execute more complex tasks gradually, as stated in the PMCD Framework (PMI, 2007).

This is in line with Zangiski et al. (2013), who indicate that formal training programs can generate a competitive advantage for the organization, but that they are only a complementary tool once individuals gain more experience in the execution of their functions.

8 participants pinpointed the need to “organize more who needs to take the courses”. This means that the competence assessment tool will help to identify which elements must be improved according to the requirements, and then the manager will be able to suggest taking a specific course to increase the particular competence during the People@Statoil dialog.

In addition, 5 participants recognized the usefulness and high quality of the Project Control Competence Program, which is a formal training program of 4 days that explains the theoretical foundation and practical application of the responsibilities and work process from the PCA department. As one participant stated, “it is good to have a course to get general

knowledge when people are starting and also to refresh the knowledge of the people that have already been working for years”.

Moreover, 6 participants suggested establishing an organized and formal mentorship and coaching program. Mentoring builds a long term relationship concentrating on broad development needs, while coaching focuses on developing specific issues in a short term period (PMI, 2007).

Even though Statoil has detailed information and suggestions about mentoring and coaching in the organization, this has not been implemented yet as a standard practice in the PCA department. Therefore, it is recommended to launch a mentoring and coaching program in order to increase knowledge sharing, accelerate development and help improve the professional network.

12 participants highlighted the value of the PCA Community site, which is a page in the intranet of the company where the employees can ask questions to fellow coworkers and receive answers, publish relevant news and create posts in a blog. Additionally, the community site allows uploading documents and shows the upcoming events, for example future courses.

Turner et al. (2000) have also recognized the importance of using IT tools and the intranet of the company for document and knowledge sharing, and it can be noticed that the community site has a variety of functionalities that make it very useful with a user-friendly interface.

Nevertheless, there are still some suggestions to improve the quality of the information contained in the community site. For example, the comments and the documents could be categorized by topic according to the competence elements from the competence assessment tool, in order to increase the efficiency in finding the right information.

Another important issue for the employees is to always use a reference when answering questions, for instance including the link to an internal governing document or guideline, because this would improve the reliability and truthfulness of the information shared.

Lastly, 16 participants indicated that establishing networks is another very useful tool for knowledge sharing and competence development, involving “discussions with experts about different topics” and offering the opportunity to “know who to ask about a specific subject”, as some participants expressed.

Turner et al. (2000), as well as the PMCD Framework (PMI, 2007) have acknowledged the benefits of sharing experience among peers and providing support to each other, since it creates a positive and collaborative environment and helps improve the job performance.

Formal gatherings to discuss relevant and up-to-date topics are essential, but the main challenge presented with the networks is the spread of the employees across multiple locations. As it is difficult and costly to bring all the employees from the network into a single location, it is paramount to make use of IT tools that facilitate the communication, for example carrying out video-gatherings. It is recommended to arrange network meetings at least once every two months, in order to encourage frequent contact and overall participation.

The competence development methods that have been discussed are depicted in Figure 23, and they include both formal and informal learning according to the definitions from Kock and Ellström (2011). This combination is necessary since the development of project management competence is a long term process that requires formal education and experiential learning to be able to deal with the increasing complexity of projects (Turner and Huemann, 2000). As stated by Fenwick (2006), learning is a process that happens naturally as part of the work besides attending relevant courses.

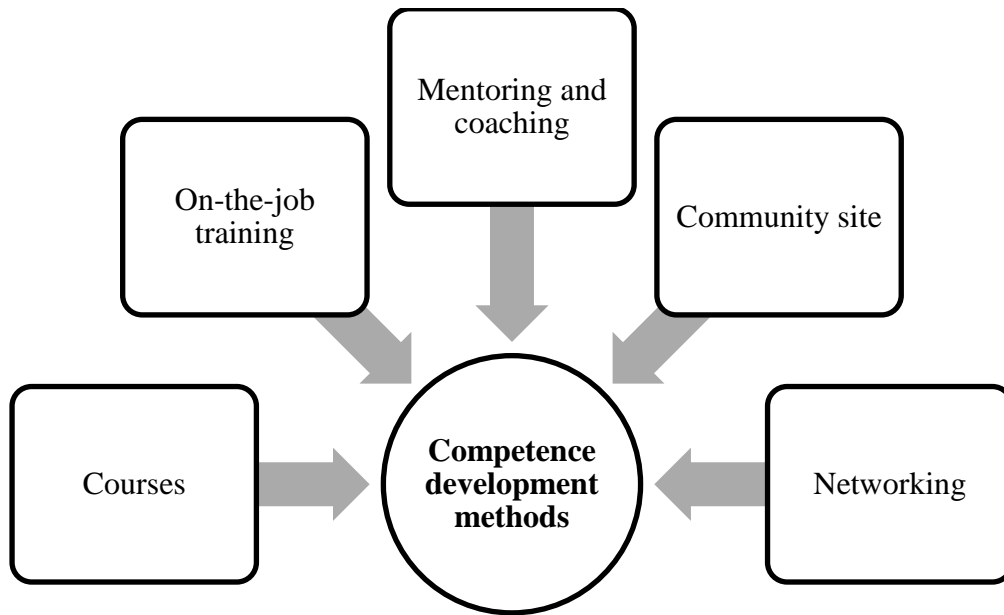


Figure 23. Integration of competence development methods

In accordance with Turner et al. (2000), it is also useful to move people across the organization in order to spread and transfer knowledge and experience. Fuller and Unwin (2006) support this idea, stating that organizations require an expansive learning environment that offers opportunities for new and stimulating tasks.

In this sense, the allocation of personnel to projects is a process that involves complex decisions based on the availability of resources and the specific experience and development needs from the employees, considering the opportunities and challenges that the projects may provide (Huemann et al., 2007).

Regarding this issue, 4 participants expressed that it is beneficial to maintain the same people throughout the lifecycle of the project, in order to increase efficiency and team alignment. Furthermore, in case of leaving the project, it is an advantage to have overlap between the person starting and the person leaving to be able to smooth the initiation and transition process, and to provide appropriate guidance for the execution of the functions.

These participants also identified the need for better planning of career development within the department, meaning that managers should “think about where people are needed before they finish their assignment”, as one participant stated. The competence assessment tool would be useful for this purpose, by showing the strong competence elements from the individuals and helping the allocation of resources according to the knowledge and experience requirements from the project. This would also provide the opportunity to increase the group of experts in specific areas and build up the pool of competent and prepared employees.

To conclude, it can be said that for the competence development process and for the implementation of the suggestions contained in this section it is imperative to have management support and to secure the funding for the development plans and methods, as affirmed by Thiry (2004), since this encourages building a career in the organization and boosts employee engagement.

5. CONCLUSIONS

This master thesis had the objective of developing and evaluating an instrument to identify competence needs in project management for the Project Control and Analysis (PCA) department in Statoil.

In this sense, it was identified that there are several world known project management competence standards, for example the Project Management Body of Knowledge (PMBOK Guide), the Project Manager Competency Development (PMCD) Framework, the IPMA Competence Baseline (ICB) and the APM Competence Framework. Many organizations create their competence assessment tool based on these standards and on the specific internal processes and functions. In the case of the PCA department, the PMBOK Guide was the most suitable standard because of how the governing documents and guidelines are structured.

For the design of the instrument it is appropriate to apply a top-down approach, meaning to develop the list of competences by going from general to specific. It is also important to organize and categorize the items in a structured and familiar way for the respondents, and to create a competence scale with well-defined levels. Then, the requirements in each competence can be established depending on the responsibilities of the position.

After the instrument has been designed it is essential to evaluate its quality in terms of reliability and validity, and the interview method offers a suitable solution to elicit the opinions and suggestions from the experts in order to ensure that the competence assessment tool is understandable, consistent and that it reflects the organizational functions and requirements.

The competence assessment process allows diagnosing the gaps between the available and the required competence level to be able to address the competence needs through suitable development plans. The competence development methods should include a

combination between formal and informal learning, and it is suggested for the PCA department to integrate courses, on-the-job training, mentoring and coaching, use of collaborative IT tools and networking as a comprehensive competence development strategy.

The way forward for the PCA department involves implementing a competence assessment IT system, carrying out the self-assessment as part of the People@Statoil dialog, establishing individual and organizational development goals based on the results from the assessment process, planning and executing the development programs, and evaluating the results in order to identify the strengths and possible improvements of the competence assessment process and development methods.

The competence assessment tool created in this master thesis makes a very important contribution to the PCA department, since it identifies the required competence for the different roles in the department and it will help to determine the competence strengths and weaknesses from the individuals, obtain an overall picture of the competence level in the organization, design and deploy customized development plans that will improve the organizational capabilities and enhance project performance.

This tool will also be useful for the allocation of human resources to the projects based on the specific knowledge and skills required, and it will reveal opportunities for career development in addition to assist the process of hiring new employees.

Moreover, the methodology followed to design and evaluate the competence assessment tool offers a systematic process that could be extended to the other departments in the company with the purpose of establishing a corporate standard for competence development.

On the other hand, the tool that has been designed is not directly transferable to other organizations because it is centered specifically on the functions and responsibilities from the PCA department, therefore it cannot be generalized. However, several recommendations can

be made to those companies that would like to develop and implement a competence assessment process.

First, it is important to clarify the intention of the competence assessment, which should be the improvement of the performance of the employees and not “punishment” or “reward”. Management support and guaranteed funding are also essential elements for the success of the process.

Then, the design of the assessment tool can begin by gathering and reviewing the information of the processes that are followed in the organization and the descriptions of the different positions, in order to identify the knowledge and skills that the employees need to execute their roles and the specific competence requirements. If applicable, they could also identify a suitable project management competence standard to serve as the foundation for the instrument, and use the same structure (headlines) and the same competence scale that are proposed in this thesis.

A review process for evaluating the tool will greatly improve its quality, and the early involvement of the employees will facilitate the acceptance of the tool. The evaluation can be done through interviews following a formal process like it was done in the present work or for example through discussion teams (focus group method).

Subsequently, the final competence assessment tool can be created taking into consideration the feedback received during the evaluation phase. It is of high value to implement a software that can aggregate the results from all the employees and provide reports about the competence status.

Finally, the competence assessment should be a standardized process done for example once a year, and the development plans must be established and followed based on the individual and organizational competence needs.

This study has been innovative in the sense that most of the academic contributions focus on identifying the general competences required for a project manager, while this work presents a detailed process for the design and evaluation of a competence assessment tool applied to a specific company setting, and offers general suggestions for other organizations on how to do this as well.

Further research in the topic could explore the possibility of including the personality characteristics within the competence assessment tool and how to do so, considering that these aspects are more difficult to evaluate. Additionally, an exhaustive examination of competence development methods for project management could be carried out with the intention of creating development programs that emphasize both technical skills and personal qualities. Finally, it would be of interest to execute an empirical investigation to recognize the evolution of organizational competence through development plans and compare it with project performance.

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Appendix 1. Pre-study report

Development and evaluation of an instrument for identification of competence needs in project management

Alexandra Mallcott Reinales

Pre-study report

Master Thesis Spring 2014

Master of Science in Project Management

Department of Production and Quality Engineering

Supervisor: Bassam Hussein

Company contact: Hege Pernille Thronsen

Date: 20.01.2014

1. BACKGROUND

The specialization project assignment was delivered fall 2013 and the general objective of this project was to develop a prototype for an instrument to identify and measure competence development in project management for the Project Control and Analysis (PCA) department in Statoil. For this purpose, a literature review was conducted in order to establish a theoretical framework of previous published work in the fields of competence development and project management. Furthermore, the data collection consisted of reviewing internal processes and the descriptions of positions within the department.

Consequently, the organizational information was analyzed and the competence areas were suggested based on the PCA functions and according to the project management knowledge areas proposed in the literature. Finally, a prototype for the instrument was proposed, including the competence development process as part of the People@Statoil process, which is a corporate process for people development, deployment, performance and reward.

2. PROJECT DESCRIPTION AND OBJECTIVES

This master thesis is an extension of the specialization project assignment. The objective of this assignment is to further refine the prototype of the instrument for identifying and measuring competence needs in project management on both individual level and organizational level. The assignment aims also to test and evaluate the reliability and validity of the instrument in the case company.

The assignment has the following objectives:

1. Conduct a condensed literature review about competence development, design and evaluation of tools to identify and measure competence needs. Investigate and discuss related previous and published work covering similar topic.

2. Refine the preliminary prototype of the instrument created in the specialization project. Develop the final list of competences and specify the requirements in each competence area for the different positions in the host company.
3. Identify how the reliability and validity of the instrument shall be evaluated and tested.
4. Conduct necessary testing and evaluation of the instrument on a selected sample in the host company.
5. Based on the results obtained suggest improvements to the current competence development programs or methods in the host company.

3. PROJECT TASKS

The thesis has been divided in the following work packages or specific tasks:

1. ***Conduct literature review:*** the investigation and discussion of previous published work covering competence development, project management competence and design of tools to measure competence, by means of research within a bibliographic database, in order to strengthen the theoretical framework established in the specialization project. This task covers the first objective of the thesis.
2. ***Develop the final competence list:*** the final list of competences with the required level of detail will be developed in collaboration with the company contact, based on the PCA processes and descriptions of positions. This task covers partially the second objective of the thesis.
3. ***Specify competence requirements for the positions:*** the requirements in each competence area for the different positions in the department will be specified in collaboration with the company contact, based on the PCA descriptions of positions. This task together with the previous one fulfills the second objective of the thesis.

After this task has been executed, the proposal of the instrument will be ready for evaluation of its reliability and validity.

4. ***Plan evaluation and test of the instrument:*** this task is related to accomplishing the third objective of the thesis (Identify how the reliability and validity of the instrument shall be evaluated and tested). This will depend on the methodological issues identified during the execution of the first task.
5. ***Conduct evaluation and test of the instrument:*** the methodology planned in the previous task will be executed, therefore achieving the fourth objective of the thesis. The initial idea is to interview approximately 15 different experts within the department (head of portfolio, leading advisor, project manager and area leader, for example) to obtain their opinions and suggestions about the instrument.
6. ***Analyze results:*** the results of the previous task will be analyzed with the purpose of identifying necessary changes to the instrument.
7. ***Suggest improvements:*** the final version of the instrument will be developed according to the results from the previous task, reflecting the needs from the department. Additionally, improvements to the current competence development programs in PCA will be suggested, thus accomplishing the fifth and last objective of the thesis.
8. ***Finalize thesis writing:*** the information that is produced during the execution of the tasks will be presented in a thesis report, which will be structured as a research paper (abstract, introduction, literature review, methodology, results, analysis, conclusions and references).

4. COMPANY PRESENTATION

Statoil is a multinational energy company headquartered in Norway, with operations in more than 30 countries, approximately 23000 employees worldwide and 40 years of experience in oil and gas production. The company is committed to create innovative business solutions in a responsible manner to meet the energy demands.

The department of Project Control and Analysis (PCA) manages project costs, plans, project changes, risk and estimation. They are responsible for providing cost forecasts, schedules, project status analysis and managing schedule risks in all the projects to ensure that the right targets have been established and that the projects are on track.

5. RELEVANCE

The Statoil book, which represents the foundation of how the company conducts the business, recognizes the people as one of the most important assets to achieve the goals, highlighting the importance of skills, personal commitment and effective leadership. In order to develop the expertise required to fulfill the business needs, they have established processes for people development, deployment, performance and reward.

In this sense, it is important for the Project Control and Analysis (PCA) department to have a tool for identifying and measuring the competences required for their employees to execute their tasks successfully, with the purpose of detecting possible gaps and offer opportunities for learning and improving.

6. SUPERVISION

The supervisor will offer constant guidance in order to fulfill the academic requirements of the assignment. The company contact will provide access to information,

input and feedback during the execution of the tasks to ensure that the organizational goals regarding this project are met.

7. SCHEDULE

Task n°	Task description	Duration	Start	Finish	Predecessor
1	Conduct literature review	3 weeks	20.01.14	09.02.14	
2	Develop the final competence list	2 weeks	10.02.14	23.02.14	1
3	Specify competence requirements for the positions	2 weeks	24.02.14	09.03.14	2
4	Plan evaluation and test of the instrument	1 week	10.03.14	16.03.14	3
5	Conduct evaluation and test of the instrument	3 weeks	17.03.14	06.04.14	4
6	Analyze results	2 weeks	07.04.14	20.04.14	5
7	Suggest improvements	3 weeks	21.04.14	11.05.14	6
8	Finalize thesis writing	4 weeks	12.05.14	08.06.14	7
Milestone 1	Theoretical background		09.02.14		
Milestone 2	Progress report		23.03.14		
Milestone 3	Results and analysis		11.05.14		
Milestone 4	Final report		08.06.14		

The schedule is represented in the following Gantt chart.

GANTT CHART (part 1 of 4)

Task n°	Week 4							Week 5							Week 6							Week 7							Week 8						
	20 Jan '14							27 Jan '14							3 Feb '14							10 Feb '14							17 Feb '14						
	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S
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Milestone 2	[Empty]																																		
Milestone 3	[Empty]																																		
Milestone 4	[Empty]																																		

Legend

Color	Meaning
[Blue]	Work on the task
[Green]	Milestone

GANTT CHART (part 2 of 4)

Task n°	Week 9							Week 10							Week 11							Week 12							Week 13						
	24 Feb '14							3 Mar '14							10 Mar '14							17 Mar '14							24 Mar '14						
	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S
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Legend

Color	Meaning
	Work on the task
	Milestone

GANTT CHART (part 3 of 4)

Task n°	Week 14							Week 15							Week 16							Week 17							Week 18						
	31 Mar '14							7 Apr '14							14 Apr '14							21 Apr '14							28 Apr '14						
	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S
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Legend

Color	Meaning
	Work on the task
	Milestone

GANTT CHART (part 4 of 4)

Task n°	Week 19							Week 20							Week 21							Week 22							Week 23						
	5 May '14							12 May '14							19 May '14							26 May '14							2 Jun '14						
	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S
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Color	Meaning
	Work on the task
	Milestone

8. WORKLOAD

The duration of the project will be 20 weeks (from 20.01.2014 to 08.06.2014) with a planned workload of 35 hours per week (approximately 5 hours per day), which results in:

Task n°	Task description	Weeks	Hours
1	Conduct literature review	3	105
2	Develop the final competence list	2	70
3	Specify competence requirements for the positions	2	70
4	Plan evaluation and test of the instrument	1	35
5	Conduct evaluation and test of the instrument	3	105
6	Analyze results	2	70
7	Suggest improvements	3	105
8	Finalize thesis writing	4	140
	Total workload estimate	20	700



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Appendix 2. Progress report

Development and evaluation of an instrument for identification of competence needs in project management

Alexandra Mallcott Reinales

Progress report

Master Thesis Spring 2014

Master of Science in Project Management

Department of Production and Quality Engineering

Supervisor: Bassam Hussein

Company contact: Hege Pernille Thronsen

Date: 23.03.2014

1. DESCRIPTION OF THE PROGRESS

During the time that has elapsed since the thesis was started (9 weeks) the activities have been executed and completed according to plan, covering the following:

Task 1: Conduct literature review

This task comprised the investigation and discussion of previous published work covering the topics of competence development, project management competence standards, and design and evaluation of tools for competence assessment.

The Literature Review chapter has already been written and the academic supervisor has offered positive feedback. The findings from this theoretical framework have formed the basis for the development of the competence assessment tool.

The completion of this task has accomplished the first objective of the thesis:

“Conduct a condensed literature review about competence development, design and evaluation of tools to identify and measure competence needs. Investigate and discuss related previous and published work covering similar topic.”

Task 2: Develop the final competence list and Task 3: Specify competence requirements for the positions

Initially, a meeting was held with one of the portfolio managers to identify the department's competence strategy and the purpose of the implementation of the competence assessment tool. Consequently, an interview was carried out with one of the leading advisors from the Procurement and Supplier Relations (PSR) department to gain insight about the competence assessment process they have already implemented.

The final competence list was developed by defining competence groups and competence elements according to the company's governing documents, the work processes

and the descriptions of positions from the PCA department. It is important to highlight that the main governing document uses the same classification from the knowledge areas established in the Project Management Body of Knowledge (PMBOK Guide) from the Project Management Institute (PMI). The competence requirements were established according to the description of the different positions.

In addition, collaborative meetings were carried out with the company contact and a leading advisor for the design of the competence assessment tool.

The execution of these two tasks fulfills the second objective of the thesis:

“Refine the preliminary prototype of the instrument created in the specialization project. Develop the final list of competences and specify the requirements in each competence area for the different positions in the host company.”

Task 4: Plan evaluation and test of the instrument

The management team of PCA formed a reference group, integrated by two portfolio managers (Fast Track and Subsea), the Competence Center manager, and two leading advisors (Project Control and Project Planning and Analysis). This reference group was selected through discussion and consensus in a management meeting, in order to create a smaller group that represented the management interests and which could simplify the communication process.

The interview guide was created and approved by the academic supervisor. Thereafter, an initial meeting with the reference group was held to discuss the competence assessment tool and the interview guide before the evaluation phase.

The portfolio managers (also called resource owners) proposed candidates for the interview process, covering the different positions across all the portfolios. The interviews were planned directly with the candidates. The competence assessment tool and the interview

guide were sent to the interviewees before the planned date for the interview.

The accomplishment of this task meets the third objective of the thesis:

“Identify how the reliability and validity of the instrument shall be evaluated and tested.”

Task 5: Conduct evaluation and test of the instrument

23 interview invitations were sent during the execution of the previous task. Up to now, 16 interviews have been confirmed and are planned to start next week (24.03.2014) with an expected duration of 1 hour. The interviewees span all the positions in the department (Project Control Manager, Project Control Engineer, Planner, Cost Control Engineer and Project Economist) across the different portfolios (OCP, FTS, OBF and GP).

The completion of this task will accomplish the fourth objective of the thesis:

“Conduct necessary testing and evaluation of the instrument on a selected sample in the host company.”

Task 6: Analyze results

The results of the interviews will be analyzed with the purpose of identifying necessary changes to the competence assessment tool.

Task 7: Suggest improvements

The final version of the instrument will be developed according to the results from the previous task, reflecting the needs from the department. Additionally, improvements to the current competence development programs in PCA will be suggested, thus accomplishing the fifth and last objective of the thesis.

“Based on the results obtained suggest improvements to the current competence development programs or methods in the host company.”

Task 8: Finalize thesis writing

The information that is produced during the execution of the tasks will be presented in a thesis report, which will be structured as a research paper (abstract, introduction, literature review, methodology, results, analysis, conclusions and references).

2. SCHEDULE

All the tasks have been executed according to plan and no changes are necessary.

Task n°	Task description	Start	Finish	Status
1	Conduct literature review	20.01.14	09.02.14	Completed
2	Develop the final competence list	10.02.14	23.02.14	Completed
3	Specify competence requirements for the positions	24.02.14	09.03.14	Completed
4	Plan evaluation and test of the instrument	10.03.14	16.03.14	Completed
5	Conduct evaluation and test of the instrument	17.03.14	06.04.14	In progress
6	Analyze results	07.04.14	20.04.14	Not started
7	Suggest improvements	21.04.14	11.05.14	Not started
8	Finalize thesis writing	12.05.14	08.06.14	Not started

3. REMAINING WORKLOAD

The remaining duration of the project is 11 weeks (from 24.03.2014 to 08.06.2014) with a planned workload of 35 hours per week (approximately 5 hours per day), which results in:

Task n°	Task description	Weeks	Hours
5	Conduct evaluation and test of the instrument	2	70
6	Analyze results	2	70
7	Suggest improvements	3	105
8	Finalize thesis writing	4	140
	Remaining workload estimate	11	385

Appendix 3. Interview guide

PCA Competence Assessment Tool

Interview Guide

The purpose of this interview is to obtain valuable input and feedback regarding the competence assessment tool designed to identify the knowledge and skills required to execute the different functions from the Project Control and Analysis (PCA) department and create suitable competence development plans.

1. How many years of experience do you have with PCA functions?
2. Which position do you hold at the moment?

Project Control Manager

Project Control Engineer

Planner

Cost Control Engineer

Project Economist

3. Which portfolio does your project belong to?

Onshore, Cessation and Pipelines (OCP)

Fast Track and Subsea (FTS)

Offshore Brownfield (OBF)

Greenfield (GP)

4. Do you believe the competence groups are appropriately divided? Do you have any suggestions regarding the competence groups (changes, removals or additions)?

5. Do you believe the competence elements are appropriately divided? Do you have any suggestions regarding the competence elements (changes, removals or additions)?
6. Do you believe the knowledge and skills described are understandable and relevant? Do you have any suggestions for alternative formulations, removals or additions of elements?
7. Do you suggest keeping the knowledge and skills as single items or grouping them together within the competence element?
8. Do you have any suggestions regarding the deliverables and applicable governing documents?
9. Do you think the competence scale is suitable and well described? Do you have any suggestions regarding the competence scale?
10. Do you agree with the competence requirements for the position type you hold at the moment?
11. Do you have any suggestions regarding PCA competence development methods?

Appendix 4. PCA Description of positions

1. Project Control Manager

The Project Control Manager is responsible for all Project Control work and needs to work closely with the different work streams in the project, organizing and managing the Project Control tasks in cooperation with the project and line management.

The Project Control Manager has the following responsibilities:

- Manage all project control tasks in the project
- Establish the planning system and develop the Project Master Schedule (PMS) and all other relevant schedules
- Establish the Project Control system based on Statoil's Project Control procedures and tools and in compliance with all relevant governing documents
- Establish and update the Project Control Basis (PCB) from DG1 and onwards
- Estimating, cost control, funding and accounting
- Forecasting, analysis and trends
- Coordinate and establish annual budget and forecast
- Establish and manage the Project Detailed Schedule (PDS)
- Follow up and ensure active steering of plans, milestones, critical path and risks
- Manage risks associated with Project Control, actively contributing to the risk management process and utilizing the risk registers when producing monthly reports and cost forecasts
- Establish reporting routines satisfying requirements in Project Agreement and relevant requirements from authorities and owners
- Arrange benchmarking sessions at the decision gates (DGs)

- Participate in contract preparation, evaluation and agreement
- Ensure that the project is SOX compliant within the Project Control area (The Sarbanes-Oxley Act of 2002, commonly called SOX, is a United States federal law and contains 11 sections that describe specific mandates and requirements for financial reporting)

2. Project Control Engineer

The Project Control Engineer supports the overall project with Project Control related issues, having the following responsibilities:

- Ensure that the project is performed in accordance with the projects targets on weight, cost and plan, in close cooperation with the task manager
- Participate in the evaluation of contracts
- Contract follow-up to secure suppliers deliverables
- Provide input and contribution to the Project Control Basis (PCB)
- Control and report on project activities and results, and take corrective actions
- Preparation of monthly report
- Responsible for forecasting, trending and analysis of project cost and schedule data
- Establish and manage change and cost control systems
- Ensure consistent cost control and reporting in accordance with governing documents

3. Planner

The Project Planner is responsible for establishing all planning processes and ensuring that deliverables are developed and aligned with planning requirements and best practice. The Project Planner has the following responsibilities:

- Establish and maintain all schedule documents (in cooperation with all disciplines):

- Project Master Schedule (PMS)
 - Project Detailed Schedule (PDS)
 - Project Work Plan (PWP)
 - Milestone Schedule, Interface Schedule, Authority Schedule, Contract Schedule and Marine Schedule.
 - Commissioning Schedule S-Curves and Manpower Histograms
 - Project Planning Basis (PPB), as input to the Project Control Basis (PCB)
- Technical evaluation of tenders
 - Follow up and secure contractors schedule deliverables
 - Establish and perform schedule control
 - Handling of schedule interfaces
 - Execute schedule benchmarking and schedule risk
 - Schedule revision and management
 - Document revision
 - Prepare input to bid documents for the contracts
 - Close-out of contracts

4. Cost Control Engineer

The Cost Control Engineer has the following responsibilities:

- Establish WBS structure and task structure in PIMS and SAP
- Maintain the WBS and task structure in PIMS and SAP
- Prepare input to bid documents for the contracts
- Contribute in contract formulation and evaluation
- Follow-up and secure contractors deliverables

- Responsible for collection of monthly cost and progress information and preparing a total monthly project status (cost, progress and prognosis)
- Compile and issue monthly reports
- MIS status reporting
- Estimating of accruals
- Coordination of the half-yearly Current Control Estimate (CCE) updates
- Establish and update the Project Control Basis (PCB) for the project
- Establish work program and yearly budget for the project
- Maintain prognosis and variance analysis against the approved budget
- Contribute to change management in the project
- Estimating of cost consequence of project changes
- Maintain the Master Control Estimate (MCE)
- Close-out of contracts and finalization of all relevant project close-out activities
- Participate in other Cost Control issues and together with the Project Control Team contribute to coordinated and good work-processes in the interface towards defined stakeholders
- Ensure that the project has established sufficient project control systems and procedures that ensure consistent cost control and reporting in accordance with governing documents
- Follow up quality and risk management processes in close cooperation with the Quality and Risk Management (QRM) function

5. Project Economist

The Project Economist is responsible for the economy and accounting function in the project, having the following responsibilities:

- Be familiar with the license and the accounting agreement
- Establish and update budgets, the Current Control Estimate (CCE) and the work programme
- Establish and maintain the project's accounting and task structure in SAP
- Establish and follow up the Service Work Orders (SWO)
- Ensure that the project's accounts and financial management are carried out in line with the guidelines
- Assist in tax discussions
- Follow-up time writing
- Coordinate input for monthly cost reporting
- Create requisitions
- Participate in establishment of input to contract specific follow up strategies regarding control of actual cost of work performed (invoiced cost)
- Coordinate input to monthly Cash-Call and accruals
- Advise Project Management on financial and commercial matters
- Audit coordinator - internal/external
- Actively search for ways to improve and simplify working requirements, guidelines and governing documents

Appendix 5. Initial competence assessment tool

Competence group	Competence element	Knowledge and skills	Competence level required				
			Project Control Manager	Project Control Engineer	Planner	Cost Control Engineer	Project Economist
Management system	Organizational knowledge	Comprehensive knowledge of company values, operating model (Ambition to Action, Compliance and Leadership Model, CVP), corporate policies (Ethics code of conduct and anti-corruption compliance program, Health, Safety and Environment (HSE) philosophy and security policies, Corporate Social Responsibility (CSR) philosophy), People@Statoil process.	3	3	3	3	3
		Use of ARIS to find relevant processes and governing documents.	3	3	3	3	3
Scope management	Work Breakdown Structure (WBS)	Describe the work in controllable and measurable work units, specific for the project, following the coding requirements.	2	2	2	3	2
Human resource management	Manpower Projection Plan (MPP)	Identify the personnel resources needed for a project and their responsibilities.	2	2	2	3	1
		Plan the personnel resources acquisition and staff the project using resource levelling and resource smoothing.	2	2	2	3	1

Competence group	Competence element	Knowledge and skills	Competence level required				
			Project Control Manager	Project Control Engineer	Planner	Cost Control Engineer	Project Economist
Time management	Schedule planning	Plan specific activities in a network considering their estimated duration, logical dependencies and resource availability, by using the Critical Path Method (CPM).	2	2	3	2	1
		Determine the project duration.	2	2	3	2	1
	Schedule interfaces	Plan the interfaces between major deliveries/installations and critical elements, sub-projects and contracts.	2	2	3	2	1
		Establish interface milestones.	2	2	3	2	1
		Manage the interfaces ensuring interface alignment, consistency and harmonization.	2	2	3	2	1
	Schedule control, analysis and reporting	Monitor the status of project activities to update project progress and all schedule documents, by using Earned Value Management (EVM) and time phasing.	2	2	3	2	1
		Manage changes to the schedule baseline ensuring that deliverables are developed and aligned with planning requirements and best practice.	2	2	3	2	1
		Verify and monitor critical path(s) and float development.	2	2	3	2	1
		Schedule benchmarking.	2	2	3	2	1

Competence group	Competence element	Knowledge and skills	Competence level required				
			Project Control Manager	Project Control Engineer	Planner	Cost Control Engineer	Project Economist
Cost management	Cost preparation	Prepare, establish, initiate and set-up the cost control system, the authority control structure, the project and task structure, the Work Breakdown Structure (WBS), the workflow in SAP and the Service Work Order (SWO)	2	2	2	3	2
	Cost estimating	Forecast, analyze and identify trends in the cost.	2	2	2	3	2
		Be familiar with the different cost estimate classes, estimating methodology and tools.	2	2	2	3	2
		Cost benchmarking.	2	2	2	3	2
	Cost control, analysis and reporting	Monitor, analyze and report cost developments, establishing basis for actions to complete the projects within the approved control estimate.	2	3	2	3	2
		Re-schedule the remaining scope of work and update the project cost estimate based on status at cut-off (baseline) for the whole Business Case, by using Earned Value Management (EVM).	2	3	2	3	2
	Funding and accounting	Ensure that project funding and accounting activities comply with Statoil's accounting principles and other relevant internal and external reporting requirements.	2	2	2	3	3
		Ensure SOX compliance.	2	2	2	3	3

Competence group	Competence element	Knowledge and skills	Competence level required				
			Project Control Manager	Project Control Engineer	Planner	Cost Control Engineer	Project Economist
Cost management	Funding and accounting	Establish the project accounting structure in Statoil's accounting system to secure accurate accounting treatment and reporting towards stakeholders, providing reliable, relevant and sufficient financial information according to the corporate accounting principles and reporting requirements.	2	2	2	3	3
		Ensure high-quality financial risk management and sufficient financial capacity and flexibility supporting Statoil's strategy.	2	2	2	3	3
Procurement management	Contract preparation and strategy	Contribute to the prequalification process and the establishment of bidders lists.	2	3	2	2	2
		Contribute to the development of contract specific strategy, contract model, compensation format, contract schedule and milestones.	2	3	2	2	2
	Contract evaluation and award	Participate in the tender evaluation considering the best commercial bid.	2	3	2	2	2
		Prepare the bid check estimate.	2	3	2	2	2
		Ensure compliance with the project control requirements by using the available checklists.	2	3	2	2	2
	Contract follow-up	Establish and execute the agreement follow-up strategy, performing invoice handling and the process for liquidated damages in case of delayed delivery.	2	3	2	2	2

Competence group	Competence element	Knowledge and skills	Competence level required				
			Project Control Manager	Project Control Engineer	Planner	Cost Control Engineer	Project Economist
Procurement management	Contract follow-up	Time and cost management of the contract.	2	3	2	2	2
		Baseline update at the contract level.	2	3	2	2	2
		Change management of the contract.	2	3	2	2	2
	Contract close-out	Verify the final account and close the contract in all relevant systems.	2	3	2	3	2
		Perform the experience transfer activities.	2	3	2	3	2
Integration management	Change management	Ensure the use of a change control process including all affected disciplines within each project and change consequences (HSE, regulatory, risk, cost, schedule, quality).	3	3	3	2	2
		Ensure the process of identifying, evaluating, approving, rejecting or deferring change proposals.	3	3	3	2	2
		Accomplish management and control over changes related to approved project frame conditions.	3	3	3	2	2
Quality management	Quality knowledge and experience transfer	Be familiar with the quality management plan, comprising quality management strategy, quality plan, program of project monitoring activities and non-conformities management.	3	3	3	2	2
		Execute the program for experience transfer, ensuring qualitative and quantitative data collection and knowledge sharing.	3	2	3	3	2

Competence group	Competence element	Knowledge and skills	Competence level required				
			Project Control Manager	Project Control Engineer	Planner	Cost Control Engineer	Project Economist
Risk management	Risk control	Be familiar with the established work process for risk management, ensuring that threats and opportunities are identified, analyzed and handled.	3	2	2	2	2
		Identify cost and schedule impact of risks	3	3	3	2	2
	Schedule risk analysis/assessment	Evaluate risks and mitigation actions to accomplish the plan and secure timely deliverables. Schedule risk analysis: quantitative simulation (Monte Carlo technique). Schedule risk assessment: based on elements in the risk register.	2	2	3	2	2
		Cost risk analysis/assessment	Evaluate the probability and consequences of threats and opportunities in the cost, evaluate the cost effects of mitigating actions and identify trends of key indicators. Cost risk analysis: quantitative simulation (Monte Carlo technique). Cost risk assessment: based on elements in the risk register.	2	2	2	3
Stakeholder management	Stakeholder identification	Identify the stakeholders and their possible impact in achieving the project plan.	3	2	2	2	2
Information Technology (IT) tools	SAP	Use of SAP for human resource management, cost management (funding and accounting) and procurement management.	2	3	2	3	3

Competence group	Competence element	Knowledge and skills	Competence level required				
			Project Control Manager	Project Control Engineer	Planner	Cost Control Engineer	Project Economist
Information Technology (IT) tools	PIMS	Use of PIMS for scope management, human resource management, cost management, procurement management, change management, quality management, risk management, document management, milestones.	2	3	2	3	3
	Safran Planner SQL	Use of Safran for time management.	2	2	3	1	1
	ProCoSys	Use of ProCoSys for facilities work order preparation, completion and Life Cycle Information (LCI).	1	1	2	1	1

Competence scale description

Scale	Competence level	Description
1	No knowledge	- No knowledge or experience related to the competence.
2	Basic knowledge	- Sufficient knowledge and skills to work under guidance and to take simple decisions. - Limited experience and knowledge of where to find information. - General practical and theoretical skills.
3	Qualified/can work independently	- Good knowledge and skills to work independently and secure. - Can take responsibility for decisions and performance. - Able to provide guidance. - Good practical and theoretical skills.
4	Expert	- Excellent knowledge and skills in addition to extensive experience. - Considered a resource person within the area. - Could be used in training situations as an instructor.

List of deliverables and applicable governing documents

Competence group	Competence element	Deliverables	Applicable governing documents
Management system	Organizational knowledge		The Statoil Book Project Development (FR05) Ethics Code of Conduct (FR18) Safety Management (FR10) Sustainability Management (FR11)
Scope management	Work Breakdown Structure (WBS)	WBS	Establish WBS (PD105, PD205, PD305, PD372)
Human resource management	Manpower Projection Plan (MPP)	MPP	Project resource allocation (GL0284)
Time management	Schedule planning	Master Control Schedule (MCS) Project Master Schedule (PMS) Project Detailed Schedule (PDS) Project Work Plan (PWP) Commissioning Schedule	Planning and Scheduling in Statoil (GL0187) Project Master Schedule (PMS) (PD169-02, PD269-04) Project Detailed Schedule (PDS) (PD269-05, PD369-02) Project Work Plan (PWP) (PD118, PD218, PD318)
	Schedule interfaces	Interface Schedule	
	Schedule control, analysis and reporting	Project Planning Basis (PPB) Schedule baseline update - Current Control Schedule (CCS) For OBF: Master plan, Operation plan and Work Order (WO) plan	Project Planning Basis (PPB) (PD118, PD218, PD318) Update project baseline (PD452-03) Update contract baseline (PD452-04)
Cost management	Cost preparation	Cost control system	Cost Management Planning Period (GL0450) Guideline for Project Set-up DG3-DG4 (GL0440)

Competence group	Competence element	Deliverables	Applicable governing documents
Cost management	Cost estimating	CAPEX/OPEX, pre-investments, insurance, investment estimates, target cost	Guideline for Facilities Cost Estimating (CAPEX) (GL0430) Establish cost estimate for facilities (PD169-03, PD269-06, PD269-07, PD369-03) Establish total cost estimate (PD369-04) Perform external benchmarking (PD256, PD356, PD456)
	Cost control, analysis and reporting	Monthly reporting Project Control Basis (PCB) Cost baseline update - Current Control Estimate (CCE)	Guideline for Project Baseline (GL0441) Guideline for Monthly Reporting and Closing (GL0442) Follow up cost and time (PD152, PD252, PD352) Update Project Control Basis (PCB) (PD371) Control of Baseline Update (KC0745)
	Funding and accounting	Monthly accruals Cash call Decision memo Budget and work program	Finance and Control (FR14) Project Development Key Controls (KC1800)
Procurement management	Contract preparation and strategy		Supply Chain Management (FR09) Guideline for Project Control of Contracts (GL0191)
	Contract evaluation and award		
	Contract follow-up	Variation Order (VO) Variation Order Request (VOR)	Guideline for Project Control of Contracts (GL0191) Update contract baseline (PD452-04)
	Contract close-out		Perform close-out of cost control system (PD187, PD287, PD387, PD487) Guideline for Project Closing in Project Control (GL0443)
Integration management	Change management	Project Change Proposal (PCP) Minutes from the Change Board meeting	Manage change in projects (PD359, PD459)

Competence group	Competence element	Deliverables	Applicable governing documents
Quality management	Quality knowledge and experience transfer		Capture and communicate experience (PD103, PD203, PD303, PD405) Collect and share experience (PD185, PD285, PD385, PD485)
Risk management	Risk control		Risk management (FR08) Manage risk (PD465)
	Schedule risk analysis/assessment		Update project baseline (PD452-03) Schedule risk assessment (R-90522)
	Cost risk analysis/assessment		Guideline for Cost Risk Analysis (CRA) (GL0431)
Stakeholder management	Stakeholder identification		
Information Technology (IT) tools	SAP		
	PIMS		
	Safran Planner SQL		
	ProCoSys		

Appendix 6. Final competence assessment tool

Competence group	Competence element	Knowledge and skills	Competence level required				
			Project Control Manager	Project Control Engineer	Planner	Cost Control Engineer	Project Economist
Management system	Organizational knowledge	Comprehensive knowledge of company values, operating model (Ambition to Action, Compliance and Leadership Model, CVP), corporate policies (Ethics code of conduct and anti-corruption compliance program, Health, Safety and Environment (HSE) philosophy and security policies, Corporate Social Responsibility (CSR) philosophy), People@Statoil process.	2	2	2	2	2
		Use of ARIS to find relevant processes and governing documents.	2	2	2	2	2
Scope management	Work Breakdown Structure (WBS)	Describe the work in controllable and measurable work units, specific for the project, following the coding requirements from the templates.	2	1	1	2	2
		Maintain the WBS structure updated.	2	1	1	2	2
Human resource management	Manpower Projection Plan (MPP)	Identify the personnel resources needed for a project and their responsibilities.	2	1	1	2	2
		Plan the personnel resources acquisition and staff the project using resource levelling and resource smoothing.	2	1	1	2	2
		Maintain the MPP structure updated.	2	1	1	2	2

Competence group	Competence element	Knowledge and skills	Competence level required				
			Project Control Manager	Project Control Engineer	Planner	Cost Control Engineer	Project Economist
Time management	Schedule planning	Plan specific activities in a network considering their estimated duration, logical dependencies and resource availability, by using the Critical Path Method (CPM).	1	1	2	1	0
		Determine the project duration.	1	1	2	1	0
	Schedule interfaces	Plan the interfaces between major deliveries/installations and critical elements, sub-projects and contracts.	1	1	2	1	0
		Establish interface milestones.	1	1	2	1	0
		Manage the interfaces ensuring interface alignment, consistency and harmonization.	1	1	2	1	0
	Schedule control, analysis and reporting	Monitor the status of project activities to update project progress and all schedule documents, by using Earned Value Management (EVM) and time phasing.	1	1	2	1	0
		Manage changes to the schedule baseline ensuring that deliverables are developed and aligned with planning requirements and best practice.	1	1	2	1	0
		Verify and monitor critical path(s) and float development.	1	1	2	1	0
		Schedule benchmarking.	1	1	2	1	0

Competence group	Competence element	Knowledge and skills	Competence level required				
			Project Control Manager	Project Control Engineer	Planner	Cost Control Engineer	Project Economist
Cost management	Cost preparation	Prepare, establish, initiate and set-up the cost control system, the authority control structure, the project and task structure, the Work Breakdown Structure (WBS), the workflow in SAP and the Service Work Order (SWO)	1	1	1	2	1
	Cost estimating	Forecast, analyze and identify trends in the cost.	1	1	1	2	1
		Be familiar with the different cost estimate classes, estimating methodology and tools.	1	1	1	2	1
		Cost benchmarking.	1	1	1	2	1
	Cost control, analysis and reporting	Monitor, analyze and report cost developments, establishing basis for actions to complete the projects within the approved control estimate.	1	2	1	2	1
		Re-assess the remaining scope of work and update the project cost estimate based on status at cut-off (baseline) for the whole Business Case, by using Earned Value Management (EVM).	1	2	1	2	1
	Funding and accounting	Ensure that project funding and accounting activities comply with Statoil's accounting principles and other relevant internal and external reporting requirements.	1	1	1	2	2
		Ensure SOX compliance.	1	1	1	2	2

Competence group	Competence element	Knowledge and skills	Competence level required				
			Project Control Manager	Project Control Engineer	Planner	Cost Control Engineer	Project Economist
Cost management	Funding and accounting	Establish the project accounting structure in Statoil's accounting system to secure accurate accounting treatment and reporting towards stakeholders, providing reliable, relevant and sufficient financial information according to the corporate accounting principles and reporting requirements.	1	1	1	2	2
		Ensure high-quality financial risk management and sufficient financial capacity and flexibility supporting Statoil's strategy.	1	1	1	2	2
Procurement management	Contract preparation and strategy	Contribute to the prequalification process and the establishment of bidders lists.	1	2	1	1	1
		Contribute to the development of contract specific strategy, contract model, compensation format, contract schedule and milestones.	1	2	1	1	1
		Prepare the bid papers and the Invitation to tender (ITT)	1	2	1	1	1
	Contract evaluation and award	Participate in the tender evaluation considering the best commercial bid.	1	2	1	1	1
		Prepare the bid check estimate.	1	2	1	1	1
		Ensure compliance with the project control requirements by using the available checklists.	1	2	1	1	1
	Contract follow-up	Establish and execute the agreement follow-up strategy, performing invoice handling and the process for liquidated damages in case of delayed delivery.	1	2	1	1	1

Competence group	Competence element	Knowledge and skills	Competence level required				
			Project Control Manager	Project Control Engineer	Planner	Cost Control Engineer	Project Economist
Procurement management	Contract follow-up	Time and cost management of the contract.	1	2	1	1	1
		Baseline update at the contract level.	1	2	1	1	1
		Change management of the contract.	1	2	1	1	1
	Contract close-out	Verify the final account and close the contract in all relevant systems.	1	2	1	2	1
		Perform the experience transfer activities.	1	2	1	2	1
Integration management	Change management	Ensure the use of a change control process including all affected disciplines within each project and change consequences (HSE, regulations, risk, cost, schedule, quality).	2	2	2	1	1
		Ensure the process of identifying, evaluating, approving, rejecting or deferring change proposals.	2	2	2	1	1
		Accomplish management and control over changes related to approved project frame conditions.	2	2	2	1	1
Quality management	Quality knowledge and experience transfer	Be familiar with the quality management plan, comprising quality management strategy, quality plan, program of project monitoring activities and non-conformities management.	2	2	2	1	1
		Execute the program for experience transfer, ensuring qualitative and quantitative data collection and knowledge sharing.	2	1	2	2	1

Competence group	Competence element	Knowledge and skills	Competence level required				
			Project Control Manager	Project Control Engineer	Planner	Cost Control Engineer	Project Economist
Risk management	Risk control	Be familiar with the established work process for risk management, ensuring that threats and opportunities are identified, analyzed and handled.	2	1	1	1	1
		Identify cost and schedule impact of risks	2	2	2	1	1
	Schedule risk analysis/assessment	Evaluate risks and mitigation actions to accomplish the plan and secure timely deliverables. Schedule risk analysis: quantitative simulation (Monte Carlo technique). Schedule risk assessment: based on elements in the risk register.	1	1	2	1	1
		Cost risk analysis/assessment	Evaluate the probability and consequences of threats and opportunities in the cost, evaluate the cost effects of mitigating actions and identify trends of key indicators. Cost risk analysis: quantitative simulation (Monte Carlo technique). Cost risk assessment: based on elements in the risk register.	1	1	1	2
Stakeholder management	Stakeholder identification	Identify the stakeholders and their possible impact in achieving the project plan and cost.	2	1	1	1	1

Competence group	Competence element	Knowledge and skills	Competence level required				
			Project Control Manager	Project Control Engineer	Planner	Cost Control Engineer	Project Economist
Information Technology (IT) tools	SAP	Use of SAP for human resource management, cost management (funding and accounting) and procurement management.	1	2	1	2	2
	PIMS	Use of PIMS for scope management, human resource management, cost management, procurement management, change management, quality management, risk management, document management, milestones.	1	2	1	2	2
	Safran Planner SQL	Use of Safran for time management.	1	1	2	0	0
	ProCoSys	Use of ProCoSys for facilities work order preparation, completion and Life Cycle Information (LCI).	0	0	1	0	0
	eRoom PCI	Use of eRoom PCI for change management	2	2	2	1	1

Competence scale description

Scale	Competence level	Description
0	No knowledge	- No knowledge or experience related to the competence.
1	Basic knowledge	- Sufficient knowledge and skills to work under guidance and to take simple decisions. - Limited experience related to the competence. - Knowledge of where to find information. - General practical and theoretical skills.
2	Qualified/can work independently	- Good knowledge and skills to work independently and secure. - Can take responsibility for decisions and performance. - Able to provide guidance. - Good practical and theoretical skills.
3	Expert	- Excellent knowledge and skills in addition to extensive experience. - Considered a resource person within the area. - Could be used in training situations as an instructor.

List of deliverables and applicable governing documents

Competence group	Competence element	Deliverables	Applicable governing documents
Management system	Organizational knowledge		The Statoil Book Project Development (FR05) Ethics Code of Conduct (FR18) Safety Management (FR10) Sustainability Management (FR11)
Scope management	Work Breakdown Structure (WBS)	WBS	Establish WBS (PD105, PD205, PD305, PD372)
Human resource management	Manpower Projection Plan (MPP)	MPP	Project resource allocation (GL0284)
Time management	Schedule planning	Master Control Schedule (MCS) Project Master Schedule (PMS) Project Detailed Schedule (PDS) Project Work Plan (PWP) Commissioning Schedule	Planning and Scheduling in Statoil (GL0187) Project Master Schedule (PMS) (PD169-02, PD269-04) Project Detailed Schedule (PDS) (PD269-05, PD369-02) Project Work Plan (PWP) (PD118, PD218, PD318)
	Schedule interfaces	Interface Schedule	
	Schedule control, analysis and reporting	Project Planning Basis (PPB) Schedule baseline update - Current Control Schedule (CCS) For OBF: Master plan, Operation plan and Work Order (WO) plan	Project Planning Basis (PPB) (PD118, PD218, PD318) Update project baseline (PD452-03) Update contract baseline (PD452-04)
Cost management	Cost preparation	Cost control system	Cost Management Planning Period (GL0450) Guideline for Project Set-up DG3-DG4 (GL0440)

Competence group	Competence element	Deliverables	Applicable governing documents
Cost management	Cost estimating	CAPEX/OPEX, pre-investments, insurance, investment estimates, target cost	Guideline for Facilities Cost Estimating (CAPEX) (GL0430) Establish cost estimate for facilities (PD169-03, PD269-06, PD269-07, PD369-03) Establish total cost estimate (PD369-04) Perform external benchmarking (PD256, PD356, PD456)
	Cost control, analysis and reporting	Monthly reporting Project Control Basis (PCB) Cost baseline update - Current Control Estimate (CCE)	Guideline for Project Baseline (GL0441) Guideline for Monthly Reporting and Closing (GL0442) Follow up cost and time (PD152, PD252, PD352) Update Project Control Basis (PCB) (PD371) Establish project routines for control and administration (PD404) Control of Baseline Update (KC0745)
	Funding and accounting	Monthly accruals Cash call Decision memo Budget and work program	Finance and Control (FR14) Project Development Key Controls (KC1800) Accruals (R-90236)
Procurement management	Contract preparation and strategy	Contract specific strategy Contract model Compensation format Invitation to tender (ITT)	Supply Chain Management (FR09) Guideline for Project Control of Contracts (GL0191)
	Contract evaluation and award		
	Contract follow-up	Variation Order (VO) Variation Order Request (VOR)	Guideline for Project Control of Contracts (GL0191) Invoice handling control (GL0460) Update contract baseline (PD452-04) Contract follow-up (SCM244)

Competence group	Competence element	Deliverables	Applicable governing documents
Procurement management	Contract close-out		Perform close-out of cost control system (PD187, PD287, PD387, PD487) Guideline for Project Closing in Project Control (GL0443)
Integration management	Change management	Project Change Proposal (PCP) Minutes from the Change Board meeting	Manage change in projects (PD359, PD459)
Quality management	Quality knowledge and experience transfer		Capture and communicate experience (PD103, PD203, PD303, PD405) Collect and share experience (PD185, PD285, PD385, PD485)
Risk management	Risk control		Risk management (FR08) Manage risk (PD465)
	Schedule risk analysis/assessment	Schedule Risk Analysis/Assessment (SRA)	Update project baseline (PD452-03) Schedule risk assessment (R-90522)
	Cost risk analysis/assessment	Cost Risk Analysis/Assessment (CRA)	Guideline for Cost Risk Analysis (CRA) (GL0431)
Stakeholder management	Stakeholder identification		
Information Technology (IT) tools	SAP		
	PIMS		
	Safran Planner SQL		
	ProCoSys		
	eRoom PCI		

Appendix 7. PSR competence assessment IT tool

MyProfile (Edit Modus)

The application will return automatically to read only modus after saving your changes.

Last updated: 14.11.2011

Overview of your status and registered competence
[User Guide](#)

You can: View, change/register your competence here.

Tip! To view other registered competence – select the 'Additional competence' screen mode

Maintain your current competence profile

Select a screen mode: Requirement to position Select competence group: All competence groups Refresh Log for removed competence

Competence groups	Competence	Proficiency level	My registered competence	Log	Valid until	Checklist	Learn	Matchup
SCM / Agreement	Evaluation models	Qualified/can work independantly	Basic knowledge	Log				▲
SCM / Agreement	Negotiation planning and execution	Qualified/can work independantly	Basic knowledge					▲
SCM / Agreement	Procurement standards and models	Qualified/can work independantly	Qualified/can work independantly					■
SCM / Agreement	Strategy development	Qualified/can work independantly	Expert					■
SCM / Agreement ad	Agreement administration and call off	Qualified/can work independantly	Basic knowledge					▲
SCM / Agreement ad	Agreement close out	Qualified/can work independantly	Qualified/can work independantly					■
SCM / Agreement ad	Agreement start-up	Qualified/can work independantly	Expert					■
SCM / Agreement ad	Claims and warranties	Qualified/can work independantly	No knowledge					●
SCM / Analysis	Industry and market analysis	Basic knowledge	Basic knowledge					■
SCM / Analysis	Main cost driver analysis	Basic knowledge	No knowledge					●
SCM / Analysis	Spend and forecast analysis	Basic knowledge	Expert					■
SCM / Business	Supply chain understanding	Qualified/can work independantly	Expert					■
SCM / Business	Value chain understanding	Qualified/can work independantly	Expert					■
SCM / Customer and	Customer relationship management	Qualified/can work independantly	Qualified/can work independantly					■
SCM / Customer and	Supplier relationship management	Qualified/can work independantly	Basic knowledge					▲
SCM / Demand mana	Demand management	Qualified/can work independantly	No knowledge					●
SCM / Inventory	Inventory and materials management	Basic knowledge	Basic knowledge					■
SCM / Performance	Performance measurement in general	Qualified/can work independantly	Expert					■
SCM / Performance	Supplier performance measurement	Qualified/can work independantly	Expert					■
SCM / Procurement	Procurement applications and tools	Basic knowledge	Expert					■