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Information Technology Based System for Experience Transfer in Projects

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MASTER THESIS
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Information technology based system for experience transfer in projects

Projects are per definition unique. However, there are several elements (solutions, methods, tools, etc.) that are common to projects. In a time sensitive work environment, like project settings, it is highly beneficial to focus on making use of existing knowledge and solutions, and avoid "reinventing the wheel". Hence, experience transfer gains importance in project organizations. There are many ways to transfer experience in organizations. Development in information technology has led to several tools and systems that promote experience transfer. This master thesis will look at one such system that is used by an organization called Gassco. Gassco, as an operator, is responsible for safe and efficient gas transport from the Norwegian continental shelf and will be a leading gas transporter in Europe.

The following issues will be considered:

1. How is the system used in the organization? (the extent and ways of using it)
2. How does the usage of the system create the desired results (the extent and results of the usage)?
3. Are there any challenges related to using the system?
   - If there are any challenges, what are they?
   - How can these challenges be dealt with?
4. How can the system be developed further?

This thesis work also includes literature study related to the topic of experience transfer.

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.

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- 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 research report with a summary, table of contents, conclusion, list of reference, list of literature etc. The text should be clear and concise, and include the necessary references to figures, tables, and diagrams. It is also important that exact references are given to any external source used in the text.

Equipment and software developed during the project is a part of the fulfilment of the task. Unless outside parties have exclusive property rights or the equipment is physically non-moveable, it should be handed in along with the final report. Suitable documentation for the correct use of such material is also required as part of the final report.

The student must cover travel expenses, telecommunication, and copying unless otherwise agreed.

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: June 10th 2013.

Two bound copies of the final report and one electronic (pdf-format) version are required.

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**DEPARTMENT OF PRODUCTION
AND QUALITY ENGINEERING**

Per Schjølberg
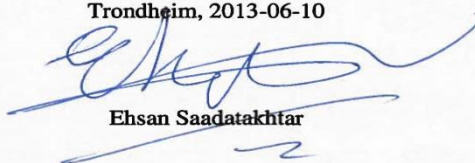Associate Professor/Head of Department

Bjørn Andersen
Responsible Supervisor

Preface

This is my master's thesis in Project Management at NTNU. It was carried out during the spring semester of 2013. The project has been carried out for Gassco which is located in Norway in Haugesund city, and it is the Gas Company as an operator for delivering gas to the European countries. I had the cooperation as a researcher for my master's thesis in this company. In this purpose, I had two workshops and some interviews with some project managers in Gassco in order to bring up my ideas in the thesis.

Trondheim, 2013-06-10

Ehsan Saadatakhtar

Acknowledgements

I would like to appreciate my supervisors Anandasivakumar Ekambaram, Sobah Abbas Petersen, and Alf Kristian Haugland in Gassco for their patience and valuable guidance during the process of completing this master thesis. Moreover, I would like to express my appreciation to Bjørn Andersen as main supervisor for helping me during my thesis.

Summary

Projects are per definition unique. However, there are several elements, such as solutions, methods, tools, etc. that are common to projects. In a time sensitive work environment, like project settings, it is highly beneficial to focus on making use of existing knowledge and solutions, and avoid "reinventing the wheel". This existing knowledge can be both explicit and tacit knowledge. Explicit refers to written knowledge, and tacit refers to experience and unwritten knowledge. Experience like explicit knowledge can be transferred among people as well. Hence, experience transfer gains importance in project organizations. There are many ways to transfer experience in organizations. Development in information technology has led to several tools and systems that promote experience transfer. So, this master thesis will look at one such system that is used by an organization called Gassco. Gassco, as an operator, is responsible for safe and efficient gas transport from the Norwegian continental shelf and will be leading gas transporter in Europe. In this regards, this thesis aims to understand, find problems, suggest solutions for solving problems, and develop and improve the experience transfer systems in this company.

Key words: knowledge management, knowledge transfer and sharing, experience transfer, individuals and organizational learning, information technology based system, PIMS R3 (project information management system), and Experience Transfer system

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1 Introduction

Today organizations have different types of projects which are executed by different project teams. Project teams consist of some engineers who have various skills and backgrounds. So, these teams have existing knowledge and solutions to execute projects and deliver them. Besides these knowledge and solutions, they will gain more positive and negative experiences during project execution. Therefore, these new experiences can help project teams to avoid their previous mistakes and reworking, and also the project teams can use the positive side of experiences to develop their work in the future projects. And also, these experiences can be useful and beneficial for others, such as individuals, project teams, and whole organization in order to read and learn from the negative and positive experiences. One of the reasons of using previous experiences is that organizations can reduce the cost of mistakes and reworking in their projects. So, organizations have ambition to transfer all these experiences and use them. According to this purpose, experiences should be recorded and registered, so organizations should use different tools to record and register the experiences as well, and then transfer them among all people within organization. One of these tools is Information Technology based system which is currently used in Gassco (Norwegian Gas Company). In this regards, this master thesis focuses on "Information technology based system for experience transfer in projects in Gassco company" and I analyze the experience transfer system in this company with four purposes, such as understanding the system, finding problems and challenges regarding using the system, finding solutions for problems, and develop and improve the system after solving problems. The names of the systems in Gassco are PIMS R3 for recording and Experience Transfer for sharing and transferring the experiences. In this respect, I made a structure for my thesis with 6 chapters which includes Topic and company, research methodology and research questions, Theoretical framework and its relevance to the case company part, Practical part as a case analysis, Discussion part, and Conclusion part. The table 1 shows all chapters in the thesis as my structure for this project and it includes 6 chapters.

Structure of project	
Chapter 1	**Topic and company**
	1. Introduction
	1.1 Company
	1.2 Industry
	1.3 Outcomes
Chapter 2	**Research Methodology and Research Questions**
Chapter 3 (Theoretical framework and its relevance to the case company part)	**Theory**
	3.1 Knowledge management in organizations
	3.2 Knowledge and Experience transfer or sharing
	3.3 Individuals and Organizational learning
	3.4 Information technology based the system
	3.5 Discussion and Analysis of the theory
Chapter 4 (Practical Part)	**Case Analysis**
	4.1 Gassco as a Case Company
	4.2 Experience Transfer Module in Gassco
	➢ Understanding of the systems
	➢ Problems and challenges
	➢ Suggestions and solutions
	➢ Discussion and analysis for development of the systems
Chapter 5	**Discussion part**
	5.1 discussion about the theoretical and practical part
	➢ Transfer Region
Chapter 6	**Conclusion, Limitations, and Future Research**

Table 1: the structure of master thesis

1.1   Company

In this part, I introduce my case company which is Gassco as Norwegian Gas Company in Haugesund city in Norway. I mention the history of Gassco, and different units of this organization. I found this information from their web page which is www.gassco.no, and also from annual reports 2011 and 2012.

Gassco is limited company owned by the Norwegian state, which operates the integrated gas

transport system from Norwegian Continental Shelf (NCS) to European countries. This system comprises pipeline, gas processing facilities, platform and receiving terminals in continental Europe and the UK(Bjordal, 2011). Gassco is a company where people achieve good results through collective action. Its organization cultivates pride and enthusiasm. Moreover, this company follows strategic goals, such as best practice for health, safety and the environment, characterized by leading-edge expertise in its core areas, responsible for first class operation, maintenance and development of transport and processing facilities, ensure value creation through integrated development of the gas transport system, perceived as a professional, neutral and independent system operator and administrator of capacity in the transport system, and finally have an active relationship with changes to its operating parameters and new business areas(Bjordal, 2012).

History: The creation of Gassco forms part of an extensive reorganization of the Norwegian oil and gas sector since 2001. Gassco was founded by the Ministry Petroleum and Energy (MPE) on 14 May 2001, and took over the operatorship of all gas transport from the Norwegian continental shelf (NCS) on 1 January 2002. This activity had previously been carried out by several companies, and the creation of Gassco formed part of an extensive reorganization of Norway's oil and gas sector in 2001. So, the company was assigned a key role in the further development of the gas transport system, which would contribute to efficient overall utilization of resources on the NCS. During time this company had these developments, Gassco operational 2002, operator assignments and coordination 2003-04, new assignments 2005, five years and new records 2006, heavyweight operator 2007, more responsibility 2008, piped post 2009, and the way ahead 2010 http://www.gassco.no/wps/wcm/connect/Gassco-EN/Gassco/Home/om-gassco/historie/.

Different units: Gassco has a functionally-structured line organization, supplemented by certain staff and support services. It had about 353 permanent employees at December 2011, and women account for 23 percent of Gassco's workplace(Bjordal, 2011). Figure 1 shows the Gassco organization chart in June 2012 with different departments. This company includes 9 different units such as;

1. System operation is responsible for planning, monitoring, and coordination, managing and supervising the product flow through the integrated gas transport system from field to receiving terminals.

2. <u>Asset management</u> is responsible for operation and maintenance of the entire Norwegian gas transport network.

3. <u>Technology</u> is a support unit with leading-edge expertise in selected technology areas.

4. <u>Business</u> development and finance is responsible for administering the joint ventures served by Gassco as operator.

5. <u>Project</u> is responsible for the portfolio management of project activities and for ensuring a high quality in project development and project implementation. My master thesis is located in this department which is shown in the figure 1 with red circle.

6. <u>Controller</u> is a staff function which primarily provides management with as instrument for cross-company control and coordination.

7. <u>Health, Safety, Environment and Quality</u> is responsible for establishing, operating and supervising Gassco's management system.

8. <u>Public relation</u> is staff function with responsibility for framing the company's information policy and being the company's press contact.

9. <u>Human resource</u> is responsible for the internal administration services related to HR.
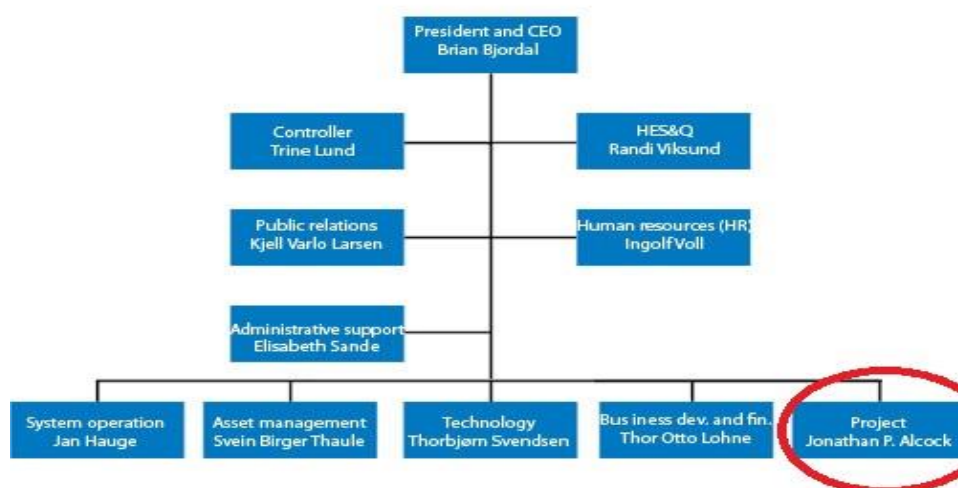
Figure 1: Gassco organization chart, June 2012,
http://www.gassco.no/wps/wcm/connect/Gassco-EN/Gassco/Home/om-gassco/organisasjon/

All sectors in Gassco are using PIMS which is Project Information Management System in project portal. This information technology based system contains some modules in projects that my thesis investigates two of these modules, such as PIMS R3 and Experience Transfer

which are the systems for transferring experience in Gassco. So, this investigation takes place in Project department which is called PRO and it is demonstrated in the picture.

1.2 Industry

In this part, I investigate the system operation of Gassco in Norway and other European countries. This company is basically Gas Company which transfers gas to other countries in Europe. Gas delivers from the NCS to Europe were the highest ever in 2012 at 107.6 billion standard cubic met**ers** (SCM). Total deliverability was 99.69 percent compared with 99.17 percent in 2011. Preparations were made in 2012 for gas deliveries from Skarv, Marulk, Atla, Visund South and Morvin, and two new shippers delivered gas to the transport system. These fields and shippers are now incorporated in Gassco's systems and from part of operational gas transport. Vessel traffic with natural gas liquids (NCL) from Kårstø calls for careful coordination with daily gas transport to avoid full product stores and field shutdowns. A total of 658 ship calls were recorded at Kårstø during the year, without giving rise to any incidents of significance for gas transport. The transport network has a built-in flexibility which makes it possible to compensate for production disruption on fields, at processing plants and on riser platforms. This flexibility can be utilized through the management exercised by Gassco's control room, which operates around the clock. As the transport system has become increasingly complex, with more fields tied in and a larger number of gas qualities, the ambition is to deliver with almost 100 percent availability in the market. Gassco has now completed a development project to adopt the advanced New Pipeline Model System. This has proved to lie at the leading edge internationally, and was also nominated for the 2012 Engineering Achievement of the year award (Bjordal, 2012).
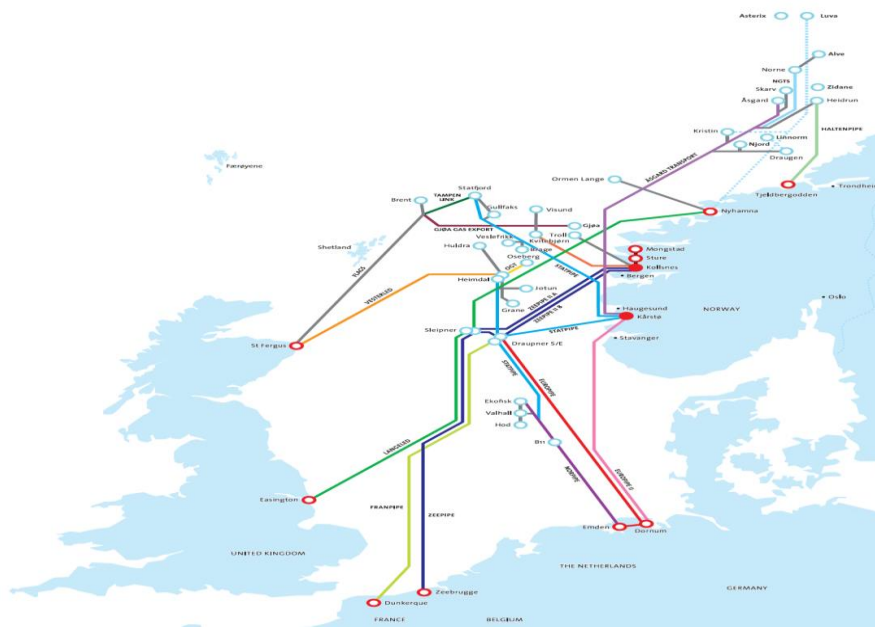
Figure 2: the transport system from Norway to other countries in Europe(Bjordal, 2012)

Figure 2 shows the transport system of gas from Norway to the countries, like UK, Germany, Belgium, and France which are usual customers in Europe (Bjordal, 2012).

1.3 Outcomes of the thesis

Outcomes play an important role in every paper, since they show the result of that paper. So, in my master thesis, this part indicates the result, objectives and scope of my work. I have done my master thesis in Gassco which is the stakeholder of my result, and this company will use my research result to develop the Experience transfer systems and solve project trams' problems according to the suggestions in this thesis. Regarding to this ambition, I follow four *purposes* in my thesis such as;

1. Understanding the Experience transfer systems such as PIMS R3 and Experience Transfer
2. Finding and analysis problems in the systems and people's problems
3. Finding and investigating suggestions in order to solve problems
4. Improve and develop the systems according to the solutions

In order to reach these purposes, I made a *scope* which has three parts such as,

1. Theoretical part: I investigate different theories like, knowledge management, individuals and organizational learning, and information technology based system

from different authors. The name of this part is Theoretical framework and its relevance to the case company.

2. <u>Practical part:</u> I had two days workshops in Gassco to understand the whole systems; the first one was about understanding of PIMS R3 and Experience Transfer, and the second one was about understanding of recording and transferring experience into the systems that PRO department did as a sample. Moreover, I had 7 interviews with project managers and development group to find problems and project managers' suggestions. So, these interviews and workshops made my practical part.

3. <u>Combination of theory with practical case:</u> in this part, I linked the theory in the practical part. So, this part shows how practical case can be explained and discussed by using relevant theories. And at the end, I designed a process as a general view of transferring experience in an organization.

Therefore, according to these scopes and purposes, the outcomes of this thesis are solutions and proposals which can help Gassco to solve project teams' problems, and develop the experience transfer systems. Without understanding of the systems these outcomes can be impossible. So, the outcomes for project teams are new procedure and training workshops of experience transfer, and for the experience transfer systems are development.

2   Research methodology

As I mentioned in chapter 1, this thesis includes three parts, such as theoretical part, practical part, and combination of theory and practice. In this respect, the methodology for theoretical part is literature review related to the topic of experience transfer, and I found these literatures from different kinds of articles. I did research in Google Scholar to find valid and suitable articles and papers regarding my topic. According to the articles, I reflected the authors' findings in my theory, then I analyzed them regarding to my practical case company, and I reflected my own view as well. Moreover, in the theory I followed three aspects, such as knowledge management and knowledge transfer, individuals and organizational learning, and information technology based system. The methodology for practical part is qualitative method that I have done in Gassco Company which is located in Norway. According to this method, I had two training sections, interview with 5 project managers and 2 developers of computer system, talking with my supervisor in the company, and reviewing company's documents in order to collect all my data for analysis. I found some of my data from documents which my supervisor gave me in Gassco, and for finding some other data, I used manual reports from Gassco's web page (www.gassco.no), like introducing the company and industry. The combination of theory and practice part is an analysis part which I mentioned in the two parts, the first analysis is discussion and analysis of theory in chapter 3, and I focus on the link among the three aspects. And the second analysis is discussion about the theoretical and practical part in chapter 5 which shows the link between theory and practical case. Besides these analysis parts, I mentioned the usage of the theories in the case with more analysis after every literature in chapter 3.

2.1   Research questions

According to my research methodology, I have some research questions which are answered by two ways, the first way is the theories from analysis of the articles, and the second way is qualitative method, such as the interviews, reading the Gassco's documents, talking with employees, and the two workshops about the experience transfer systems in the company. The questions are;

1. Why is knowledge transfer important within organization? (theoretical question)
2. What are the links among experience transfer, organizational and individual learning, and Information Technology based system? (theoretical question)

3. How is the system used in the organization? (practical question)

4. How does the usage of the system create the desired result? (practical question)

5. What are the challenges and problems related to using the systems? (practical question)

6. How can these problems and challenges be dealt with and solved? (practical question)

7. How can the system be developed further in Gassco? (practical question)

I answered these questions by doing the interviews and workshops in Gassco, and studying the literatures. The first question is theory which is answered in the theoretical part, and other questions are related to my case company.

3   Theoretical framework and its relevance to the case company part

In this chapter, I investigate the concepts and theories which can help my case company. The theories can make some clear concepts for investigation of Information Technology based system in Gassco. These concepts are knowledge management and its different types, knowledge and experience transfer, organizational and individual learning, and the role of Information Technology in experience transfer. These entire concepts are seen in my case in Gassco, and also this company can use the knowledge of other authors, like their theories and suggestions as references which I used in my thesis.

I discuss the theories into four parts which includes knowledge management, knowledge and experience transfer, organizational and individual learning, and Information technology based system in the knowledge and experience transfer. And in the fifth part I conclude entire theories that what relationships are among experience transfer, organizational learning, and Information Technology. Moreover, after every topic I discuss why this topic can be useful in my case, or why this topic is relevant in my case and thesis. I mention this relevancy with this expression "*relevance to Gassco, or relevance to experience transfer and Gassco*". So, there are two part analysis, the first part is after every topic which I combine the theory into case, and the second one is the fifth part which is discussion and analysis of the theories. Table 2 shows the summary of chapter 3 with four studies, discussion part, and their applied theories.

Chapter 3 theoretical part	
Study	**Applied theories**
1. **Knowledge management in organization**	➢ Different types of knowledge
2. **Knowledge and experience transfer or sharing**	➢ Factors that influence knowledge transfer ➢ Barriers in knowledge transfer ➢ Knowledge transfer actors
3. **Individual and Organizational learning**	➢ Learning from direct experience ➢ Four processes through three levels in organization for learning ➢ Barriers to process of organizational learning ➢ Organizational memory and learning
4. **Information Technology based system in knowledge and experience transfer**	➢ The role of IT in organizational knowledge management ➢ IT supports of knowledge strategies
5. **Discussion and analysis of theory**	

Table 2: the summary of chapter 3

3.1 Knowledge management in organizations

This thesis is investigating experience transfer in Gassco as a case company. In this part, I am going to focus on the theories which are relevant to experience transfer, and I talk what concepts explain experience transfer. Knowledge is a concept that experience can originate, since knowledge has very vast definition and includes different aspects and levels, such as tacit and explicit which are nature of knowledge, and individual, group, and organization which are different levels of knowledge. But, before deeply investigation of knowledge, I need to investigate where knowledge is from and what is the relationship between knowledge, data, and information, and then I can find a good definition for knowledge.

Data, Information, and Knowledge: (Stenmark, 2002) found some definitions from other authors who identify data, information and knowledge, for example Kogut and Zander defined information as "knowledge which can be transmitted without loss of integrity" or Nonaka mentioned knowledge and information are similar in some aspect but different in some: while information is more factual, knowledge is about beliefs and commitment. (Davenport and Prusak, 1998) define data as " a set of discrete facts", information as "a

message meant to change the receiver's perception", and knowledge as "Experiences, values, insights, and contextual information"(Davenport and Prusak, 1998). But (Stenmark, 2002) believes that first data is made, then information is made, and finally knowledge is originated from them. This view is as the same as Bellinger's view. (Bellinger et al., 2004) defines data as "data is raw. It simply exists and has no significance beyond its existence. It can exist in any form, usable or not. It does not have meaning of itself. In computer parlance, a spreadsheet generally starts out by holding data." And then, he defines information as "a data that has been given meaning by way of relational connection. In computer parlance, a relational database makes information from the data stored within it." And finally, he defines knowledge as "the appropriate collection of information, such that it is tent to be useful. Knowledge is a deterministic process"(Bellinger et al., 2004). Moreover, (Roberts, 2000) has very close definitions from data, information, and knowledge like other authors, Roberts (2000) defines data as necessary inputs into information and knowledge, information as data that have been arranged into a meaningful pattern, and knowledge as application and productive use of information(Roberts, 2000). (Stenmark, 2002) claims knowledge is based on personal experience and fundamentally tacit. We use our knowledge to perform actions such as creating information(Stenmark, 2002). In this thesis, these definitions are important, since they refer to experience, for example Davenport and Prusak (1998) defined knowledge is experience.

So, *knowledge* is usually defined as justified belief that increases an individual's capacity to take effective action(Ko et al., 2005) and as an experience(Davenport and Prusak, 1998). And, it has three levels, such as individual, group, and organizational levels. Knowledge is created through interaction between individuals at different levels in the organization, also organizations cannot create knowledge without individuals, and unless individual knowledge is shared with other people and groups, so obviously group and organizational levels are made up of individuals level(Ipe, 2003, Stenmark, 2002). The figure 3 shows that knowledge is shared from people, then groups and finally through whole organization. Moreover, knowledge in groups and in organizations depends on the individuals' knowledge. Therefore, perceived effectiveness of knowledge at the individual level may be expected to facilitate perceived effectiveness of knowledge at the group level, then the progression of knowledge from the individuals to the group continues to the organizational level(Sabherwal and Becerra-Fernandez, 2003). Sabherwal and Becerra-Fernandez (2003) proposed three

hypotheses which show perceived individual-level knowledge effectiveness facilitates perceived group-level and organizational-level, and also perceived group-level facilitates effectiveness perceived organizational-level.
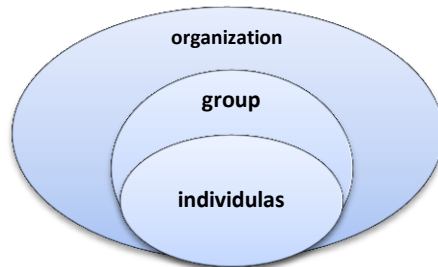
Figure 3; level of knowledge from individuals till organization

Individual knowledge; it is a part of organization's knowledge that is in the brain and body of people(Ipe, 2003). In the same over view from (Griffith et al., 2003), I found out that Griffith believes individual knowledge is conceptualized as a continuum from explicit to tacit which is in the brain of people. All organizational learning takes place inside human heads. This is divided into three types such as *know-how* which included experience based knowledge that is subjective and tacit(Ipe, 2003), and refers to skills as well(Stenmark, 2002), *know-what* included task related knowledge that is objective in nature(Ipe, 2003), and also refers to knowledge about facts(Stenmark, 2002), *know-who* which refers to specific and selective social relations(Stenmark, 2002), know-why which refers to scientific knowledge of principles and laws of motion in nature(Stenmark, 2002), and the last one is *dispositional knowledge* which was defined as personal knowledge that included talents, aptitude, and abilities. Therefore, individuals need some tools to be able to share their knowledge to group, and then in organizational level. I can say that this tool is available in Gassco as my case company. There is a system in Gassco which let people update their experience for others.

But, why are there a lot of definitions and concentrations in data, information, and especially for knowledge and they are important? I found some good answers in (Ipe, 2003)'s article, he mentions that Knowledge is now the most important strategic resource in organizations and increases innovativeness and responsiveness(Alavi and Leidner, 2001), and also Organizations have to invest on knowledge that they have, they have to understand how knowledge is created, shared, and used within organization in order to be able to learn from them and avoid rework, (Ipe, 2003). And in Gassco, due to this investment, learning, and avoiding rework, they are investigating their experience transfer system to develop it. So, in order to understand how knowledge is created and transferred, they need to know, where

knowledge is originated, and it gets clear that knowledge is from information, and information from data.

(Bloodgood and Salisbury, 2001) believes that organizations should manage their knowledge in order to be able to implement change, and gain and maintain a competitive advantage through the use of three general knowledge management strategies;

1. *Knowledge creation* which focuses on creativity, experimentation, and, to a significant extent, creating a shared understanding within the creating group to make new knowledge from previous knowledge and experience that can be used to develop new projects, products, and services(Bloodgood and Salisbury, 2001). And also (Alavi and Leidner, 2001) mention that knowledge creation refers to the development of 'new' organizational know-how and capability.

2. *Knowledge transfer* which focuses on rapidly issuing knowledge through their organization in an effort to utilize experiences and knowledge to its fullest extent as quickly as possible(Bloodgood and Salisbury, 2001). And (Alavi and Tiwana, 2003) identified three modes of knowledge transfer in organizations, such as transfer of knowledge between individuals, transfer between individuals and knowledge repositories (e.g. downloading a report from a document repository), and the last one is transfer among existing knowledge repositories(Alavi and Tiwana, 2003).

3. *Knowledge protection* which focuses on maintaining knowledge in its organizational and constructive state, for example not losing experiences and knowledge(Bloodgood and Salisbury, 2001).

Therefore, Bloodgood and Salisbury (2001) say that it is important for an organization to understand which knowledge management strategies it should focus on under various circumstances. So, in my case, Gassco is following the knowledge creation, transfer, and protection strategies. All these three strategies can be reflected in PIMS R3 and experience transfer system.

Relevance to Gassco

According to theory of data, information, and knowledge; data like words is the input of PIMS R3 without meaning of itself, and then this module makes information from data like sentences, finally information or all sentences are collected and become knowledge

which people in the organization can read and learn from them. This is an overview of the system that Gassco is using for experience transfer currently. So, I can say that knowledge can be an experience. Otherwise, categorizing the knowledge can be observed easily in Gassco, since individuals share their experience in a meeting with their groups, and then they put them in experience transfer system in order to be available for all people in whole of Gassco. So, knowledge is from people to groups, and then whole organization. And also, Gassco has two strategies in knowledge management, the first one is *experience and knowledge* transfer from people and group into system in order to be available for others, and second strategy is *knowledge protection* that system is established to keep and maintain experiences from different projects in order to be available in future projects.

3.1.1   Different types of knowledge

 Knowledge has different kinds of types, and I found some of them from different authors. For example (Joshi et al., 2007) found that knowledge has been categorized as *tacit* which refers to the type of knowledge that is difficult to express and explicate, *embodied* which can be partially articulated and result from physical presence, *encoded* that refers to the knowledge residing in notebooks and data banks long after the knowledge contributor has left the organization, *embrained* that refers to cognitive ability of understanding underlying patters of a given phenomenon, *procedural* refers to the knowledge about the processes., and finally, *embedded* knowledge refers to knowledge that is contained within a variety of contextual factors and is not pre-given(Joshi et al., 2007). But I found in (Nonaka and Takeuchi, 1995) article, which categorized knowledge as two main types, Tacit and Explicit. They found out that tacit knowledge is experience, simultaneous, and analog. While explicit is rationality, sequential, and theory. So according to (Nonaka and Takeuchi, 1995) knowledge of experience tends to be tacit and subjective.

And in other articles are found similar definition for two main type of knowledge; tacit and explicit. Such as; ***Tacit knowledge****;* the knowledge resides in individual's head in forms of experience, know-how, insight and so on, is the most valuable and important part of human knowledge existed(Panahi et al., 2012), and tacit knowledge is personal and context dependent, it is very difficult to express, formalize or communicate(Fernie et al., 2003). So, it refers to personal knowledge such as people's ideas, experience, and thoughts and so on. Moreover (Bloodgood and Salisbury, 2001) discussed and found that tacit knowledge is

difficult to articulate and express to others as well. Examples of tacit knowledge include implicit organizational routines which are not codified, rather they occur through the institutionalized interactions occurring in the organization, such as those used for creating new product designs, projects, and competitive strategies(Bloodgood and Salisbury, 2001). ***Explicit knowledge****;* it refers to knowledge that has been articulated and written down, for example knowledge in books, journals, manuals, guidelines, databases and so forth(Panahi et al., 2012). Also, it is described as knowledge that can be easily expressed or codified(Fernie et al., 2003). (Bloodgood and Salisbury, 2001) define explicit knowledge is easily expressed, it can be written down or passed verbally to others, they expressed explicit knowledge is more easily transferred and imitated. Example of explicit knowledge include product characteristics, testing procedures, marketing strategies, and accounting procedures that have been documented which are have been already defined (Bloodgood and Salisbury, 2001). Bloodgood and Salisbury (2001) investigate the relationship between knowledge types and IT which is nearer to my case and thesis, and more practical, while others investigate the theoretical and conceptual of knowledge types.

Regarding to all definitions of different types of knowledge, I can conclude that two types of knowledge which are tacit and explicit, are relevant to my master thesis. I can conclude from these definitions that tacit is hard to express and it is experience. And explicit is from literature.

Figure 4 shows explicit and tacit knowledge like an iceberg shape. It indicates that knowledge is hard to be shared from explicit to tacit knowledge, while the value of sharing from explicit to tacit knowledge becomes higher. Explicit knowledge is like top of iceberg clear and obvious. When we go down knowledge becomes conscious tacit then unconscious tacit which are harder to be shared and more important. Moreover, at the bottom of the iceberg there are team and individuals unconscious tacit knowledge that is very difficult to express.

The knowledge iceberg

Figure 4: model of knowledge sharing(Bartholomew, 2005)

Consequently, according to knowledge management theory, the concepts that can explain experience transfer are tacit knowledge, and knowledge transfer which I discus in part 2. So, I define that experience is type of knowledge which is hard to express, but it is possible with some tools.

Relevance to experience transfer system and Gassco

The theory that I mentioned above are relevant to my thesis because the knowledge that will be transferred and shared in the Gassco is experience. And I found out in some definitions that experience is tacit knowledge and hard to express, and also explicit is theory and easy to express. So, experience will be hard to transfer. But the way that I am thinking is conversion from tacit knowledge as an experience to explicit knowledge as a theory, in Gassco. This way is possible by using of Gassco systems, people in Gassco have meetings during or after project and discus with each other about their experience in projects, then they update and upload their experience in the system which is going to be available for all people in form of written that is like literature and readable documents. Therefore, this work in Gassco is kind of conversion of tacit as an experience to explicit as a document.

3.2   Knowledge and experience transfer or sharing

As I mentioned in the knowledge management part, knowledge can be an experience as well, since I can refer to definition of experience transfer which I found from (Aase, 1997). Aase (1997) defined experience transfer as an "organizational processes for communication of experiences from persons, group, and organizational units to other persons, groups, and organizational units that have not developed these experiences themselves so that these actors

are able to use the experiences in their own work". So, it is seen that these three units are level of knowledge which I investigated in the knowledge management theory. This aspect of knowledge can be important within organizations especially for managers. Managers always think that how they can encourage people to share and transfer what they know among other people within organizations. I can refer to (Joshi et al., 2007) which mentions "making knowledge transfer an important topic of interest for both academics and practitioners. Also, knowledge transfer occurs when knowledge is distributed from one individuals, group, and organizations to other." Due to this importance, Gassco wants to investigate the amount of usage of its experience transfer system, and then develop it. So, experience transfer is very important for manager in Gassco. In this part, I investigate theory of knowledge transfer within organizations from articles, and then I compare this theory with real case which is Gassco.

I found some definitions for knowledge transfer from some articles, for example one author says "knowledge transfer occurs when knowledge is distributed from the individual to others"(Roberts, 2000). And also, (Ko et al., 2005) found definition of knowledge transfer from other authors as "dyadic exchange of organizational knowledge between a source and a recipient unit in which the identity of the recipient matters". But Ko (2005) defines knowledge transfer by himself as "the communication of knowledge from a source so that it is learned an applied by a recipient". Moreover, (Joshi et al., 2007) found out that successful knowledge transfer needs a "degree of resonance" between two or more agents, suggesting that knowledge transfer requires both the transfer of knowledge from the source agent, and the learning of that knowledge by the recipient agent.

According to literature, there are some factors that affect knowledge transfer within information systems development. And also, actors and barriers have important roles in knowledge transfer. So, in the next part, I will argue factors, actors, and barriers in knowledge transfer and their relevance in my case and experience transfer system.

Relevance to experience transfer system and Gassco

This thesis is investigating experience transfer in Gassco, so all these definitions can help to understand the concept of knowledge transfer in the real case. For example, theory says transferring happens between a source and a recipient, and then this event can be

observed in Gassco's meetings for experience transfer.

3.2.1   Factors that influence knowledge transfer

There are some factors which influence in transferring knowledge and experience among people within organizations. These effects can have positive or negative on knowledge transfer and sharing. For example, lack of trust causes decreasing knowledge transfer and sharing within organizations. Or, culture can have negative impact like conservative people, and positive impact like respect each other and people who are good talker and listener. I found some factors from literatures and collect them in my thesis.

1. **Source Capability:**

(Joshi et al., 2007) argues that Information System Development (ISD) knowledge of an individual source will be positively related to the extent of knowledge transferred by that source. Because, Joshi (2007) found that the outflow of knowledge from a source to a recipient depends upon the wealth of a source's knowledge-base. And also, he found that positive relationship exists between the degree of the source's capability and knowledge transfer. An ISD team consists of multiple members from different backgrounds, with different levels of skills, and in different roles(Joshi et al., 2007). In comparison with Joshi view, there is another view which mentions source capability as absorptive capacity(Ko et al., 2005), Ko (2005) believes the greater the absorptive capacity of a client, the greater the knowledge transfer. Because, Ko (2005) found that functional users who lacked absorptive capacity about ISD have difficulties in knowledge transfer.

Relevance to experience transfer system and Gassco

ISD as a factor for knowledge transfer in this theory can be Experience transfer system as an output and PIMS R3 as input in Gassco.

2. **Source Credibility and Trust:**

This factor is very important in knowledge transfer, since some authors mention in their literatures a lot. (Joshi et al., 2007) argues that source credibility refers to the extent to which a recipient perceives a source to be trustworthy and reputable. Thus, he mentions the credibility concept has two dimensions: trust and reputation. Both (Joshi et al., 2007) and (Roberts, 2000) have the same view and they argue that trust is important for knowledge

transfer and sharing.

Trust: it influences the level of risk and uncertainty arising from the transaction of commodities within organizations(Roberts, 2000). Roberts (2000) found three conditions which are common in definitions of trust from other articles. Firstly, trust is identified with an agent's belief rather than with his/her action. Secondly, trust refers to beliefs about the likely behavior of others, which matter for the trust's decision-maker. And finally, it refers to situation where the complexity of the relationship, or the fact that it is marked by unpredicted contingencies, precludes having recourse to complete contingent contracts with third party enforcement(Roberts, 2000). In (Joshi et al., 2007) points out that trust is the most important precondition for knowledge exchange or transfer, and also Joshi (2007) referred trust as "magic" ingredient for knowledge transfer.

Otherwise, (Joshi et al., 2007) argues that knowledge source's reputation is seen as critical, since it is often used by the potential recipient to screen and evaluate the value of the source's knowledge. So, Joshi (2007) concluded that credibility of, an individual source will be positively related to the extent of knowledge transferred by that source.

Relevance to experience transfer system and Gassco

Trust can be an important factor in Gassco as well, and the theory refers to trust within organizations among people. Because, when people in Gassco trust each other, and there is a reliable environment among them. Top manager can be sure that all people review projects and read previous experience. Thus, I think in order to strengthen credibility and trust in Gassco, they should have more friendly environment and talk more with each other, for example in breaks about their projects or system and so forth.

3. Communication:

Communication is another factor that influences in knowledge transfer and a lot of authors point out the importance of communication, and face to face contact in their study (Roberts, 2000, Joshi et al., 2007). In (Stenmark, 2002) mentions that from communication perspective, we can act upon our new understanding, thereby transforming our knowledge to organizational benefit. In another view, I found out that (Disterer, 2001) links communication with reliability in the knowledge sharing and transfer. Disterer (2001) mentions management

must afford time for communication and reflection in order to allow employees to network and transfer and share their experience and knowledge with each other.

Communication between individuals requires both the decoding and encoding of messages(Ko et al., 2005). Communication *decoding* refers to a recipient's ability to listen, and *encoding* refers to a source's ability to express idea clearly ko (2005) found it from (monge et al. 1982). Therefore, studies suggest that increased communication competence increase the likelihood for individuals to engage in activities with each other and greater the shared and transferred knowledge and experience(Ko et al., 2005). (Joshi et al., 2007) argues that communication plays a crucial role in the process of knowledge transfer due to three reasons. First, communication leads to socialization which is important for team-oriented values, collaboration which is defined by (Hardy et al., 2003) as "a cooperative, inter organizational relationship that is negotiated in an ongoing communicative process", cooperation, harmony, consensus, decision making, and team accountability. Second, it helps in building and maintaining a team's social capital embedded in team members' relationships. And finally, by building on the knowledge of the various team members, team facilitate the exchange and internalization of knowledge and insights, so joshi (2007) suggests the extent of communication between team members will positively related to the extent of knowledge transferred (Joshi et al., 2007).

Relevance to experience transfer system and Gassco

As discussed in theory of communication from different literature, communication is very important factor to find reliability among people within organizations. Since when people trust each other, they talk and discuss more and more, so in their discussion and talking they transfer knowledge and experience with each other. Also, if someone would be social and have good communication skills, people would potentially be interested to talk with him/her to ask about problems or share knowledge or experience with him/her. In Gassco more communication can increase awareness about experience transfer system, and even increase experience sharing by discussion and talking. Moreover, some people in Gassco believe that face to face communication and talking with people directly are useful for experience transfer. And, a lot of people are using communication skills in order to learn and transfer their experiences.

4. Motivation:

In this part, I investigate the motivation as an important factor in knowledge sharing and transfer, since people are not likely to share their experience and knowledge without strong personal motivation. Or even, maybe they do not know that individuals need their knowledge. If the individuals recognized that their experiences help projects, and then in higher level helps organization, they would contribute in knowledge and experience sharing. According to (Bartholomew, 2005) top management and people within organization are motivated to different thing: management by business benefits particularly when, as in many design practices, they own the business, other people by personal benefits such as more time to spend on the interesting parts of the job, professional recognition, or social rewards. In this regards I found two factors for motivation, the first one is internal factor and the second one is external factor (Ipe, 2003, Ko et al., 2005). (Ipe, 2003) mentions that internal factor includes the perceived power attached to the knowledge and the reciprocity that results from sharing, and external factors that include relationship with the recipient and rewards for sharing(Ipe, 2003). But (Ko et al., 2005) found out from another author that internal motivation occurs when an activity is valued for its own sake and appears to be self-sustained and employees are directly satisfied, and also internal motivation should enable the transfer of tacit knowledge, and employees are externally motivated when satisfaction does not lie in the content of the activity itself (Ko et al., 2005). In this respect, when individuals think that their contributions to others will be worth, and some new value will be created with expectations of receiving some of that value for themselves, for example being recognized by others or top management. These private rewards are more likely to accrue to individuals who actively participate and help others. Thus, they are motivated to share knowledge and experience, and contribute to others (Wasko and Faraj, 2005). Also Wasko and Faraj (2005) mention that individuals engage in social interaction based on an expectation that it will lead in some way to social rewards such as approval, status, and respect. They suggested that reputation and enjoy helping are two factors which help people for knowledge sharing(Wasko and Faraj, 2005). So, I can find some factors for motivation, people are motivated in experience and knowledge transfer because of these factors;

Knowledge as power for motivation; increasing knowledge in organization provides environment for people to collect and create knowledge for themselves, since according to (Ipe, 2003), people use knowledge for both control and defense.

Reciprocity as a motivation*;* the mutual give-and take of knowledge can facilitate knowledge sharing if individuals see that the value-add to them depends on the extent to which they share their own knowledge with others(Ipe, 2003). Moreover, reciprocity as a motivator implies that individuals must be able to anticipate that knowledge sharing will prove worthwhile(Ipe, 2003).

Relationship with recipient*;* one external factor in motivation is relationship between sender and receiver. It has two elements; one is trust which is primary dimension in organization influencing the action of individuals(Ipe, 2003) since people share their knowledge when they feel reliability. And, another one is power and status of the recipient which mediate the relationships between individuals involved in such exchanges influence to some extent whether and how knowledge is shared. People with low status and power in the organization tend to direct information to those with more status and power and vies versa(Ipe, 2003).

Rewards for sharing knowledge*;* another motivation for people is rewards to share knowledge. When there is a beneficial like prize for knowledge sharing in the organizations, individuals try to catch it. Another aspect of rewards is, professionals participate in knowledge sharing activities because of the intrinsic reward that comes from the work itself, and also professionals are motivated by a sense of involvement and contribution(Ipe, 2003). Otherwise, in (Gurteen, 1999) is discussed that rewards must be put in place to encourage knowledge sharing, that an ideas database should be created and that people should be paid for their contribution. Gurteen (1999) does not believe "you can make people share by overtly rewarding them. We are not laboratory pigeons. Stimulus-response does not work in complex system. Human beings are motivated by more than just money".

Relevance to experience transfer system and Gassco

I found out that motivation is very important factor in theory for experience transfer. I observed in Gassco motivation is an important factor as well, and even they have a tool as a motivator which is a system with two parts, PIMS R3 as input of experience and experience transfer system as output of experience. This system is a good motivator, since it is easy to use, and has a clear environment. Also, people are very motivated to learn from each other, such as having workshop and help. So, according to theory and Gassco as case, I can identify two main factors for motivation. First, learning new things from each other is high level and

internal motivation, and second, experience transfer system is a motivation tool that helps people to learn from each other and transfer their experience easily as external motivator.

5. Opportunity:

Another factor of knowledge transfer is opportunity. People in organizations can share their knowledge in both formal and informal situation. Formal opportunities include training programs, structured work teams, and technology based systems. Informal opportunities include personal relationships and social networks that facilitate learning and the sharing of knowledge(Ipe, 2003). Informal as a relational channels facilitate face-to-face communication which allows for the building of trust(Ipe, 2003).

Relevance to experience transfer system and Gassco

According to this theory, I can find opportunity of experience transfer in Gassco, formal one is, meetings that they discuss and put their experience into the system, and informal one is, talking face to face with each other next to coffee machine in breaks, or going directly to others' offices and ask about their problems. But, I think combination of formal meetings and informal gathering can be very great opportunities for experience transfer in Gassco.

6. Culture:

All those previous factors are influenced by the culture of the work environment in the subunit and the culture of the organization at large(Ipe, 2003). Because Culture is a major barrier to effective knowledge creation, sharing, and use(Ipe, 2003). People from different countries have different culture. Knowledge sharing only succeeds when it is supported by other aspects of culture and management practice(Bartholomew, 2005). There is no point telling people to share knowledge and experience if they believe their authority depends on hoarding(Bartholomew, 2005). Culture plays an important role in the success of a knowledge management effort(McDermott and O'Dell, 2001). So, according to these definitions culture reflected in values, people behavior, and structure and systems. In an organization with a knowledge sharing culture, people would share ideas and insights because they see it as natural, rather than they are forced to do(McDermott and O'Dell, 2001). So, knowledge sharing follows organizational culture in the communication between people in organizations.

Culture in an organization suggests what to do and what not to do regarding knowledge processing. For example, culture does not allow you to ignore people with low status and power in knowledge while it helps to share knowledge with them.

Therefore, in order to overcome "culture as barrier" to share knowledge, we should design and implement our knowledge management effort and make a connection between sharing knowledge and practical business goals, problems or results (McDermott and O'Dell, 2001).

Relevance to experience transfer system and Gassco

In the theory mentions culture as main barrier such as people that their authority depend on hoarding or they are aggressive and conservative, so it is very difficult that we expect them to share their experience within organizations. Also vice versa; there are a lot of people that enjoy helping and transferring knowledge and experience with others. Therefore, I think culture can have both positive and negative impact, because I found out in Gassco the majority of people are Norwegian with the same culture and help each other a lot. For example, in their meeting they remind each other's experiences, discuss with each other in friendly environment, like to learn from others, and they can remind their colleagues to record their experiences in the systems, so I think this is positive side of the culture that cannot be a barrier. But in another side, a German company replies Gassco's email in German language that is hard for Gassco to understand and translate, so this side of language culture can have negative impact.

Consequently, there are six factors that influence in knowledge transfer, these effects can contribute positively and negatively in experience transfer, for example culture can be positive or negative, and lack of motivation in experience transfer can be a problem for transferring experience. So, in the next part, I discuss about negative factors which are barriers in experience and knowledge transfer.

3.2.2 Barriers in knowledge transfer

In this part, I investigate the barriers and challenges that are related to knowledge transfer and sharing within organization. Barriers exist in collaboration for knowledge sharing and transfer, they are between knowledge owners and receivers. Barriers may distort the internalization of (previously or simultaneously) externalized knowledge(Hendriks, 1999). Hendriks (1999) mentions that barriers such as space and time which relatively straight

forward, and also fundamental barriers such as social distance, culture and language, and differences in mental or conceptual frames(Hendriks, 1999). While (Disterer, 2001) divides barriers into two groups, the first group is individual barriers to knowledge transfer which are loss of power, revelation, uncertainty, and motivation. And second one is social barriers to knowledge transfer which are language, conflict avoidance, bureaucracy and hierarchy, and incoherent paradigms(Disterer, 2001).

Individual barriers:

1. *Loss of power:* Disterer (2001) found out that knowledge is power, so where job security is low knowledge as a power becomes vital for the individual and knowledge might be seen as a kind of insurance against losing the job(Disterer, 2001). So, in this situation, nobody likes to transfer experiences.

2. *Revelation*: transferring knowledge to colleagues or putting experience into a knowledge database may be considered as a revelation, since it proclaims that this knowledge has a certain value and rareness(Disterer, 2001).

3. *Uncertainty*: people who are less experienced may feel some uncertainty, because they cannot judge if their experiences represent valuable knowledge for others(Disterer, 2001).

4. *Motivation*: transferring knowledge may be seen as extra work, due to time of documentation. So, lack of motivation is big barrier, especially for people with lack of time, it will be hard for them to transfer experience(Disterer, 2001).

Relevance with Gassco:

Barriers can be problem in Gassco, especially in uncertainty and motivation. Uncertainty in Gassco means project manager suppose their experience is not useful for others, and in motivation, although system is big motivation. System needs to get easier, in order not to take so much time to be filled.

Social barriers:

1. *Language:* in some companies lack of a certain language is perceptible, which is known and acceptable for all involved people and can carry personal knowledge(Disterer, 2001).

2. *Conflict avoidance:* attitudes of conflict avoidance and some conservative habits may

prevent the transfer of knowledge(Disterer, 2001).

3. *Bureaucracy and Hierarchy:* more bureaucratic shows formal procedures, which prevent the transfer of knowledge. And hierarchical enterprises prevent functional communication(Disterer, 2001).

4. *Incoherent pattern:* a lack of coherence between the personal intents of the individuals and the pattern of the organization (like mission, values, strategies, and so forth) can cause difficulties to transfer experience(Disterer, 2001).
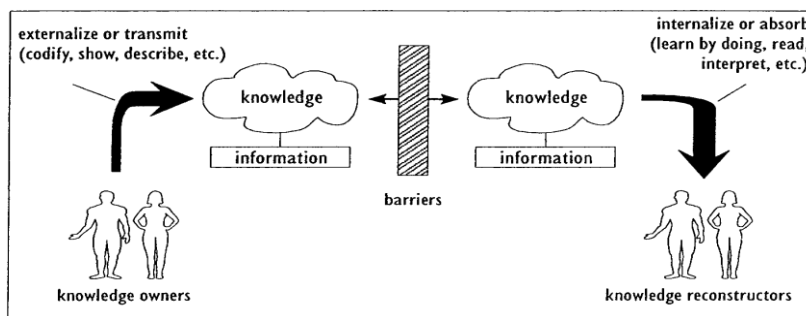
Figure 5: a simplified model of knowledge sharing and transfer(Hendriks, 1999)

Figure 5 shows the model of knowledge transfer with a wall as barriers between owner of experience and knowledge and recipients of knowledge and experience.

Relevance with Gassco:

Gassco can have problem in language for working and transferring knowledge with other countries, and they should discuss to avoid these problems. And also, Experience transfer systems are in English which may be a problem for whom are not good at English or have problem in English. So, these barriers can influence in Gassco and they should avoid them in order to transfer experience more and more both inside the company, and even with other companies, like improving language or define dictionary in the systems in other languages.

3.2.3 Knowledge transfer actors

This part can help to understand the experience transfer system in Gassco better. According to (Eckl, 2012) actors can be summarized in three groups with changing intersections of stakeholders;

Knowledge-creators: those who are actively involved in the creation of knowledge(Eckl,

2012). In Gassco people who are involved in the workshop and meetings for transferring experience, are creators of knowledge and experience. These people are members of team project, project manager, and facilitator. Facilitator is responsible to type experiences into system.

Knowledge-disseminators: those who are actively involved in the dissemination process of knowledge(Eckl, 2012). In Gassco, there are two disseminators,

1) People can transfer their knowledge by using face to face communication.
2) The experience transfer system which is the most important tool in this company for experience transfer.

Knowledge-takers: those who accept and absorb the generated and disseminated knowledge(Eckl, 2012). In Gassco takers are people who read and learn from previous experience, and use them in their new projects.

Knowledge transfer and sharing between individuals is a process that helps both individuals and organization to learn from each other(Ipe, 2003). All these three factors are parts of knowledge transfer process in every organization and also in Gassco. The result of this learning is more collaboration and contribution between people in an organization. Moreover, according to (Potgieter et al.) there are several reasons for sharing and transferring knowledge in organization; or "Why is knowledge transfer important within organization?" (Research questions pages 8 and 9)

❖ Knowledge sharing is designed to transform individual knowledge into organizational knowledge(Potgieter et al.).

❖ Increasingly the only sustainable competitive advantage is continuous innovation. In other words the application of new knowledge(Gurteen, 1999).

❖ Modern organizational culture is synonymous with knowledge sharing process(Potgieter et al.).

❖ Organizations that share knowledge may lead to improve innovation capacity and therefore to sustained competitive advantage(Potgieter et al.).

According to these reasons for transferring knowledge, I can identify another reason for transferring knowledge that is organizational and individual learning. So, I believe the main

reason for sharing and transferring knowledge and experience is learning, like in Gassco that top management wants people to learn from each other. I will discuss about organizational and individual learning in part 3.

3.3 Individuals and Organizational learning

In this part, I investigate why knowledge and experience transfer are important, since in the last part, I concluded that the usefulness of knowledge and experience transfer is learning. So, in this part, I mention learning in organization and among people, and then I conclude that organizational and individual learning are linked with knowledge and experience transfer.

Kim (1998) believes that the importance of individual learning for organizational learning is at once obvious and subtle-obvious because all organizations are composed of individuals; subtle because organizations can learn independent of any specific individual but not independent of all individuals(Kim, 1998). In the same view, (Fiol and Lyles, 1985) believes that individuals are important in organizational learning but it is a mistake to conclude that organization learns from immediate members, while organizations learn from cumulative of their members' learning. And also, (Schilling and Kluge, 2008) mentions individual and organizational learning are mutually dependent on each other, since people learn as representatives of their organization, and all knowledge should be recorded in order to be available in future. In this respect, I found some definitions for learning and organizational learning from different authors, for example (Kim, 1998) states the dictionary definitions that learning is "the acquiring of knowledge or skill". So, learning has two meanings, (1) the acquisition of skill or know-how, which implies the physical ability to produce some action, and (2) the acquisition of know-why, which implies the ability to articulate a conceptual understanding of an experience(Kim, 1998). And (Schilling and Kluge, 2008) define organizational learning as "an organizationally regulated collective learning process in which individual and group-based learning experience concerning the improvement of organizational performance and goals are transferred into organizational routines, processes and structure, which in turn affect the future learning activities of the organization's member"(Schilling and Kluge, 2008).

Three classical observations are built as a framework for organizational learning by (Levitt and March, 1988) and their findings, which are behavior, actions, and oriented to targets. Organizations are seen as learning by encoding inferences from history into routines (forms,

rules, procedures, conventions, strategies, and technologies) that guide behavior(Levitt and March, 1988). For example, procedure and technology play an important role in Gassco, which can guide people behavior related to experience transfer system in order to learn how to use the system. Before investigating learning from experience, I found two kinds of learning level which are low and high levels from both (Schilling and Kluge, 2008) and (Fiol and Lyles, 1985). *Lower level* or single-loop (Schilling and Kluge, 2008) focuses learning that may be mere repetition of past behaviors, usually short term, surface, temporary, but with associations being formed(Fiol and Lyles, 1985), For example, learning from face to face communication without recording. *Higher level* or double-loop (Schilling and Kluge, 2008) is the development of complex rules and associations regarding new actions, and an understanding of causation, also learning that affects the entire organization(Fiol and Lyles, 1985). Moreover (Kim, 1998) mentions double-loop learning occurs when individual mental models (mental model represent a person's view of the world, including explicit and implicit understandings) become incorporated into organization through shared mental models, which can then affect organizational action (Kim, 1998). For example, learning how to use experience transfer system in Gassco, then recording experience into system, and then again learning from previous experiences.

Relevance with Gassco

The main purpose of this thesis is investigation of experience learning in Gassco and showing that there are systems in Gassco, which people are using for recording experience in order to have all experience in future as well. This view of learning in Gassco refers to *High level* learning, since people first should learn system, then record their experiences, and finally learn again from negative, positive, and neutral experiences.

3.3.1 Learning from Direct Experience

Behavioral theories of the firm posit that organizations' past experiences, retained in their routines and beliefs which change through two learning mechanisms(Sosna et al., 2010). So, according to some other authors as well, there are two main mechanisms in organizational experience, the first one is trail-and-error experimentation, and the second one is organizational search (Levitt and March, 1988, Sosna et al., 2010). Sosna (2010) found out that trial-and-error is a theory held by the actor, like individuals, group, and organizations. So, trial-and-error experimentation involves organizational members retaining actions that

produce desired results and discarding those that do not. The trial-and-error process allows the organization to introduce variations that produce results that converge with goals, and also fosters organizational learning about exploration and exploitation streams, promoting organizational change or stability at different times(Sosna et al., 2010). So, this view shows that learning flows between levels of knowledge within organizations.

Learning from direct experience has two aspects, such as learning by doing, and Competency traps, which I found from (Levitt and March, 1988), while Sosna (2010) found out from other authors, organizations remember by doing. So, here I discuss these two aspects briefly.

Learning by doing: (Levitt and March, 1988) found out that the simplest and purest example of learning from direct experience comes from the effects of cumulated production and user experience on productivity in manufacturing. so, learning by doing refers to empirical of experience curves which (Levitt and March, 1988) divided them into three elaborations. The first one is the attempts that decompose experience curves into several inter-correlated causes in order to assess their separate contributions to the observed improvements in manufacturing or company costs. The second one is the attempts to use experience curve as a basis for pricing strategies. And the third one is the attempts to define models not only predict the log-linear result, but also accommodate some of the small, but theoretically interesting departures from that curve. So, all these efforts refers to trial-and-error learning or organizational search(Levitt and March, 1988).

Competency traps: Levitt and March (1988) discussed that experiential learning based on trial-and-error learning or organizational search, organizations are described as gradually adopting those routines, procedures, or strategies that lead to favorable outcomes. And also, they found that competency traps are particularly likely to lead to maladaptive specialization if newer routines are better than older ones. One case is the sequential exposure to new procedures in a developing technology(Levitt and March, 1988). Competency traps exactly refers to new procedure in Gassco that is preparing to teach the systems to people, and explain the systems into new procedure.

Relevance with Gassco

Learning from direct experience is reflected in experience transfer system and PIMS R3 in Gassco by recording and reading. People experience with using trial-and-error

experimentation and organizational search in their projects, which are direct experiences. Then they record these direct experiences into the system for using of others, in order to read and learn from those experiences that are done before. So, these experiences in the system are from direct experiences, and that would be great to learn from them without any trial and error experimentation, since trial and error experimentation has cost. People have had positive and negative mistakes, which are like trial and error experimentation and they did before, so others can learn from direct experience without paying any cost. Therefore, for the first time, project teams experience something which they can learn directly, but after that, they read previous experiences of other project teams without doing them, so they are learning indirectly.

3.3.2 Four processes through three levels in organization for learning

At the beginning of this part, I discussed that there is link between organization and individuals. There are four processes which contribute people and organizations to transfer experience and learn from each other. On the other hand, (Crossan et al., 1999) found 4I framework of organizational learning that contains four related processes, such as intuiting, interpreting, integrating, and institutionalizing that occur over three learning levels; individual, group, and organization. However, (Schilling and Kluge, 2008) discuss about barriers that there are between processes. Therefore, the link between organization and individual can be seen in these processes. And also, the figure 6 shows these processes.
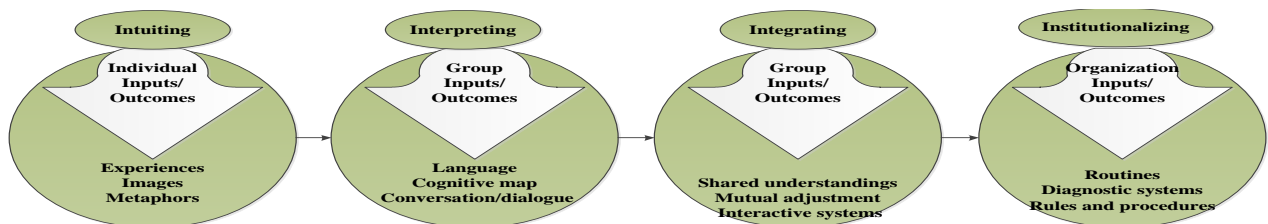
Figure 6: four processes of learning, it is made from table 2 of (Crossan et al., 1999)

Intuiting: This process of developing new insights and ideas based on personal experience is located within the individual(Schilling and Kluge, 2008). And also, (Crossan et al., 1999) found definition for this process as the preconscious recognition of the pattern and possibilities inherent in a personal stream of experience. This process can affect the intuitive individual's actions, but it only affects others when they attempt to act with that individual(Crossan et al., 1999). also, Crossan (1999) mentioned this process

is a largely subconscious process, since the subconscious is critical to understanding how people come to discern and comprehend something new, for which there was no prior explanation, so intuiting focuses on the subconscious process of developing insights(Crossan et al., 1999). Therefore, the inputs/outcomes of individual are experiences, images, and metaphors, which are transferred to next processes in group.

Interpreting: In this step, the individual explains his/her insight through words and actions to him/herself and more importantly to others(Schilling and Kluge, 2008). So, this process is interpretation of previous process that comes from individuals' knowledge and experiences. The individuals' actions are discussed and interpreted in group in the conversations and communication. This process defined by (Kim, 1998) as translating events and developing concepts consistent with prior understanding of the environment. Also, (Levitt and March, 1988) interpret experience stem from features of individual inference and judgment. Moreover, they say that the outcomes are stories, paradigms, and frames. They mentioned that these outcomes of individuals should be considered and evaluated, since they believe outcomes can be successful and positive, or failures and negative(Levitt and March, 1988). In another view, (Crossan et al., 1999) mentioned that interpreting is the explaining, through words and actions, of an insight or idea to one's self and to others. This process goes from the preverbal to the verbal, resulting in the development of language. Crossan (1999) mentioned that interpreting begins picking up on the conscious elements of the individual learning process. Therefore, in this process, all outcomes from individuals should be investigated and interpreted in groups, then prepared for integration which is next process.

Integrating: this step takes place at group level where a shared understanding among individuals and groups is achieved which allows for coherent, collective action within the organization(Schilling and Kluge, 2008). (Kim, 1998) discussed that this process organizes all of the elements discussed from interpreted process, and then it addresses the issue of the transfer of learning through the exchange of individual and shared mental models. Additionally, (Crossan et al., 1999) defined that integrating is the process of developing shared understanding among people and taking coordinating action through mutual adjustment. Dialogue and joint action are crucial to the development of shared understanding. This process will initially be informal, but if

the coordinated action taking is recurring and significant, it will be formal and institutionalized. So, this process focuses on coherent, collective action, for coherence to evolve, shared understanding by members of the group is required(Crossan et al., 1999). After this process all collective experiences and knowledge should be institutionalized within organizations.

Institutionalizing: Finally, shared understanding is implemented in systems, structure, procedures, rules and strategies, thereby becoming independent of its individual or group origins, and guides organizational action(Schilling and Kluge, 2008). According to (Bloodgood and Salisbury, 2001) tacit knowledge that includes the implicit organizational routines take place in this process. So, it is the process of ensuring that routinized actions occur. Tasks are defined, actions specified, and organizational mechanisms put in place to ensure that certain of embedding learning that has occurred by individuals and group into the organization, and it includes systems, structure, procedures, and strategy(Crossan et al., 1999). This is exactly like institutionalizing the experience transfer system and PIMS R3 in Gassco, by producing a new procedure.

Briefly, I can discuss that individuals give their knowledge and experiences to groups, then in groups their experiences are discussed, evaluated, and collected and shared, then in the final process all individuals' experiences are institutionalized in whole organizations.

Relevance in Gassco

Gassco can follow these processes as well, while they are doing these processes in the two cases. First case, Gassco investigates the system which is my master thesis. I had two workshops and some interviews (Intuiting process), then interpreting problems and challenges, after that I integrated and collected individuals problems, and in the final steps Gassco should institutionalize the system by producing a new procedure. Second case, people in Gassco can record their experiences into the system (intuiting process), then they can interpreting their experiences in their groups and meetings, after that they integrate positive and negative ones, then finally they institutionalize them into the company and the system.

3.3.3 Barriers to processes of organizational learning

In the last part, I discussed about the four processes of learning which people can follow in order to learn from each other, and also at the final process transfer learning to their organizations. But, there are some barriers in the learning between processes which people

should know, and avoid them. (Crossan et al., 1999) did not mention barriers in the organizational learning. While, I found barriers in learning from some other authors, such as (Schilling and Kluge, 2008) who discuss the four social psychological processes can be used to categorize the barriers to organizational learning, or (Smith and Elliott, 2007) who found some other barriers to learning.

(Smith and Elliott, 2007) discussed barriers, such as rigidity of core beliefs and values and assumptions that create problems of sense making when things appear to be 'not as expected', ineffective communication and information difficulties, denial and centrality of expertise and the disregard of outsiders, peripheral inquiry and decoy phenomenon which mean, there may be a difficulty of infinite regress because as soon as a problem becomes well defined it may be obscuring another. Another barrier is, cognitive narrowing and fixation which tend to focus on manageable chunks of problem or areas of the business, and this generates problems when these elements are aggregated upwards to the larger system. Maladaptation, threat minimization and environmental shifts, and also lack of corporate responsibility, and focus on single-loop learning are barriers that (Smith and Elliott, 2007) found and discussed. While (Schilling and Kluge, 2008) categorized barriers according to four processes into three forms, such as action-personal, structural-organization, and societal-environment forms.
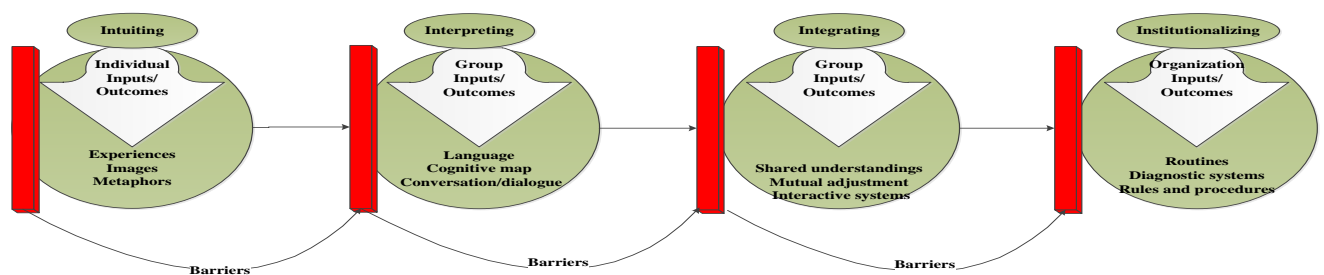
Figure 7: barriers to organizational learning before every process

Figure 7 shows four processes of learning with their barriers before every process. They are like obstacles(Schilling and Kluge, 2008) or red walls which prevent flowing insight and innovative ideas from one person or group to another person or group.

Barriers to intuiting (individuals): the barriers that (Schilling and Kluge, 2008) found in this process in the form of *action-personal* are biased and deficiencies of employees in their

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function as sensors of the organization superstitious learning, lack of know-how concerning systematic failure analysis, lack of motivation of the innovator, high level of stress, professional identity characterized by first-order problem-solving, fear of disadvantages, and restrictive and controlling management style(Schilling and Kluge, 2008).

In the *structural-organization*, there are barriers, such as lack of clear, measurable goals and performance feedback, stocks and inventories which cover process errors, narrow corporate identity, monolithic corporate culture with homogeneous work force, strict work rules and regulations, and narrow job descriptions and high division of labor(Schilling and Kluge, 2008).

And in the last form *societal-environment*, barriers are complex, dynamic, and competitive market environment, branch with unclear criteria of success, culture distance and low level of experience in the relevant culture which I discuss in the knowledge transfer barriers that culture can have positive and negative impact, complex, ambiguous, and difficult knowledge relevant, but implicit and immobile knowledge(Schilling and Kluge, 2008). This form of barrier is being observed in Gassco, like the complexity of system to be filled up all parts can be a barrier for people that do not record their experiences in the system, another example of barrier in Gassco is lack of procedure or ambiguous procedure that causes people do not know how to record their experiences into system, so decreasing in recording and registering experiences means decreasing learning.

Barriers to interpretation (group): the barriers that I found from (Schilling and Kluge, 2008), in this process in the form of *action-personal* are fear of loss of ownership and control of knowledge, lack of political and social skills on part of the innovator and sponsor, low status, confidence and trust worthiness of the innovator, conflict relationship between innovator and group, perceived lack of relative advantage over existing practices, lack of retentive capacity on the part of the group members, lack of motivation and anxiety on the part of the group members(Schilling and Kluge, 2008).

In the *structural-organization* form barriers are found, like missing link between knowledge and important organizational goals, high workload and frontline context, failure avoidance norms of the group, ego-defenses of a strong collective identity. And in *societal-environment* form, there is just one barrier, like knowledge incompatible with existing or occupational

mindsets(Schilling and Kluge, 2008).

Barriers to integrating (group): in this process in the form of *action-personal*, there are some obstacles, like fear of disadvantages for the team benefit, lack of recognition or fear of punishment for the innovation, lack of formal authority on the part of the innovator and sponsor, lack of top management support, over-confidence of managers in existing practices, rigid and outdated core beliefs, values and assumptions of senior managers, managers' metaphors and visions for the organization, defensive routines of other departments, lack of participation and communication top-down change, and perceived incompatibility with culture and structure of the organization(Schilling and Kluge, 2008).

In the *structural-organizational*, there are few barriers, like competition with other teams, low turnover in top management, long-term organizational success which is competence traps, inadequate communication between units, and power structures and relations; and also other barriers are ineffective resource allocation, lack of learning orientated values in the organization, and lack of fit between innovation and organizational assumptions and beliefs. And in the form of *societal-environmental*, barriers are industrial recipes standing against the innovation, and time lag between organizational action and environmental response(Schilling and Kluge, 2008).

Barriers to institutionalizing (organization): this process is in the organization and it has some barriers in the three forms. In the form of *action-personal* Schilling and Kluge (2008) found barriers, like perceived irrelevance of innovation for future purposes, lack of knowledge to implement the innovation on the part of teams or employees, inadequate down the line leadership skills, past experiences of conflicts during learning transfer, low level of acceptance and trust towards teams, low degree of openness to new ideas on the part of teams.

In structural-organization, barriers are lack of time and resources (transfer processes, training and development, communication methodology and space for implementation), lack of clear responsibility concerning the implementation, lack of a consistent norm system, and lack of means and measures to control organizational behavior and performance. And, in the form of societal-environment barriers are rapid technological change, emerging management fads that promise quick success, problem with linguistics and national culture, and technical or

structural difficulties of storing implicit knowledge(Schilling and Kluge, 2008).

So, all these barriers should be found and recognized first, then organization should try to decrease them from their work in order to increase learning and experience transfer in the organizations. I observed some of these barriers in Gassco and I found new barriers as well, which I discuss here.

Relevance in Gassco

I found some barriers in form of ***societal-environment in the intuition process***, such as;

❖ Complexity of system for people and lack of procedure which are obstacles in the experience transfer, and in result they are obstacles in learning.

In form of ***societal-environment in the institutionalizing process***, such as;

❖ Rapid technological change, since Gassco established experience transfer system almost 2 years ago, so it takes some time that people get used to it. They used to use another system and traditional way for transferring experience.

In form of ***structural-organization in the institutionalizing process***, such as;

❖ Lack of time for training or lack of training for people to learn the system is another barrier, so it causes decreasing experience transfer, and then learning.

In form of ***action-personal* between individual and group**, habit can be a big barrier;

❖ I think that habit can be another obstacle and barrier in experience transfer and learning, which I observed it in Gassco. There are two cases; first people get used to use their own way to record experience, and maybe it is difficult for them to change their habits or learn new way or system. For example, they get used to record their experience in the excel sheet or word. Secondly, individuals get used to judge that which experience is suitable and which one is not suitable, so they just record experiences in the system that they think suitable, and in this regards a lot of experiences will be lost, therefore it can decrease in learning. In result, I believe habit can be a new barrier in organizational learning.

3.3.4 Organizational memory and learning

When I have been in Gassco's workshops in order to learn the system, I found out people in the workshops try to remember their experience that they had in the projects. So, I understood that learning from each other can depend on people's memory. On the other hand, (Levitt and March, 1988) found that organizational learning depends on features of individual memories. However, (Kim, 1998) found from psychological research that there is a distinction between learning and memory, "learning has more to do with acquisition, whereas memory has more to do with retention of whatever is acquired." Kim (1998) mentions that memory plays a critical role in linking individual to organizational learning. And also, Kim discusses that separating the two processes is difficult because they are tightly interconnected, what we already have in our memory affects what we learn, and what we learn affects our memory(Kim, 1998). (Kim, 1998) and (Levitt and March, 1988) have the same view that experiences should be storage and recorded. (Levitt and March, 1988) also believe that experiences should be maintained and accumulated within routines, since maybe personnel move to another company, and also due to passage of time(Levitt and March, 1988). But their ways are different to understand the role of memory in learning; Kim (1998) mentions the concept of mental models while Levitt and March (1998) mention some other ways, such as *recording of experience*, *conservation of experience*, and *retrieval of experience.*

Mental models: (Kim, 1998) found that mental models as deeply held internal images of how the world works, which have a powerful influence on what we do because they also affect what we see. The concept of mental models is different with traditional notion of memory as static storage because mental models play an active role in what an individual sees and does. Also, mental models represent a person's view of the world, including explicit and implicit understandings. It provides the context in which to view and interpret new material, and they determine how stored information is relevant to a given situation. They are not only collection of ideas, memories, and experiences, but they are like the source code of a computer's operation system, and also like the programmer of that source code with the know-how to design a different source code as well as the know-why to choose one over the other. Therefore, mental models not only help us make sense of the world we see, they can also restrict our understanding to that which makes sense within the mental mode(Kim, 1998).

Recording of experience: (Levitt and March, 1988) found that experiences are recorded in

documents, account, files, standard operating procedures, and rule books; in social and physical geography of organizational structures and relationships; in standards of good professional practice; in the culture of organizational stories; and in shared perceptions of the way things are done around. So, the transformation of experience into routines and the recording of those routines involve costs(Levitt and March, 1988). But recording experience is important, since maybe experienced people move organization or maybe people forget something which they will need in long future, so they should have recorded experience in order to refer them in future. But cost problem can be solved by information technology. (Levitt and March, 1988) discuss that the costs are sensitive to information technology, and a common observation is that modern computer based technology encourages the automation of routines by substantially reducing the cost of recording them. Also, Levitt and March (1988) mentioned that experiential knowledge, whether in tacit form or in formal rules, is recorded in an organizational memory. For example in Gassco experiences are recorded in PIMS R3 system.

Conservation of experience: experiences can be transferred from people those who experienced it to those who did not, also the experiences are likely to be lost through turnover of personnel and knowledge disappears from an organization's active memory, if organizational experience is not conserved(Levitt and March, 1988). So, if experiences are important for organizations and they need to use them in future, organizations should maintain and conserve all experiences.

Retrieval of experience: only part of an organization's memory is likely to be evoked at a particular time, or in a particular part of the organization. Some parts of organizational memory are more available for retrieval that others. Availability is associated with the frequency of use of a routine, recently used and frequently used routines are more easily evoked than those that have been used infrequently. So, organizations have difficulty retrieving relatively old, unused knowledge or skills(Levitt and March, 1988). Therefore, the routines that record experience are organized around organizational responsibilities and are retrieved more easily when actions are taken through regular channels than when they occur outside those channels(Levitt and March, 1988).

Consequently, (Kim, 1998)'s view in comparison with (Levitt and March, 1988)'view, Kim's view is more psychological and related to mental models, while Levitt and March's view is more practical which is more useful in an organization.

Relevance in Gassco

I understood from theory that Gassco is following the (Levitt and March, 1988)'s view. Gassco is currently recording the experience into the system in order to be able to use them in future, in this respect they maintain and conserve the experience in the system automatically as well; also they should update and retrieve the experiences during project execution, because it may be changed something during project.

Theories and analysis in part 2 and part 3 can be concluded that knowledge and experience should be shared and transferred among people within organizations in order to learn from each other. So, I can say now that the result of knowledge transfer is learning in organizations between people and group. In this respect, there can be tools that help people to transfer and share their knowledge and experience more and more, and easier than traditional ways. One of these tools is information technology based system, like a computer software and system in the intranet and internet of organizations. For example, this system for experience and knowledge transfer in Gassco is PIMS R3 as input and experience transfer system as output. Therefore, in the next part, I discuss and analysis the aspects and impacts of information technology in knowledge and experience transfer.

3.4   Information technology based system in knowledge and experience transfer

In the previous parts, I discussed that experience transfer is important, since people need to learn from those experiences. And, I mentioned the four processes of learning which knowledge and experience transfer from individuals to group and then to whole organization. But, how can organization implement the processes? Or how can they maintain the experiences? So, there should be tools that contribute people within organizations to transfer their experience. In this respect, there can be some ways of transferring experience, like writing down in papers, asking from others about experiences, using software or computer systems, and others tools that help people to transfer their knowledge. I found two ways in Gassco, the first way is traditional way which was old way of experience transfer, such as writing experience in a lot of papers and keeps them which was so difficult and hard to read and maintain them. The second way is information technology system which Gassco is using currently, and it has two parts, one part as input (PIMS R3), and another part as output (Experience transfer system). Therefore, in this part I discuss the theory of information technology and the usage of this system in experience transfer.

I found that (Tanriverdi, 2005) believes human are limited in their information processing

and coordination capabilities, and also they are costly to maintain, which can be referred to knowledge transfer. So, Tanriverdi (2005) mentioned that IT-based coordination is less limited and IT has had great impact on the productive processes of organizations in its role as coordination mechanism and knowledge management. In the same view, (Aase, 1997) found that IT eliminates many of the barriers which have impact in experience transfer and productive communication (Aase, 1997). Aase (1997) emphasized three important features in IT. First, IT makes experience available and accessible to the organization. Second, IT makes experience continuous testing and using, due to recording experiences into IT system. And third one, IT transforms experiences into knowledge, since Aase found that IT supports for the processes of sharing tacit knowledge and making tacit to explicit, it means IT supports the socialization process, like building a system that motivates people to express their personal experiences about a certain topic and projects into system, and this system can change tacit knowledge or experience to explicit. In this respect, I have discussed from some authors that tacit knowledge is hard to express, so I am looking for a way like Aase to express this sentence " although tacit knowledge is hard to express, it is possible by using some tools like IT system" as one outcome of this thesis. So, Aase mentioned that IT system can change experience into explicit knowledge which is readable, and I observed as well in Gassco that PIMS R3 transforms experience to knowledge into Experience Transfer System. In the next part, I investigate the capabilities, role, and relationship of Information Technology in knowledge transfer since I mentioned that IT system can be a tool for transferring the knowledge.

3.4.1 The role of IT in Organizational Knowledge Management

I found out that there has been a trend toward the application of advanced information technology, such as internet, intranets, data warehouses, and software agents, to systematize, facilitate, and expedite firm-wide knowledge management (Alavi and Tiwana, 2003). So, Alavi and Tiwana (2003) investigate three processes, like creation, transfer, and storage and retrieval, that all processes are supported by information technology. Three processes in (Alavi and Tiwana, 2003) are as the same as three strategies in (Bloodgood and Salisbury, 2001) in knowledge management. And in another view, (Bloodgood and Salisbury, 2001) investigate the capabilities and relationship of IT in knowledge management strategies. (Bloodgood and Salisbury, 2001) found that IT has two general capabilities with respect to knowledge. First one is *codifying knowledge* which makes knowledge explicit, for example

this is done in expert systems through the elicitation(Bloodgood and Salisbury, 2001). This expert system exists in Gassco as well and its name is PIMS R3. And second capability is *creating networks* which help to keep track of people with particular expertise, and enable rapid communication between people (Bloodgood and Salisbury, 2001). This network is the intranet system that is just available inside Gassco for people to use experience transfer system and other parts of project portal. According to (Bloodgood and Salisbury, 2001) approach, IT provides creating networks with respect to tacit versus explicit knowledge, because information technology has had the net effect of making knowledge more explicit. This is done in order to facilitate more rapid transmission, standardized decision-making procedures, or codifying knowledge. In knowledge transfer strategy, a codification strategy with IT can be used to make the knowledge even more explicit throughout the organization, by making it readily available in databases, decision support systems and expert systems. Bloodgood and Salisbury (2001) mentioned that explicated versions of tacit knowledge can benefit the organization by making the knowledge more available to the rest of the organization. However, using IT to codify and then transfer tacit knowledge within organizations can be costly, like establishing and buying an expert system, and ineffective due to difficulties of making tacit knowledge more explicit in preparation for its transfer. So, (Bloodgood and Salisbury, 2001) believe that IT facilitates the knowledge transfer in organization, but they concluded that codifying knowledge into an explicit form using IT (e.g. expert systems) is more appropriate for explicit knowledge than for tacit knowledge. And also, they say IT can be used as means to catalog individuals in the organization that hold critical tacit knowledge, and then enable communication between those who need the knowledge and those who have it(Bloodgood and Salisbury, 2001). Bloodgood and Salisbury (2001) believe it is most function to codifying knowledge into explicit knowledge, and hence, that this use of IT is more appropriate for knowledge transfer than for knowledge protection. Also, they mentioned organizations use the networking capabilities of IT to transfer the tacit knowledge without making it explicit.

Relevance in Gassco:

IT can be appropriate for tacit knowledge in Gassco since I discussed that tacit knowledge refers to experiences, and experiences are very important in Gassco. So, they bought and established the expert system, although it was expensive. It will be beneficial for Gassco. Consequently, I can use (Bloodgood and Salisbury, 2001)'s view that IT facilitates

and be an appropriate strategy for transferring knowledge, I believe IT can be appropriate not only for transmission of explicit knowledge, it can be suitable for transmission of tacit knowledge as well. So, with using of IT system, like PIMS R3 in Gassco, experience can be changed to explicit knowledge into the systems. For example, people can just press one button to identify their experiences were negative, positive, and neutral instead of expressing, and there are some specific areas which are easy to understand, and people can fill up them according to their experiences topic. But, the experience transfer system can be very suitable system to protect experience and knowledge for future using, so this action is opposite of with (Bloodgood and Salisbury, 2001)'s view, since they said IT system is more suitable for knowledge transfer than knowledge protection while it is clear that IT based system can keep and save experience as well.

3.4.2 Information technology supports knowledge strategies:

As I mentioned, (Alavi and Tiwana, 2003) discussed three knowledge processes which are supported by Information Technology. These three processes are as the same as knowledge strategies which (Bloodgood and Salisbury, 2001) mentioned.

Information technology support of knowledge creation: E-learning systems are computerized systems in which the learner's interactions with learning materials, instructors, and peers are mediated through technology(Bloodgood and Salisbury, 2001). For example, experience transfer system in Gassco is an E-learning system which available for whole people inside Gassco. Another category of IT that (Alavi and Tiwana, 2003) mentioned for support of knowledge creation is collaboration support systems. These systems refer to integrated information and communication technologies designed to facilitate interactions among individuals in support of organizational collaboration during task performance. New knowledge is created through collaboration and discussion among members' knowledge in groups. This joint creation of knowledge is usually accomplished through the group members' exposure to each other's thoughts, opinions, and beliefs, while also obtaining and providing feedback from others for clarification and understanding(Alavi and Tiwana, 2003). So, IT system supports collaboration among individuals and groups in organizations as well. For example, experience transfer system supports people's collaboration, since people and groups can find relevant experiences from the system and discuss about them in their meetings, or project team can run experience transfer system in their meetings and discuss

about previous experiences easily.

Information technology support of knowledge storage and retrieval: I discussed in organizational memory and learning part about keeping and retrieval experiences, but I did not discuss how to storage and retrieval, or what tool can help organizations in this respect. So, here I discuss that IT supports organizational learning approach. (Alavi and Tiwana, 2003) found that many organizations collect large volumes of transactional data even though raw data is rarely of direct benefit. A data warehouse is a centralized repository that integrates, summarizes, and creates a historical profile of such data, which would otherwise remain fragmented. Therefore, data warehouses help convert large volumes of new data into smaller chunks of interlinked information(Alavi and Tiwana, 2003). And also, Alavi and Tiwana (2003) mentioned another technical approach to organizational knowledge storage and retrieval that is information repository. In most organizations, codified knowledge is often fragmented in many databases. Repository bring together content from various data sources, providing a unified access point and reducing knowledge search costs. So, repositories can store highly structured content(Alavi and Tiwana, 2003). According to Alavi and Tiwana (2003) research, I can find out the importance of protection of knowledge in IT approach. Therefore, (Alavi and Tiwana, 2003) discuss to protect knowledge by storage and retrieval, but (Bloodgood and Salisbury, 2001) discuss IT can be more suitable for knowledge transfer than protection. While I think both transfer and protection are important because organization tend to use experience and knowledge in future as well, so they should be saved and protected into a system. For example, this system is PIMS R3 and experience transfer system in Gassco which provide an environment into network for people in order to save and protect their experiences.

Information technology support of knowledge transfer: (Alavi and Tiwana, 2003) identified two models of IT according to considering the various modes of knowledge transfer, (1) the *network model* which draws heavily on communication support system to establish electronic channels for the efficient transfer of knowledge among individuals, like video and audio conferencing, email, Skype, and so on. (2) The knowledge *stock model* which draws on information and communication technology to transmit codified information between knowledge repositories and individuals. An enterprise information portal is an example of technical tool in the stock model. An enterprise information portal enables the

transfer of knowledge from knowledge repositories to and from individuals through a central access point and web browser interface (Alavi and Tiwana, 2003). The whole Project Portal in Gassco can be knowledge stock model, and also an enterprise information portal.

Besides the approaches of (Alavi and Tiwana, 2003) and (Bloodgood and Salisbury, 2001), I mentioned Aase (1997)'s view as well. (Aase, 1997) found two contrasting approaches to IT;

➢ The first one is *a model-based* which approach to information technology is a perspective underlying design and implementation of many existing IT systems. This approach handles the issue part of experience based learning and it makes experience accessible to the organization (Aase, 1997).

➢ And the second approach that Aase found is a *human inquiry* which seems closer to IT support for experience based learning; it emphasizes collaboration, interpersonal relation and coordination (Aase, 1997).

The second approach is based on finding from organizational studies showing that organizations seem to deal with information in a different way from that anticipated from a simple reading of decision theory. The human inquiry approach handles the reflection part of experience based learning; testing of experience, and transformation of experience into knowledge. So, model-based refers to simple and lean information, explicit knowledge, focus on replication, closeness, and tacit remain tacit. While human inquiry refers to sticky and rich information, tacit knowledge, focus on collaboration, share tacit knowledge, and from tacit to explicit(Aase, 1997). So, human inquiry is more suitable in my thesis, and it can reflect my view as well. And also, this approach can support Gassco's system because in the system tacit knowledge as experiences transform to explicit knowledge.

Consequently according to these three views, the approaches that support my thesis are; three knowledge processes but in knowledge transfer, stock model, and capability of IT from (Bloodgood and Salisbury, 2001)'view, and also human inquiry approach from Aase'view.

Relevance in Gassco

Information Technology based system supports experience transfer according to the theories. The whole IT system for project in Gassco is *Project Portal* that can be referred to *stock model*, and this portal includes several modules which my thesis focuses on experience

transfer module that has two parts, the first part is PIMS R3 as an input and it can be referred to human inquiry approach, since it transforms experiences of project teams to knowledge. And, the second part is Experience transfer system as an output which is like an explicit knowledge. So, the main purpose of this thesis is investigation, understanding, find problems and their solutions, and finally development of these two modules. And, I am going to discuss about them in the next chapter.

3.5 Discussion and analysis of theory

I discussed around three important topics which appropriate in my thesis, since I am investigating information technology based system for experience transfer in Gassco. In this respect, it was necessary to discuss about knowledge management, experience and knowledge transfer, individual and organizational learning, and the role of information technology in knowledge and experience transfer. So, this part can answer this question, what are the links among experience transfer, organizational and individual learning, and Information Technology based system? (Research questions page 8 and 9) I conclude the previous theories and their relationships, and I mention why these theories are suitable in my case and thesis.

Knowledge management has two main types, such as tacit knowledge and explicit knowledge. I understood from a lot of authors that tacit knowledge refers to experience and it is hard to state, and explicit knowledge refers to knowledge in books, articles, formula and so on, and it is easy to express. So, I define explicit knowledge as a knowledge that is easy to find and read, and it is available everywhere, so it can be easy to share and transfer with others, like in newspapers, books, internet, articles, and so on. And also, people learn this knowledge at school, like physic, mathematics, and so forth. Therefore, I believe as the same as other authors that this knowledge is easy to express. Besides this knowledge, I define tacit knowledge as practical knowledge which comes up with people's experiences, ideas, beliefs, feelings and so on, and it is hard to be found because it is not available everywhere. People should experience by themselves, or ask and discuss with others a lot in order to gain this knowledge. So, this knowledge is hard to express and share or transfer with others, in this respect it can be a challenge to learn. Therefore, I believe as the same as other authors that tacit knowledge is hard to share or transfer but I think that it is possible to share tacit knowledge as experience among people in organizations by using some tools, like

Information Technology based system, communication in the friendly environment, and so on. The focus on this thesis is Information Technology based system, like computer software, portal system in organizations and systems like these.

People with using the IT system can transfer their experience, but why do they like to transfer? The reason is they are motivated to contribute others and their organizations. They have two kinds of motivations, the first one is external motivation that people can get some beneficial like money from organization due to their contributions. But, there is a higher level of motivations which is internal feelings. People can feel internally, when they are helping others and transferring their experiences, they can get promoted and show their collaborations to others as people that always transfer their own experiences, although there are some barriers in this way. According to these transferring of experiences, people can learn from each other, since people follow four processes of learning for transferring their experiences. In this respect, IT plays an important role as a tool for transferring the knowledge and experience, because as I mentioned above experience is hard to transfer, and IT can help people for sharing and transferring the experience very well. So, now I can define a Transfer Triangle which is a framework from transferring knowledge and experience to learning process by using IT system. Figure 8 shows the transfer triangle that I understood from theories parts.
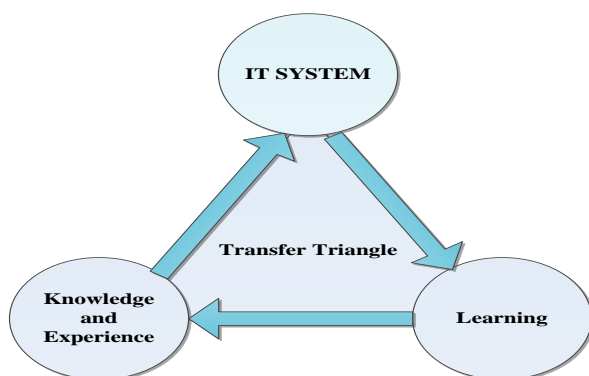
Figure 8: Transfer Triangle

The figure indicates IT system in the top vertex as an important tool of transferring tacit knowledge and experiences, and then learning and transferring can be easier for people. So, people can use an IT system that is able to transfer experiences in their organization, and record their experiences from previous work, and action from projects into the system, and then these experiences can be read and learnt from the system, and also they can be used in

new work and projects. Then again, people learned and experience something and they can record them again into the system. So, this circulate can be repeated again and again in future as well because IT system can save all records of people.

This chapter was theory part of this thesis, but there is a practical question, how does an IT system work in a real case or company? In chapter four, I investigate the practical part of this thesis which includes four steps, such as understanding, finding problems, finding solutions for problems, and then develop the system. This practical part reflects the usage of Information Technology based system in experience transfer; it helps people to learn from previous experiences in the project. This case is Gassco as practical part of this thesis.

4 Case Analysis

In this chapter, I focus on case company which is practical part of this thesis. This case company is Gassco that I have been four days in the company. During this time in Gassco, I observed Experience Transfer system and PIMS R3 in two workshops which I saw how the systems work and how project teams transfer their experiences. Moreover, I had 7 interviews with project managers from different departments and development group in order to follow four purposes, such as;

1. Understanding and the usage of the systems, and also the desired result after using Experience Transfer systems
2. Finding problems and challenges in the systems, and people's problems in using of the systems
3. Finding solutions to solve problems
4. Develop the system according to the solutions

Chapter 4 Practical Part	
Gassco as a Case Company	➢ Experience Transfer Module in Gassco
	➢ Understanding of the system
	➢ Process of input and output in the systems
	➢ Problems and Challenges
	➢ Suggestions and Solutions
	➢ Discussion for development of the systems

Table 3: the summary of chapter 4

Table 3 indicates the summary of chapter 4 which includes the six aspects in Gassco as a Case Company. These aspects reflect the purposes of this thesis.

4.1 Gassco as a Case Company

In this part, I am going to investigate the case company which is Gassco. I discuss the Information Technology based system that is being used currently in this company for experience transfer. This IT system in Gascco is Project Portal and it includes several modules. But, the only modules that are relevant in this thesis are PIMS R3 as an input, and Experience Transfer System as an output. The both modules are located in the project portal of company, and when I mention the systems, I just mean these two modules "PIMS R3 and

Experience Transfer System". So, as I mentioned in the introduction, this thesis follows some purposes, such as understanding of the systems as the first step, finding the problems and challenges in the system as the second step, finding solutions of problems and in the final step develop the system. However, before going through these purposes, I introduce briefly Project Portal/PIMS (project information management system) as general system in Gassco. And also, I reference sentences which come from the company's document to the company's report.

Project Portal

The project Portal is a system which is used in Gassco to get an overview of easy access to the Gassco project-portfolio, and individuals can view, add, and edit elements, such as project information, project schedule, uncertainties, and tasks in team documents. And also, all projects are located in this portal. Moreover, the project portal is based on Omega's PIMS (Project Information Management System) (Kjærland, 2012). Users can get an easy access to all information regarding a project. The project portal is built up from several modules, and all storing different kind of relevant project information. The system is project-based; it means that each project will have its own domain, and which modules that are available will vary depending on which project individuals are looking at. In the project portal, individuals should typically enter the project description, business drivers, and all uncertainties and milestones regarding pre/defined reports. Tasks and actions should also be stored in this portal in order to every member of project team and the management can see easily what actions are taken. All projects that have certain requirements, such as an estimate > 50 MNOK should be located in the Project Portal (Kjærland, 2012). The picture of project portal home page is available in the appendix 1. This portal has different access such as;

1. **Access to project portal:** any employee in Gassco can get access to the Project Portal. However, user access is divided into four different groups (Kjærland, 2012).

2. **Basic user:** this user will be granted read-access to all projects. From here he/she has read-access to basic information about each project (Kjærland, 2012).

3. **Project member:** this user will have read-and write-access to all projects he/she is a member of. He/she is able to edit schedule, uncertainties, and project information (Kjærland, 2012).

4. **Super user:** this user has read- and write-access to all projects in the project portfolio.

This user also has access to a few Management-modules (Kjærland, 2012).

5. **<u>Development group:</u>** this user has access to create new domains and projects. This group is reserved for the Project Portal developers and they have access to all modules through this group (Kjærland, 2012).
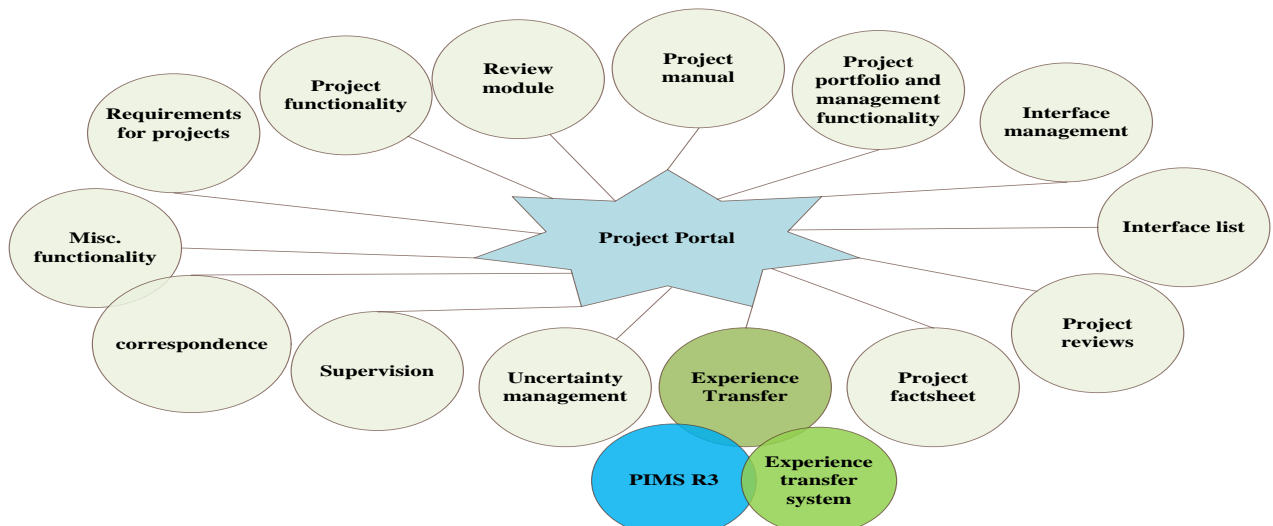
Figure 9: Project Portal System with modules in Gassco

Figure 9 indicates Project Portal System which is being used in Gassco currently. This portal includes several modules, such as Review module, Project manual, Interface management, Project portfolio and management functionality, Project reviews, Correspondence, Supervision, Uncertainty management, Interface list, Requirements for projects, Project factsheet, and Experience transfer, which people can view, add, save, and edit projects' information in their own module. And also, all these modules include other parts and more details which are not part of this thesis. This thesis just focuses on Experience Transfer module. This module is highlighted with different colors in the figure.

I had two workshops which I observed how the system works, and how a project team transfers experience into the system in order to understand this system, and experience transfer process. Moreover, I had 5 interviews with project managers in order to collect their problems and suggestions to solve problems, and then develop the system. So, I discuss about Experience Transfer module in the next part.

4.2 Experience Transfer Module in Gassco

This module actually consist of two different modules (Kjærland, 2012), the first one is Experience Transfer System as an output of experiences which is located in the project

portal-PRO-Other. And the second one is PIMS R3 as an input of experiences. People can register their experiences into PIMS R3, and all people can read and learn experiences from Experience Transfer. So, I can define the usage of Experience transfer module in Gassco;

> ➢ Experience transfer is used in order to be beneficial for people who can learn from previous work and experience in projects. In this respect, people can avoid mistakes, and follow successful and positive point of previous experiences.

Figure 10 shows these two modules, experience transfer as an output which all people have access to this part and they can read and learn, and PIMS R3 as an input which some people have access to parts of PIMS R3, not all people. So, from the page that is shown in figure 10, project team can find and use these two modules.

People should install PIMS R3 on their computer, if they have not had it already. When they click on its button, then download and install PIMS R3.
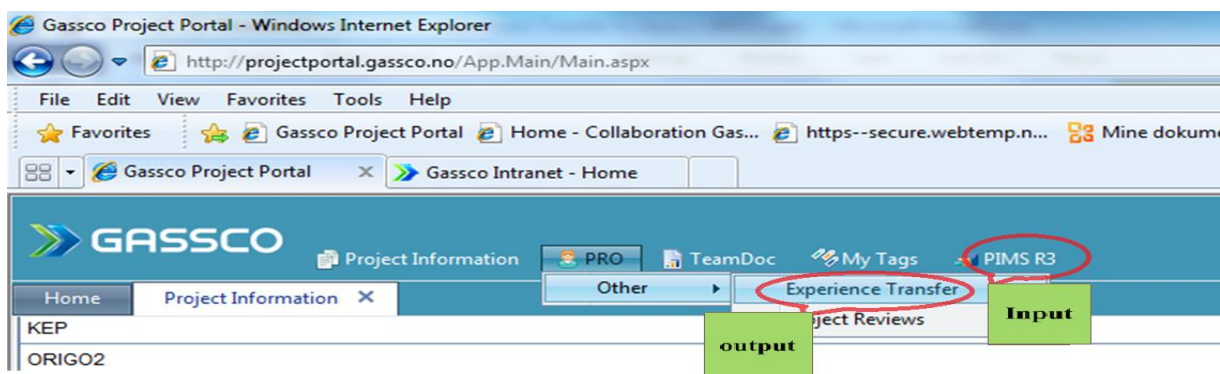
Figure 10: Experience Transfer and PIMS R3 in Project Portal(Grimstad, 2013)

According to my conversation with development group in Gassco, they mentioned that PIMS R3 was established in 2004 which was first R1, and then R2 came, and finally it was developed to R3. And also, both modules came in the same time in Gassco in June 2011. In the next parts, I discuss the usage of the system in Gassco, challenges and solutions, and the possible way of development the system according to the project managers' suggestions and I reflect my own suggestion as well.

4.2.1   Understanding of the system:

In this part, I answer to my two research questions, the first question is "how is the system

used in the organization?" and the second question is "how does the usage of the system create the desired result? (Research questions pages 8 and 9) In this regard, I had two workshops in Gassco and I observed how the system works, and how people use the system. And also, I had several interviews with project managers and I asked them about their understandings the system which I reflect.

In the Gassco procedure, experience transfer is a requirement in projects. This action has been performed only to some extent, experience reports are established, but they were not published in a common system. In the past, people wrote and gathered their experiences without publishing them for others, so it was difficult to hold on and use them. It was just like establishing experience reports, and then put them in drawer without using. So, Gassco felt that experience reports should write and input in less time, and they should be available for all people in Gassco easily. Therefore, the new solution came up which is new PIMS R3 module, and experience transfer system. Both systems are internal, and they are just available for people in Gassco. All people in Gassco can have access to experience transfer system in order to be able to read and learn from previous experiences. But, some people have access to PIMS R3, not all personals.

Experience transfer is very important in Gassco, and all procedures emphasize that people should record and transfer their experiences into the system during project executions. There are four important existing procedures and requirements in experience transfer in projects(Grimstad, 2013), such as;

> ➢ Project execution with TSP which is Technical Services Provider
> ➢ Project execution without TSP
> ➢ DGSP which is Decision Gate Support Package Procedure
> ➢ Project development Decision Gate1-Decision Gate4

For example, in the project execution with TSP is mentioned "the project shall conduct experience transfer sessions with relevant projects, and documented in PIMS, and also check experience reports from previous project in order to do the projects right the first time, and do not repeat mistakes from previous projects"(Rune S. Iversen, 2012). And, in project execution without TSP is mentioned that at start-up of project execution the project manager shall establish an overview of relevant experience information from other projects, from

operation and from the relevant asset owners. The project manager is responsible for arranging appropriate experience handover to relevant line-and project organizations, at project complete. The experience elements, both qualitative and quantitative experience data, shall be systematized and presented in the relevant Gassco experience databases(Geir Hausken, 2010). And finally, in project development from DG1 to DG4 is recommended, (1) arrange experience transfer workshops with other relevant projects, and (2) for personnel involved in the completed phase as well as personnel to be involved in the new phase. This is especially important when parts of the project team will be changed out in the new project development phase, experiences should be recorded and followed up in the new phase(Hans Høie, 2009).

According to these procedures, I can define three main purposes for transferring the experience;

1. Avoid mistakes and learn from bad experiences in order not to repeat them.
2. Follow successful previous experiences.
3. Use information of previous experiences in order to avoid rework.

New procedure: new experience transfer systems are established newly, and four different governing documents are today describing experience transfer. But, none of these include the new system(Grimstad, 2013). Therefore, there should be a new procedure for the experience transfer system, which people can find information about the experience transfer system. This is a new procedure for experience transfer system in Gassco with more, clear, and specific information about the experience transfer system. And also, new procedure includes all requirements, descriptions, and methodology(Grimstad, 2013). It includes 4 requirements, such as project execution with TSP and without TSP, DGSP procedure, and project development DG1-DG4 with less text. However, some text removed from new procedure, but all these 4 requirements in project referred and referenced to new procedure. So, new procedure and 4 requirements linked with each other. It has some stages in order to follow for using. Methodology describes how people should transfer their experiences in three steps;

1. **Collect experience from PIMS experience system:** short description of how to collect experiences from PIMS, preparations by the projects, and documentation of relevant experiences in PIMS(Grimstad, 2013).

2. **Perform experience transfer meeting with other relevant projects:** project to "place and order" to the other project, and use categories in PIMS R3 as a guideline(Grimstad, 2013).

3. **Input to PIMS R3:** workshop with facilitator, and work process prior to publication of experience report(Grimstad, 2013).

Besides methodology, new procedure describes "Experience Process" which is experience model, experience transfer collection, and input to PIMS R3(Grimstad, 2013). With this process, people understand where and when use the systems to transfer their experiences. So, procedure has an experience model which is shown in figure 11. Figure indicates the experience model which consists of Project Development (Feasibility, Concept, and Feed) and Project Execution (Detail Engineering, Construction, and Commissioning), which are stages in projects.
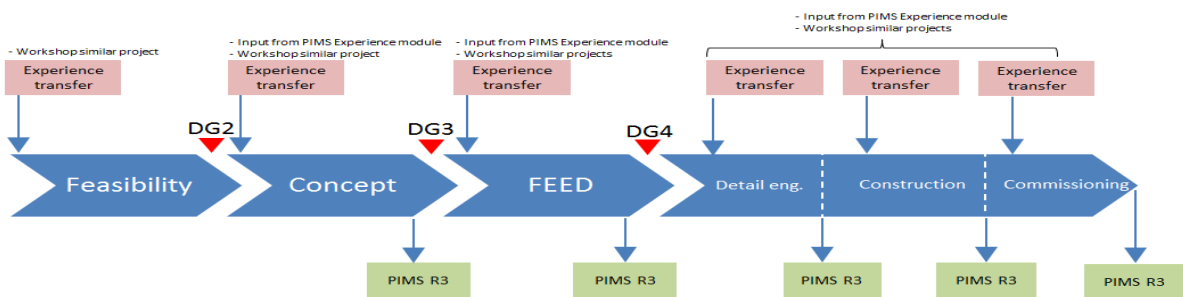
Figure 11: experience model in Gassco(Grimstad, 2013)

This model emphasizes that experience should register in PIMS R3 from end of "Concept" stage until project is delivered, and during project execution as well. Then, previous experiences should be used and discussed in workshops in the beginning of every stage. Moreover, new procedure focus on both meeting with project team and experience transfer system for transferring experiences. Therefore, all these descriptions are mentioned in the new procedure in Gassco.

Moreover, there should be meetings and workshops during projects execution for experience transfer between the members of the project team. In the meeting and workshops, project team discusses with each other about their experiences in projects, and also they discuss

about the previous experience. In the meetings, they remember their experiences which happened during the project execution; also they help and remind each other, if somebody forgot some things. So, there should be some roles in the meetings or workshops in order to organize them. The roles such as;

Facilitator: facilitator is a person who is always part of workshops and responsible for; introducing the topics, make notes based on the discussions in the PIMS comment/background field on each experience, add experience title, note if experience is Positive, Neutral or Negative, assign author for each experience, tag experience with main discipline, create new reports in PIMS R3 module, add all team-members and others who attended the workshop, and record when and where the meeting was held(Kjærland, 2012, Grimstad, 2013).

Project manager: project manager is a person who is always part of workshops and responsible for; arranging the meetings, booking the facilitator, approving experience for publishing, writing management summary, and approving complete report for publishing(Kjærland, 2012, Grimstad, 2013).

Project manager and knowledge transfer:

According to the role of project managers in Gassco, I can conclude that they play an essential role in knowledge and experience transfer. Besides this observation in Gassco, I found in (Fernie et al., 2003)'s study that it was mentioned, Knowledge transfer and sharing between different contexts is thus viewed as an essential source of competitive advantage. So, it is important for project managers from all sectors and department to address and develop appropriate methods of knowledge sharing and seek to learn from other sectors. For example, one method can use of computer system, like PIMS R3 for inputting experiences, or another method for transferring experience can be communication with each other. It is important and necessary for organizations to manage knowledge. Since the discourse of knowledge management is increasingly evident within the project management literature. So, the issue of how better to share knowledge across teams and between individuals knowledge therefore becomes of central concern to project managers. Also, the issue of knowledge sharing becomes increasingly important to many projects within organizations. Project management tends towards manage framework of knowledge that readily accepts the link between

knowledge and competitive advantage perceived elsewhere. Most project managers are implying that knowledge derived from experience cannot easily be codified and shared(Fernie et al., 2003). So, there is one question here how can project team members better collaborate through knowledge sharing? One possible answer to this question is the experience transfer systems in Gassco, due to the systems project teams should have meetings and discuss with each other in order to register their experiences in PIMS R3, and read and learn other experiences from Experience transfer module. Therefore, it is shown the important role of project managers in teams for transferring experiences.

Therefore, Experience transfer in projects follows three steps which are shown in figure 12.

1. **Input in PIMS R3;** the project teams should have facilitated workshops and project meetings during project execution, like weekly meetings in order to discuss about their experiences that they had in projects, and then they put and register them into PIMS R3.

2. **Approval by Project Manager;** all experiences which are discussed should be approved by project manager. On the other hand, project manager will read and check experience reports again, since members can add, write, and complete their experiences behind their own desk. The reason is workshops take usually some hours, so maybe project team cannot finish all parts. Therefore, project manager checks and approves full reports.

3. **Published on Gassco Project Portal;** experiences which are approved by project manager in the previous step, will be open for all in Gassco in the experience transfer system. Then, all people can search and find the experiences, and they can share with each other.
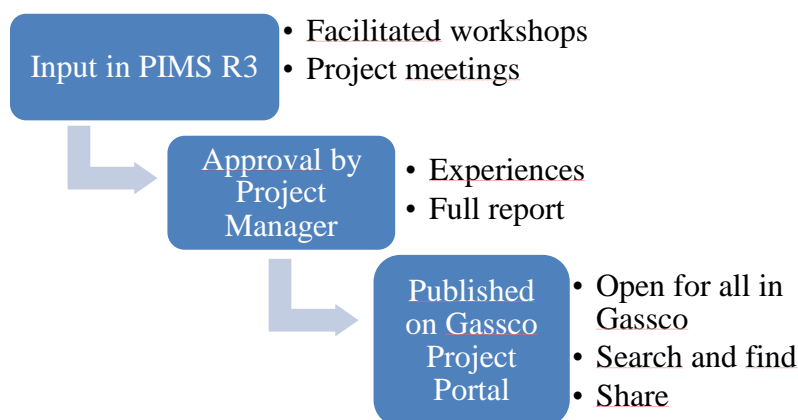

Figure 12: the steps of experience transfer in projects within Gassco(Grimstad, 2013)

The figure is made by a developer of the system who has been working in Gassco, and I observed it in the presentation which is held in Gassco. So, it shows the input, approval step, and output of the system.

PIMS R3:

The PIMS R3 is located in Project Portal, and it consists of some pages, such as *change domain* page which people should choose "Extra" from this page in order to open Experience Transfer module, *Experience Transfer module* page which people should choose "Report Input" to be able to add, edit, and view experiences. Only facilitator or super users can create new report in this module. *Administrative information* page, project team workshop page which facilitator add all team-members, *report access and approval* page where project manager approve the reports of experiences, *report participants page* where the facilitator or the project manager can specify who should have access to edit the selected report, *management summary* page that is filled by the project manager, and he should make a short summary about the project here, *objects* page which shows all registered experiences, and *edit experience* pages which project team register whole experiences. Some of these pages' pictures are shown in appendix 1.

This module includes some inputs and objectives which people can enter their project information. The administrative page in PIMS R3 includes items, such as short about topic, detailed, project name, location of projects (e.g. kårstø), project types (e.g. investment projects), execution model (e.g. with TSP, without TSP), phases (e.g. execution, prep. for execution, concept selection, feasability study, early studies, and business planning), project manager, and start and end of phase and project. Figure 13 shows the administrative page with all objects.

Figure 13: Administrative information page in PIMS R3 (Kjærland, 2012)

After entering the primary information of projects in the input page, the project teams should register experience object which has some parts in PIMS R3 page. The page includes; (1) object ID, (2) experience title, (3) type of experience (negative as bad experience, positive as good experience, and neutral experience), (4) background/context of experiences which is general view of experience, (5) how did the project handle this experience?, (6) recommendations for new projects, (7) goal of experience, (8) what was the result?, (9) additional comments which project team can write the key words here in order to remember topics and complete the rest of items behind their own desk, since in the meetings, there will not be enough time to complete all parts. (10) The author should be identified in the Authors part. (11) PIMS R3 includes some categories and disciplines which is experience area, and it is located in Set Categories. Set categories should always be used for all experiences. Experience area has three parts; the *first* one is Process Areas such as Project Development and Project Execution. The *second* one is Main Disciplines such as Construction, Engineering, HSE, Operation, Procurement, Project control, Project management, Quality, and Sponsors. And the *third* one is Sub Disciplines such as Administration, Audits, Authorities, and so on. Experience area is kind of filtering in PIMS R3, and project team should tick the relevant boxes according their three parts of project. (12) Contacts information of project manager or others should be applied; at least there should be two contacts information. (13) Project team can attach some other documents which are necessary for experience object in attachments part, like picture, contract, chart, and so on. (14) In the last step, approval status and date which project manager should approve or unapproved the registered experiences and this button is just "on" for project managers. Moreover, there is Preview Object which opens experience in a Pdf-report. Professional Network Rating is located in this page as well, which opens a window where the experience can be rated(Kjærland, 2012). Figure 14 indicates the Edit Experience page with all objects.

Figure 14: Edit Experience page in PIMS R3 (Kjærland, 2012)

Procedure links; this part is important in experience object, project team can link the experience to other procedures which the experience should be implemented. There is an item which name is "Experience need to be implemented in a procedure", if project team decided that their experience is very important and it must be implemented in another procedure, they should tick this item. So, the tick in this item means that the relevant procedure which is linked to this experience, it hast to implement the experience. There are different procedures in projects in Gassco. Owners of project can look at procedure and experience from this part. And also, in procedure links, project team can give and get feedback. There is implementation-data here as well, it includes box of implemented in procedure which checking this box will remove the experience from the webpage, implemented date, and implemented in procedure by.
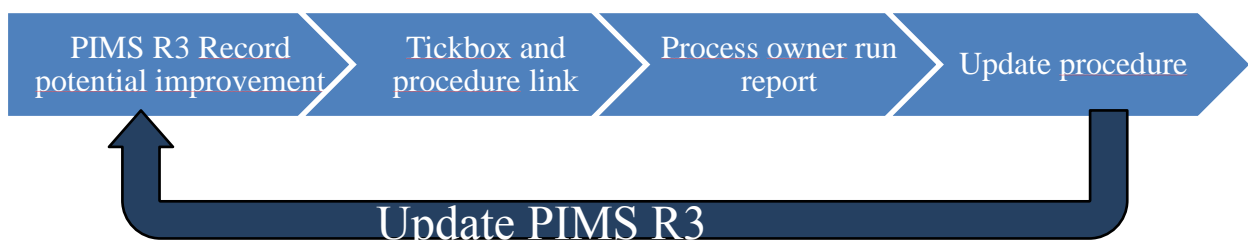
Figure 15: closing the circle of PIMS R3(Grimstad, 2013)

Figure 15 indicates that PIMS R3 records potential improvement, then tick box and procedure link, owner of projects runs report, and finally update procedure according to the experience that is recorded. And again, the circle is repeated, and PIMS R3 should be updated with new experiences.

All parts of experience object should be saved after every changing. There is save button

which facilitator should press after writing and changing. After experience reports are completed, project manager should check and approve them. When reports are approved, they will be available in Experience Transfer System for all people in Gassco to search and find relevant experiences that they need. So, the only approved experiences will be searchable from the website. Some pictures of PIMS R3's pages are available in appendix 1. All information which is explained, are according to my observation in Gassco and Project Portal Guide which is written by (Kjærland, 2012) in Gassco.

Experience Transfer:

Experience transfer is located in Project Portal, → PRO, →Other, and →Experience transfer. Experiences are open for everyone with access to project portal to view. As I mentioned before, the only approved experiences will be searchable on the Experience Transfer page, and it is not possible to edit any experiences from this page, all inputs are done in the PIMS R3 module. In this part, all people in Gassco can search for experiences which they need. When people open this module, the information box will be displayed in the image. This box explains the different icons used in the module and also how to do searches with special characters (Kjærland, 2012). So, this box is kind of information guide for experience transfer, moreover, it includes the contact information of developer, so people can contact him, if they had any problem. People can close the box by clicking the close; people can bring this box any time by clicking the information-symbol. The picture of the information-box page is shown in appendix 1. Figure 16 shows the Experience Transfer page which has two sides; the right side indicates all approved reports and experiences. The left side is filter menu where people can set specific filters in order to find experiences easier and according to the location that they are looking for. The right side does not load all experiences when people open the page; it loads them as people scroll down the page. The filter-menu will only display options that have been used in experiences, if people cannot "Commissioning" in the list, because that option has not been ticked off in any of the approved experiences(Kjærland, 2012). With this filtering, people can choose items, like "Process Area", "Project Types", "Execution Models", "Phases", "Type of Experiences", "Pro- Network Ratings" and "Project Names". Therefore, people can easily choose every part that they need and look for. They should just click on filters, and then tick the box which they are look for. For example, when people click on "Process Area", they can see another filter which is "Main Disciplines", and also, if

people click on Main Discipline, "Sub Disciplines" will be displayed, and so on.
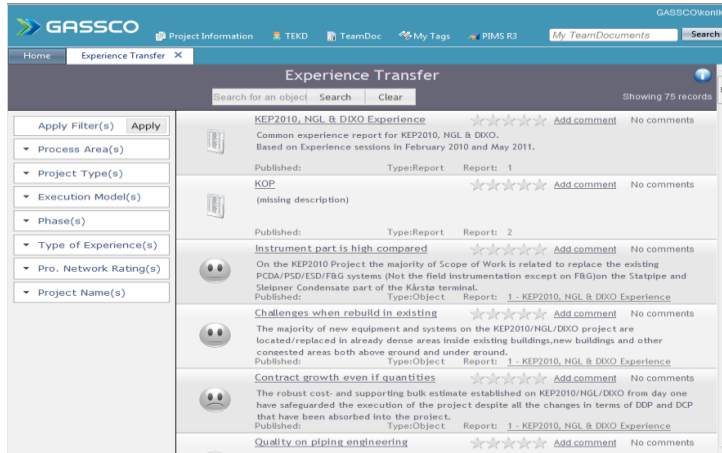
Figure 16: experience transfer search-page (Kjærland, 2012)

Experiences consist of three types in Experience Transfer, which are displayed with three symbols:

1. 🙂: This symbol shows positive experiences in Experience Transfer module. It means experiences are successful and people can learn from good points of these kinds of experiences. There can be some positive points in these experiences that help project teams in their projects.

2. ☹: This symbol indicates negative experiences in Experience Transfer. It means that there are some mistakes in these kinds of experiences. These mistakes influence badly in projects, and they should be avoided. So, people should read them and avoid these kinds of mistakes in their projects.

3. 😐 Neutral symbol: this symbol shows experiences that are not bad, or they do not have any positive point in these experiences. However, there is a lot of information in projects, which is repeated in other previous projects, so people can use them in order to avoid rework in their new projects.

Consequently, these two modules are connected with each other, and every item that is available in PIMS R3, it will be available in Experience Transfer especially filtering. But, one item is not available in Experience Transfer, while this item is available in PIMS R3. This item is the "location of project" which is seen in the administrative page of PIMS R3.

Understanding of people from the Systems in Gassco

I had 5 interviews with project managers and also two more interviews with developers who develop and work with system every day and they have full access of the systems, so they understand and use the systems very well. In appendix 4, there is process report which I described whole the interviews with more details and analysis. So, in this part, I discuss how project managers understand and use the system.

The first three project managers were from "PRO" department which is responsible in Gassco for projects, one another project manager was from "Asset Management-Process Plant" department, and the last one was in "Infrastructure Development" department.

1. This person works with experience transfer system every 5 or 6 months. He believes that is not good to put experience right during project into the system, since there are some experiences which cannot be relevant for others. So, he and his project team have some meetings during project execution and they discuss about their experience, and then collect all of their experiences into the Excel sheet for themselves separately, and at the end of project they have workshop and select most relevant and important experiences, and then record them into system. In this respect, they judge themselves which experience is relevant and which one is not relevant to put into system. Because, they think if all people just put experiences into system, after a while there are too many experiences, and it will be hard to find and use the most relevant and important ones. So, this person understands that the systems are useful in company; he uses them to register his experiences at the end of the projects into the PIMS R3, and read other relevant and important experiences form experience transfer in his meetings with project team. However, experience should be registered during project execution.

2. This person used the system to register experiences into system in the meeting and brainstorming, also he put experience into the system when he is behind his desk. But he has not used the system PIMS R3 since last year. Moreover, he did not read previous experience from experience transfer, because there was not any experience in the system, since system is quite new. He believes it is very helpful system to avoid problems; also experiences should be recorded during and after project. This system is much easier to use than before. But, it is quite new system and he needs some

workshops and procedure in order to start to use the systems again.

3. This person has never used the system and he forgot to use as well, but he is very interested to use system and read experience and learn from them. He understands that experience transfer is very useful and important in the company. So, he has his own way for gaining experience, like communicating and asking his colleagues about projects.

4. This person is from Asset Management Process Plant department, and he is participant in experience transfer meetings. In his project team, they document all experience, and then they use system just 3 times in a year to register their experiences, since they just put the most critical, important, and biggest ones into PIMS R3. He believes, there is no time to check every ting, and also for small experiences they want to ask each other face to face, since there will be a lot of project, and it will be difficult to find the most important ones. They have large project and gain experience from previous project, so they are using experience transfer systems as well, since they think, it is very beneficial.

5. This person is from Infrastructure Development (ISD) and he is project manager. He and his project team collect specific experience that they think is special, and then register experiences into PIMS R3, but at the end of project, while they should do it during project execution. And also, they have experience from experience transfer system, but they do not use it, since they do not know how to use this system. Besides this system, they believe face to face communications, and he mentioned when they have any problem, they go directly to people and ask them, so he thinks it can better and easier, since it is hard to explain and write experience into system. Therefore, he understands that experience transfer is very important in organization, and also he uses the systems in some degrees.

4.2.1.1 *Process of input and output in the systems*

According to discussion about understanding the systems, I can conclude that experiences are necessary and beneficial to transferred and shared among people in Gassco. In this respect, figure 17 shows the process of experience transfer in Gassco. There should be meeting during project execution which can be weekly or monthly. Project managers should hold workshop phase and invite all members of project team for the meeting. And also, he should book facilitator for every workshop or meeting. In the meeting, project team discuss about their

experiences that they have had during project with each other. If somebody forgot something, other people would try to remind him to remember his experience, and then they share all their experiences with each other. So, in the meetings, facilitator should create experience report template, and add experience objects which are negative, positive and neutral experiences, main discipline, background, and setting author responsible. Project manager prepares Management Summary, also he approves experience objects and report when project participants complete input on assigned experience objects. So, all reports and objects are reviewed and approved by project manager, and they are published on web in Experience Transfer as an output, in order to be available for all people in Gassco. Complete and approve reports and objects are in the documentation phase, since they are registered and filed in PIMS R3 as an input which is like a project database in Gassco.
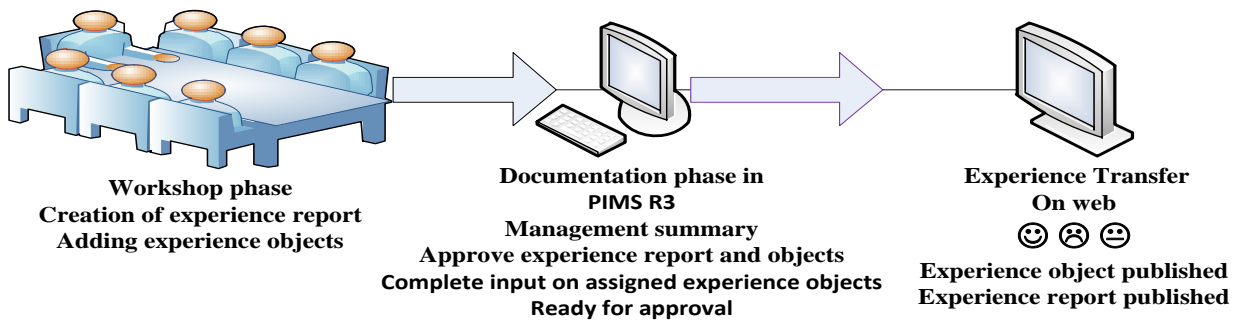
Figure 17: process of input and output in the systems

Consequently, the results of published experiences are positive, negative, and neutral experiences which people can find on Experience Transfer, and then they can read and discuss them in their meetings in order to learn from others' experiences. So, Gassco desires to avoid mistakes and rework by using previous experiences, since mistakes and reworks cause a lot of costs in projects, while Gassco wants to reduce and avoid these costs by using previous experiences from projects. On the other hand, these input and output systems should be very strong and developed in order to support the Gassco's desire.

So in the next part, I investigate problems and challenges that exist in the systems or people face, in order to solve them, and then improve and develop the systems. I collected all people's problems and challenges by using qualitative method.

4.2.2   Problems and challenges:

In this part, I discuss and investigate problems and challenges that people face in their meetings, when they are registering their experiences into PIMS R3 and Experience Transfer.

I had 7 interviews with people whom work directly with the systems, such as project managers and developers. After asking about their understandings, I asked them about their problems and challenges which they have in the systems. So, this part is going to answer this research question; "what are the challenges and problems related to using the systems?" (Research questions pages 8 and 9)

I can divide problems into two categories, the first category is the problems that exist in the systems, and the second category is people's problems in using of the system.

First category: in this category, there are problems in both systems, PIMS R3 and Experience Transfer, such as;

1. There is not any location of projects in the Experience Transfer system, while there is location of projects in the PIMS R3.
2. "There will be a lot of registered experiences into the system" the project managers said, so it is hard to find and use the most relevant and important ones.
3. "Rating systems in PIMS R3 and in Experience Transfer system for putting comment are confusing" the project manager said. There is rating system when people register experiences into PIMS R3, and there is rating system in Experience Transfer, which people can rate their comments. Also, the most relevant experiences are next to less important experiences, and it makes people confusing.
4. It takes so much time to "fill up and keep updated all part of PIMS R3 due to too many levels and items in the system" the project manager said. It means that I think the system is a little complicated.
5. There might be a missing in the system and people need them, like a "button", "link such as procedure link", and people ask for help, like system working or "how can I attach file?"
6. "There is no plan in the project managers' milestones or agenda to record their experiences into PIMS R3" the project managers said. It means that I observed there is not any link among project modules; this link can help project team to remember to record their experiences.

These problems are mentioned by the project managers and the developers, they exist in the systems. So, in order to solve these problems, development group should change some things

in the systems according to suggestions, for example adding extra icons into the systems or deleting some icons from the systems.

Second category: this category includes people's problems. Such as;

1. There is a lack of knowledge about the systems, due to lack of training and workshop for people, and lack of procedure for experience transfer systems. People need to know, "when should they have meetings and use the systems?" "Which kinds of experiences should be recorded, and which ones should not be recorded, and how often should they be recorded?" "How should they use the systems?" "What kinds of input should be in the columns?" "How can people use the experiences in the projects?" the project managers mentioned.

2. Making a new procedure is another problem especially "reflection of 4 requirements of projects execution in the procedure". So far, there has not been any procedure.

The first one is the typical problem of everybody in using of the systems, and the reason is the systems are quite new. So, project team need to learn more about the systems, in this regard they should have training workshops, help, and procedure. On the other hand, making a new procedure is a challenge for PRO department, but this department prepared the draft of this new procedure, and their problem is reflection of 4 requirements of projects in new procedure for experience transfer. In the Appendix 4, there are more details about people's problems in progress report, like every person's problem. In the next part, I discuss the project managers' suggestion for solving these problems in the first and second categories.

4.2.3   Suggestions and solutions:

In this part, I discuss the suggestions which I gained from interviews with project managers. Project managers suggested some solutions that might help development group to develop the systems, and also their suggestions can reflect their needs for experience transfer, such as training workshops, getting help for learning the systems, and having procedure and guide for experience transfer systems. So, this part answers to this research question "how can the problems and challenges be dealt with and solved?" (Research questions pages 8 and 9)

I divide people's suggestions into two categories, the first category can be good solutions for PIMS R3 and Experience Transfer, and second category can reflect their needs for experience

transfer. Also, I mentioned advantages and disadvantages of suggestions.

First category: this category reflects suggestions which can be suitable for development of the systems, PIMS R3 and Experience Transfer, such as;

1. "More filtering in the Experience Transfer in order to find experiences easier" project managers said. For example, define projects' location or area filter in Experience Transfer, since there is project area in PIMS R3 while there is not any icon for choosing the project area or location in Experience Transfer.

❖ **Pros:** more filtering can be very nice idea, and this solution mentions to more filtering. More filtering according to projects type, discipline, phase, and specially location or area of projects, which can help user to find more relevant and important experience easier and faster.

2. "Classifying project experience according to top 10 most important and relevant ones based their impact" one of the project managers suggested.

❖ **Cons:** it will be very hard to judge, since Experience Transfer is limited in this case and cannot judge itself. And, people have to judge themselves which experience is relevant and which is not relevant to put into system. But, all people think that their experiences will be useful and relevant. So, judgment will be hard about the relevancy of experiences. Moreover, in this situation, a lot of experiences can be ignored, while top management in Gassco wants all people to use all previous experiences. Therefore, I think it cannot be feasible solution for problems, it is better that project teams record all their experiences into system, and then others can choose the most relevant and important one by their own search.

3. It is better to "avoid complexity in the systems" one of project managers suggested, since the system should be easy to use, fill up, and understand. Some parts of experiences object in PIMS R3 can be deleted, such as delete rating system from Experience Transfer system and PIMS R3, since it causes confusing. And also, there are many columns in PIMS R3, which might not be necessary, like "additional comments column". For example, columns are important which people can explain their experiences very well, with practical descriptions. Otherwise, extra columns can cause complexity. So, unnecessary icons, button, and area from the systems should be

removed, since they can be confusing for people.

❖ **Pros**: experiences are important and play an important role for learning. So, when they are important, they should be used and read by other people. Thus, there is not point to rate them according to numbers, because they will be confusing, and also people will not pay attention to experiences with low rate like zero or one. And also, in Experience Transfer, if comment should be read, there is not point to rate them. For deleting columns or other parts, development group should have meeting with top manager and project manager, and discuss which part is necessary or which part is not necessary, then decide to delete them form the systems.

4. Help button should be added and defined into PIMS R3 and Experience Transfer, in order to help people to find their questions and problems directly from the systems, or when they are recording their experiences.

5. Create a link between other modules and the experience transfer systems (figure 9 page 54) can be very important, since "every project has linked to team document, and adding experience transfer as an action in this area, it can help people to use experiences, also it reminds them to record their experiences" the developers suggested. This link (between other modules and PIMS R3 and Experience Transfer) can be like a milestone in project team's agenda, and it can help project managers to remember to record their experiences into PIMS R3.

6. There should be a possibility in "Experience Transfer" for people to "choose more than one relevant and important experiences from this part, and then send them to team document in order to be available for other people in the project team" one of the developers mentioned. So, they can have and read all relevant experiences before meetings. On the other hand, one person from project team can take this responsibility to find the most relevant and important experiences before meetings and workshops, and he can send them into team document.

❖ **Pros:** this solution can be very wise idea and other project teams can use it, since in the meetings they do not have to look for and find relevant experiences to evaluate, and they can have ready experiences in the team document already for discussion in their meetings.

7. Search in the Experience Transfer system should include every key word, like search according to name of people, name of projects, title, name of experiences, projects' location, projects' type, and even every other key word. If the search system in the

Experience Transfer were sensitive with every word, people could find the desire experiences easier and faster by searching from search tool bar.

8. Dragging the Experience Transfer location from PRO to Project Portal tool bar, like the location of PIMS R3 in project portal. If the Experience Transfer were located directly in Project Portal instead of in the PRO bar, project teams could see the Experience Transfer every time when they open project portal that it can remind people to take a look at the Experience Transfer and read previous experiences.

9. Color of the Experience Transfer system's background can be changed in order to be attractive and exciting for people, since colors can influence on people to attend them. For example, sorting the experiences in the system according to type of them, negative is red, positive is green, and neutral is white.

❖ **Pros**: colors can emphasize important issues, and they are like a warning, such as green can say "there are a lot of positive points in my part" or red can say "there are a lot of mistakes in my part that you can learn, and do not repeat mistakes again". So, people can find and attend to them easier and faster.

❖ **Cons**: but, there is a disadvantage of using colors, since maybe people ignore experiences which are green or especially white, because they think that red experiences are more important than others. Therefore, development group can discuss around the advantage and disadvantage side of using colors, and then they can decide for implementing this suggestion.

10. Gamification can motivate people to transfer their experiences more because it can make people happy when they are using the systems. So, developers can develop their IT systems according to Gamification techniques.

Gamification was my specialization projects and I concluded that this technique can make a friendly environment which is easier for people to transfer the knowledge. And, (Vara et al., 2011) defined game as "involving someone into performing an everyday action while engaging in it because it is fun can be achieved through the use of game mechanics." So, I think PIMS R3 and Experience Transfer system can be combined and developed with a gamification technique, like a formal computer game, or formal social game to teach the experience transfer systems in the friendly environment.

In this category, it was just discussed about Pros and Cons of some solutions, so development

group can discuss in their own meeting, and they should decide that these solutions are useful or useless for development of the systems. But, the other solutions without Pros and Cons were discussed in the reflection meeting in Gassco, and they were supposed to be implemented in the systems by developers.

Second category: this category suggests the solutions which can help project teams to use the systems more and more in order to record their experiences in PIMS R3 and read previous experiences from Experience Transfer. Suggestions such as;

1. New procedure for experience transfer systems should be established and published. "It should include all information and requirements of project that should be involved in experience transfer, for example 4 requirements, how to use the system, when and how often use the system, and what should be recorded and not recorded" project managers mentioned. So, after people read this procedure, they can understand and use the systems better. And also, they can find their problems and questions regarding the usage of the experience transfer systems in procedure. One of project managers suggested that PIMS R3 should be added in the new procedure not only at the beginning of every stage in "Experience Model", it should also be in the middle of stage, like after shut down. Therefore, this procedure can be an educational procedure for experience transfer in Gassco.

2. Training and workshop is completely necessary for all project teams. "Development group should hold the training meeting and teach the project teams about how to use the systems" project managers suggested. In this training, all people can learn all things about the experience transfer systems in Gassco, like purpose of transferring, how to use the different part of the systems, and so on. Facilitator can teach and help project teams in experience transfer. Moreover, these training meetings should be included in the project teams' milestones.

3. "People should come to my office, and ask me more and more for getting help" one of developers suggested, and also they should reflect their views and demands about the systems. Development group have full access to the systems, and also they can improve and develop the systems very fast after getting comments from people.

These solutions can help people to know and understand the systems better. In this respect, they can use the systems more and more. In the next part, I link the problems with solutions

in order to develop the systems.

4.2.4   Discussion for development of the systems:

In this part, I discuss that how problems can be linked with their solutions. And also, I answer to this research question "how can the system be developed further in Gassco?" (Research questions pages 8 and 9) I investigated that there are two different categories for problems and solutions. The first category includes problems which exist in both PIMS R3 and Experience Transfer. And also, the second category includes individuals' problems in using of the systems. In this regard, the first category of solutions deals with the first category of problems, and the second one deals with the second category of problems. So, the first category is related to PIMS R3 and Experience Transfer, and the second category is related to people.

Table 4 shows the first category of problems with the possible solutions. These problems are main problems in the first category. It is seen that there are three main problems; the first one is hard to find the relevant and important experiences which can be solved by; more filtering in Experience Transfer, like define projects' location, improving the search tool bar in Experience Transfer according to every key words, changing the color of Experience transfer system to be more attractive for people, and possibility to select more than one experience from the system and send them to Team Document. So, after using these solutions in development of the system, people will be able to choose their desired experiences easier and faster. The second problem is complexity in the systems which can be solved by deleting and removing some parts, like extra icons, rating systems, and unnecessary columns and parts in PIMS R3. Moreover, defining the HELP button in both systems can help people to find their questions and problems when they are working with the systems. So, HELP can decrease the complexity of the systems, since if something in the systems is complicated, people could search it through help and read that how the system works in that specific part. Therefore, these solutions can decrease the amount of complexity in the systems. The third problem is lack of plan and milestones in project team, due to this problem, individuals usually forget to record their experience into PIMS R3. So, in order to solve this problem, development group should create a link between Experience Transfer modules with other project modules to remind project team for experience transfer. And also, developers can put Experience Transfer address in the Project Portal instead of in the PRO tool bar, since people can see

directly Experience Transfer every time when they open Project Portal and it can remind them to take a look at the previous experiences, and also they get motivated to record their experiences.

The first Category: PIMS R3 and Experience Transfer	
Problems	**solutions**
Hard to find desired experiences among a lot of registered experiences	➢ More filtering in Experience Transfer, like define location of projects ➢ Search according to every key words ➢ Color of Experience Transfer system ➢ Select more than one experience and send them to the team document
Complexity in the systems	➢ Remove unnecessary parts, like rating system, extra icons, and so on ➢ Define help button in the systems to get help and guide
Lack of plan in project teams milestones	➢ Create a link between Experience Transfer systems and other modules in PIMS ➢ Dragging the Experience Transfer from PRO tool bar to Project Portal bar

Table 4: the first category of problems with solutions

Implementation of solutions: as I discussed, development group have full access to the systems, and they created the systems, so they are able to add something and develop the systems, because this group includes people who are professional programmers. I had a reflection meeting with them, and I reflected all these solutions in the meeting, and also we discussed about all these solutions to implement them in the systems. In order to implement solutions, project managers should investigate them, and then they can approve solutions for development of the systems. So, development group should have other meetings with other project managers and discuss with each other about implementing the solutions in the systems, and after approval by project managers, development group can involve the solutions in the systems in order to develop it.

The second category is problems which people have in using of the systems, such as lack of knowledge about the systems. Table 5 indicates this category.

The second Category: People's Problems	
Problems	**Solutions**
Lack of knowledge about the systems; such as how to use the system? And how often? What experiences should be recorded? How can people use the experiences in the projects?	➢ Establishing and publishing the new procedure ➢ Holding training meetings and workshop for project teams ➢ People should ask their problems from developers

Table 5: the second category of problems with solutions

The second category shows the people's problem in the systems. This problem is lack of knowledge about the systems, because of forgetting how to use the systems, lack of working with the systems, and maybe people they have never learnt how to work with the systems. In this respect, there are three possible solutions for this problem. The first solution is establishing and publishing new procedure, since if project team forgets something and they had problem about the usage of the systems, they can refer to this procedure and find their answers. The second solution is holding training meetings or workshops for project teams in order to learn how to use the systems and how often, what experiences should be recorded, and other aspects of the systems in experience transfer. And, the last solution recommends people to go to the developers' offices and ask their problems from them directly. Project teams have done this solution before, but they should continue and do it more and more, due to the importance of transferring experiences in Gassco.

Consequently, according to these solutions, two aspects can be developed in Gassco. The first aspect is PIMS R3 and Experience Transfer which developers can use the first category to develop the systems. The second category is knowledge of people about the systems. This knowledge can be developed by using the second category, like participating in training meetings and using new procedure.

5   Discussion Part

In the theoretical part, I discussed three concepts, such as Knowledge transfer, individuals and organizational learning, and information technology based system. And in the practical part, I describe the case company, and I discussed their problems and solutions in order to develop the information technology based system for experience transfer. So, in this part, I discuss how theoretical part can be linked with practical case.

5.1   Discussion about the theoretical and practical part

All the three concepts are seen in Gassco, so I analyze the role of them in the company and I applied the theories in practice.

Knowledge transfer in Gassco:

I found from some articles that knowledge has three levels, individuals, group, and organizations. In Gassco, individuals are all people who have their own knowledge, and also they are experiencing new things in their projects, group is project teams who consist of some individuals with different background and skills, and they are working in different projects in the unique organization. So, knowledge in this organization consists of individuals and group knowledge.

This organization follows three strategies, first one; Gassco wants all project teams to record all their experiences into PIMS R3 in order to create knowledge. When people write their experiences, they change them from practical to knowledge and theory. The second strategy is transferring knowledge after created knowledge. This company wants to share and transfer all good and bad experiences among people, since all individuals can read them in order to follow successful experiences and avoid mistakes. In this respect, they can reduce cost in their projects. The third strategy is protection of knowledge and experiences in the database of company for using in future. Gassco wants to keep and protect all people's experiences that they had in their projects, since maybe some people want to leave this company while their experiences are important and useful for Gassco. So, in this situation, the strategy of knowledge protection can help the company to keep people's experiences for future.

I found that knowledge has two main types, explicit and tacit knowledge. I believe that explicit can be defined as a readable knowledge in papers, books, webpages, and other places which people can find explicit knowledge easily. On the other hand, I believe that tacit can be

defined as practical knowledge which people experience. Although, this knowledge can be hard to express, I think with some tools can be possible. One of these tools is PIMS R3 in Gassco, which people can write down their experiences into the system and change their experiences as tacit knowledge to explicit knowledge in order to be readable. So, according to knowledge creation strategy, Gassco transforms tacit knowledge to explicit knowledge in order to be expressed and readable. Therefore, I reached as the same result as (Aase, 1997), she found out that Human Inquiry approach to IT can transform experience from tacit to explicit, and in my case PIMS R3 can transform experiences of people to explicit knowledge.

According to knowledge transfer strategy, there are some factors in Gassco for experience transfer. *The first* factor is communication that I think is very important in experience transfer. People talk and discuss with each other in their meetings to record their experience. Besides this, people can ask their problems from others in the daily communication and they can share their ideas and experiences with each other. *The second* factor is organizational culture which I observed in Gassco. In the meetings people help each other to remember their memories which they had in projects. And also, they always talk and ask each other their problems especially around coffee machine. So, they follow organizational culture in their projects. *The third* factor in experience transfer is motivation. People are encouraged to gain experiences from other colleagues, since they think these experiences can help them in their projects, and also they can learn new things. Another motivation is the systems, since people can record their experiences in PIMS R3 and find them from Experience Transfer much easier than traditional way of experience transfer. Besides, I think promotion can be another motivation, when people transfer their experiences a lot and participate in all meetings; they internally are motivated because they will be recognized by top managers and others as an active person. So, they can be promoted by top managers. Therefore, learning the systems and previous experiences, and promotion are strong motivation in Gassco for transferring experiences. *The fourth* factor is opportunity of experience transfer which is provided by the meetings that project teams hold.

However, there are some barriers between sender and receiver of experience in Gassco. I can divide them into two categories like the problems and solutions in chapter 4. The first category of barrier in experience transfer is lack of knowledge of people about the systems that causes people use the experience transfer systems less. And the second category of

barrier is problems in the systems that cause PIMS R3 and Experience Transfer are not used very well.

In experience transfer process in Gassco people have two roles, the first role is creator of knowledge, and the second one is taker of knowledge as well. In this respect, PIMS R3 and Experience Transfer systems are tools of this process.

<u>Learning process in Gassco:</u>

Knowledge transfer strategy follows a desired result in Gassco. This desired result is learning in every level of organization, such as individuals, project teams, and organization. The main purpose of changing experiences into knowledge is increasing the amount of awareness, information, and knowledge of people about projects that Gassco has, in order to decrease cost of project execution in the company.

I discussed that there are two kinds of learning from direct experiences, learning by doing and experiencing work; and another one is learning by trail-and-error. If Gassco always wants to follow these two types of learning, they have to pay the cost of trail-and-error, and doing, because maybe doing a work will have negative result. So, learning by doing, and trail-and-error have risk which causes cost in the projects. However, in the beginning of the projects, project teams experience these two ways of learning and they paid the cost of mistakes and reworks. That is why; Gassco established two modules for transferring experience in order to encourage project teams to record their works and trail-and-error. So, after collecting and registering experiences, when people want to execute their projects, they can refer to these experiences in Gassco database, read and learn from them. Consequently, I believe that Gassco wants to follow another strategy in learning. This strategy means instead of experiencing directly which cost money, people can read and learn experiences indirectly. This learning is indirect, since these experiences have been done before by some people directly and they record them as well. And in the future projects, all project teams can take the benefit of these experiences without experiencing directly.

According to four processes of learning, I can identify four processes of experience transfer for learning from experiences in Gassco.

1. Experiences can be recorded into PIMS R3 by personals behind their own desks or by

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project teams in their meetings.

2. Experiences are interpreted and considered by all people in project teams in the meetings.

3. Then, they are integrated and approved by the project managers of the project teams.

4. Finally, they are published in the Experience Transfer system for all people in the organization.

However, there are some barriers in front of these four processes in learning. I mentioned these problems and barriers in the chapter 3. Although, I think that the main barrier in learning is ignoring to register the experiences. Therefore, recording, conservation, and retrieval of experiences are being considered as an organizational memory and learning in Gassco.

Information Technology based System in Gassco:

As I discussed, experience transfer needs some tools. Tools can be communication with each other, writing down experience in papers which is traditional way, and computer systems, like information technology. Information technology based system is one of the latest ways of transferring experience in organizations. This system can change experience to readable knowledge that people can read and understand easily. Before using information technology based system, people in Gassco used to use the traditional way to transfer their experiences. But this way had a lot of problems, for example maintenance of too many papers was so difficult, and also it was too difficult to transfer these papers to people to read them. Further, some experiences were ignored, because it was difficult to give all these papers to all departments in the company. So, information technology based system plays an essential role in Gassco especially for transferring experiences among project teams and departments. As I mentioned before, this system in Gassco consists of two modules, PIMS R3 and Experience Transfer. PIMS R3 supports creation of knowledge, and it saves all experiences. Experience Transfer supports retrieval and transferring of knowledge in whole Gassco. All people do not have access to PIMS R3 system except development group, project managers, and members of project teams who participate in meeting. But, all people in Gassco have full access to Experience Transfer system in order to be able to find, read, and learn previous experience. Project managers are responsible to approve the experience in PIMS R3, and after approval

the experience will be available in Experience Transfer system.

I defined a framework for knowledge transfer as a Transfer Triangle, and now I can develop this triangle to Experience Transfer Triangle which shows a framework for experience transfer among individuals, project teams, and whole organization in Gassco who use these experiences and learn from them. Figure 18 indicates the Experience Transfer Triangle in Gassco.
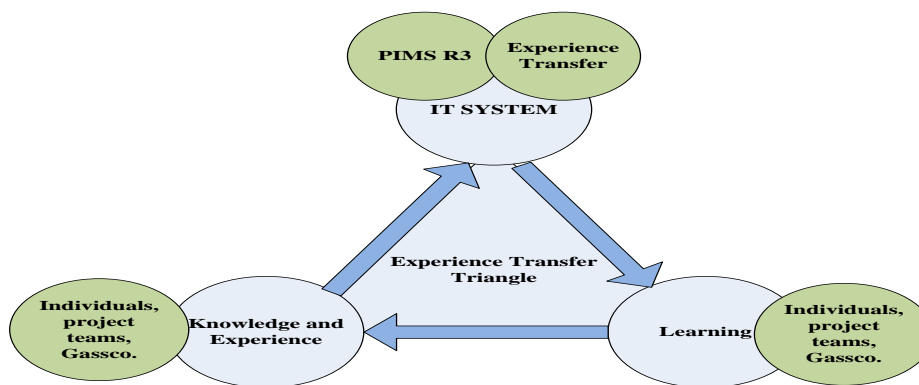

Figure 18: Experience Transfer Triangle

This triangle includes individuals, project teams, and Gassco as an organizational level in the vertex. And also, PIMS R3 and Experience Transfer are in the top vertex as IT system. Individuals and project teams are factors that have knowledge and they gain experience from their projects in Gassco. These factors use IT system to apply their experiences according to the processes of experience transfer in order to be available for individuals and project teams in the company for more using and learning. Therefore, according to this framework, all factors in the vertex of triangle have direct relationships, and also they depend on each other, since people cannot transfer their experiences without tools, so there will not be any learning in the organization without transferring.

5.1.1   Transfer Region

So far, I focused on IT system as one tool of experience transfer in an organization, but I mentioned that there can be other possible ways of transferring experience. I collect some of these ways which I experienced in Gassco and my specialization project. In my specialization project, I concluded that gamification (I defined it in chapter 4 page 73) like formal game in an organization can help individuals to ask and discuss their problems with each other in a friendly environment, in order to find solutions for their problems, then they could use these

solutions to write proposal for their projects. So, in this respect, individuals could learn from each other as well.

Therefore, according to my experiences, I define a region which knowledge and experience transfer take place in. I call this region as a *Transfer Region*. Transfer Region provides a scope which includes different tools for transferring any information in an organization. The figure 19 indicates this region.
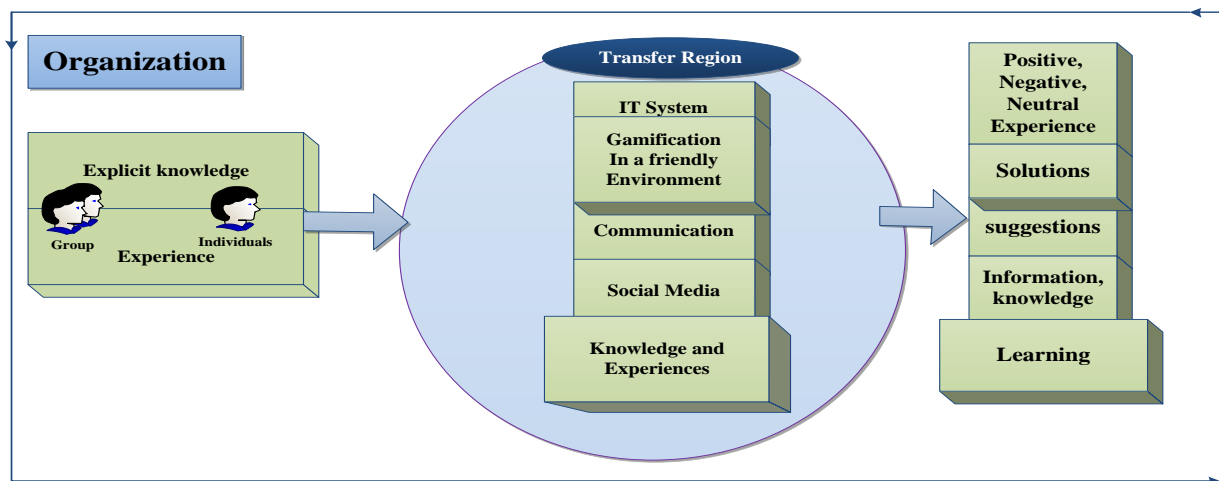
Figure 19: the whole process of knowledge and experience transfer in an organization

The figure 19 shows the whole process of knowledge and experience transfer that can take place in every organization. Group and individuals have explicit knowledge and experience, and the transfer region includes different kinds of tools of transferring, such as IT system, Gamification in Friendly Environment, Communication, and social media, which are like a block in the transfer region. And also, knowledge and experience are counted as a foundation of the block in this region. When the explicit knowledge and experience enter to the transfer region, they will go into the block and they use the tools. The outcomes of the transfer region are;

➢ Positive, negative and neutral experiences which are the result of using IT system.

➢ Solutions that can be result of Gamification in a friendly environment; I concluded this outcome from my specialization project.

➢ Suggestions which are from the people's communications, since people usually ask questions from their colleagues, and their colleagues suggest some solutions or their own ideas about the questions and problems.

> Information and knowledge which come from the social media, since people usually gain different kinds information and knowledge from social media, like internet and web sites, TV, newspaper, and other medias that produce explicit knowledge and information.

The outcomes of the transfer region are like a block as well, and learning is the foundation of this block because learning is the main purpose of transferring knowledge and experiences. Consequently, according to this purpose and all processes of experiences transfer which I experienced, found from different articles, and mentioned them in this thesis, I can suggest some proposals to organizations, so these proposals can help them to transfer their experiences more and more.

Proposal 1: using information technology based system can facilitate experience transfer process in every organization. PIMS R3 and Experience Transfer system are such the systems in Gassco that are positively associated with experience transfer in this company.

Proposal 2: experience transfer is positively associated with individuals and organizational learning. So, knowledge and experience transfer or sharing can be one way of learning within organizations. This transfer or sharing can be discussion in meetings, using the systems, and communication with each other.

Proposal 3: project managers in project teams are positively associated with experience transfer. They are responsible to hold meetings for transferring experience during project execution. They can get help from procedure of experience transfer and training workshops.

Proposal 4: procedure and training workshop are positively associated with experience transfer. They contribute project teams how to use the experience transfer systems in an organization like Gassco.

6   Conclusion, limitations, and future research

Experience as tacit knowledge is transformed to written and readable knowledge by some tools. One of these tools is information technology based system that is used in Gassco currently. This IT system in Gassco has some modules, one of them is PIMS R3 for recording the experiences, and another one is Experience Transfer System for reading and learning from previous experiences, and also this system is completely new. So, I observed that the project team in Gassco discusses with each other in the weekly meetings during project execution in order to find good enough and essential experiences from their projects, and then they record them in PIMS R3. After recording and reviewing, the experiences will be approved by project managers in order to be available in Experience Transfer System, and then people in the company can find, read, and learn from previous experiences which can be positive, negative, and neutral. Therefore, the main and important purpose of experience transfer in this company is learning from previous mistakes and avoids "reinventing the wheel". However, there are some problems for people to use the systems in this respect, such as lack of training and knowledge about the using of the systems, hard to find important experiences, lack of plan of experience transfer in project teams' milestones, and lack of location of projects in Experience Transfer System. So, project teams need more help about using the systems. In this regards, it is necessary to be published a new procedure, improve search area according to name of people, projects and so on in Experience Transfer system to find experiences easier, define projects' location and more filtering in Experience Transfer System, link the experience transfer systems to other modules to remind project managers to record their experiences, and holding more training meetings which can help people to use the systems better and easier in Gassco. And also, gaimification techniques can create a motivation environment in Gassco for people to transfer their experiences more and more. New procedure includes 4 requirements of projects as well.

Consequently, the result of experience transfer increases people's knowledge within organization about projects execution. And also, I found out from literatures that the result of knowledge transfer is learning, and in this regard information technology based system as a tool can contribute people to transfer their knowledge and experiences further for more learning.

In this thesis, there have been some limitations which are seen in practical part. I did not have

any access to PIMS R3 and Experience transfer system, so it limits my research to the guide line, the company's documents, and workshops and interviews. And also, I am not a programmer, so I could not develop and improve the systems in Gassco by myself. If I had been a programmer and have more access to the systems, I could have understood the systems better and found more problems to develop them further. I just had 5 interviews, and one interview was canceled. If I have had more interviews with more project managers, I could have found more problems and understood the systems better. Because Gassco is located in another city, and I have been in Trondheim, so it was difficult to travel a lot, due to my other courses.

The experience transfer systems exist in other companies which have collaboration with Gassco as well, and there is a relationship between these systems in Gassco and other partners. So, future research can be two different investigations, the first one can be a research about a possible new system that could be developed based on the result of this thesis. It means that it should be investigated, how much the project teams use the systems after receiving new procedure and participating in the training workshop, and what the new problems are. The second one can be a research about the interface between the experience transfer system in Gassco and experience transfer systems in its collaborative partners. It means that it can be investigated how people use this system in other collaborative partners, what link there is between them and Gassco in the experience transfer, what problems are, how the usage of the systems creates the desired result between them, and how the experience transfer systems can be developed more and more.

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Appendix 1:
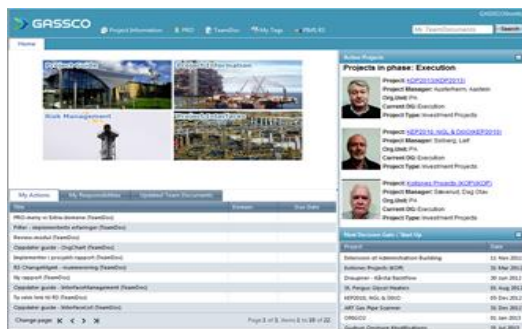
The home page of project portal system in Gassco
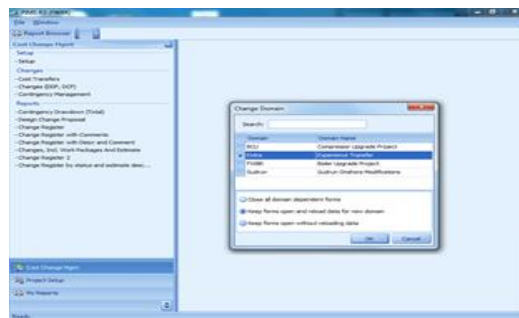
Change domain page
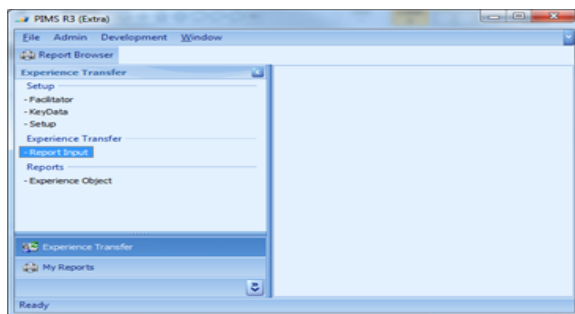
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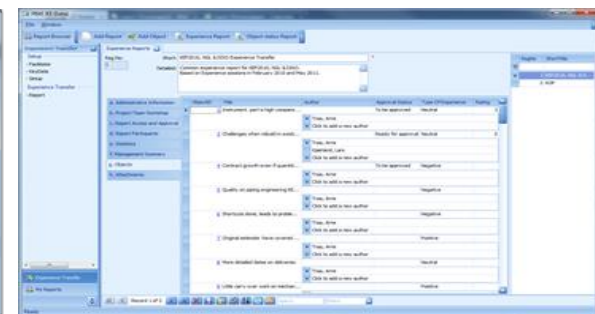
Report participants
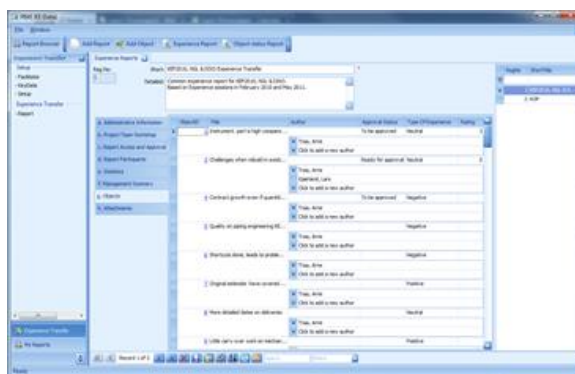
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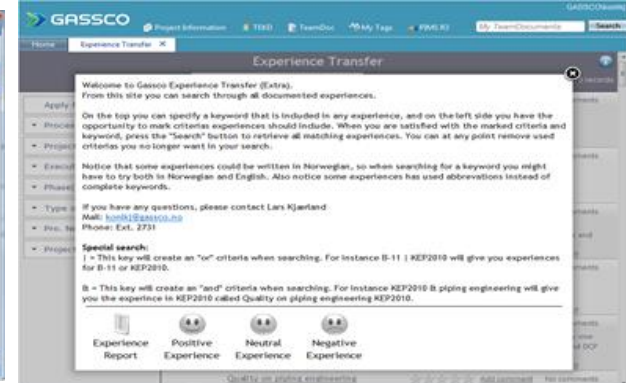
Experience Transfer search page

Figure 20: PIMS R3 and Experience Transfer systems' pages (Kjærland, 2012)

Appendix 2: Deviation report:

This thesis includes a few changes according to time schedule in my project. Actually, I did not change my thesis a lot, except a few changes. In the begging of my work, I planned my thesis with MS-Project which is shown in figure 21 in Appendix 3 in pre-study. This planning did not include my trips schedule because I did not know about the trips at the first time. But, I found out that I have to travel to Gassco which is located in another city in Haugesund, so I changed my plan and I made a new plan with MSP which is shown in figure 22 in Appendix 4 in progress report. In the new plan, I added my schedule trip. So, I followed my time schedule and I did not have any problem and changing in my schedule. I submitted pre-study, progress report, and final report on time and according to my plan. Figures 21 and 22 show progress of my project, such as pre-study, progress report, and final report time with other activities. However, the number of interview was the only thing that was changed in my agenda. I was supposed to interview with 6 project managers in Gassco, but one of them was busy and he canceled his interview with me. So, I just had 5 interviews with project managers. Besides that, nothing was changed.

Appendix 3: pre-study

Background

I am going to work on Information Technology Based System for Experience Transfer in projects. Organizations usually have a lot of unique projects which need solutions, methods, and tools in order to be achieved. So, organizations can use their previous experiences from projects in order to avoid "reinventing the wheel". For example, if they have faced something wrong before in their projects such as, defect, delay, cost overrun, and accident in the workplace, they need to learn from these mistakes in future work in order to avoid rework. In this regards, existing knowledge and experience from previous projects can play an important role within organization, so they can contribute organizations a lot. Therefore, experience and knowledge should be shared and transferred in whole organizations in order to teach individuals different kinds of skills and experience. But, there are several challenges in sharing and transferring knowledge and experience in whole organizations like, how people can transfer experience to others within organization, and what people need to use as tools to learn from others. According to these challenges, a system for transferring knowledge and experience is needed. So, this thesis will focus on an information technology based system for experience transfer within organization. In this respect, I am working in a specific case as such company for investigation its current system, and then develop system.

Case company is Gassco as an operator and responsible for safe and efficient gas transport from the Norwegian continental shelf and will be a leading gas transporter in Europe.

So, in this project, I have three supervisors Bjørn Andersen, Anandasivakumar Ekambaram who has very close communication with case company, and Sobah Abbas.

Problem description:

Learning is an issue which plays an important role in organizations these days. Organizations prefer to use their old experiences from previous projects in order to reduce time of planning, executions and workload, and avoid mistakes and defect in their work. Since, there are a lot of activities which are repeated in every project, and these repeated activities can be used in other projects. If one of these activities is wrong, they can avoid it, and if one of them is very useful and practical, they can use it in their new project. So, organizations should have a tool

and way in order to learn from previous experience, and also transfer these experiences.

In this regard, there is a very practical experience-transfer tool in Gassco as my case company, which is able to transfer experience in whole Gassco, and people can read all experience as easy as possible. This tool is a system that is used to collect all Gassco's project, and also all people can upload their projects with whole details. All members in Gassco have access to this system. Moreover, this tool has two parts, first part is called Project Portal as main part of system which all team projects should put their projects with all details, and second part is PIMS R3 or experience-transfer which people can put and read their experience from old and current projects. My master thesis focuses on the second part which is experience transfer (PIMS R3). Developer group mad this system in 2006 and currently all people are using this system. Project team is very near to this system specially experience transfer part, and they always make a meeting and discuss and reflect their experience, then write them and put it in their system. But, they are doubtful that other teams ignore PIMS R3, and maybe they do not read old experiences. Therefore, they want to investigate, how other teams are using this system, do they read old experiences and also write their own experience during project? Since, Gassco would like to use old experience and transfer new experience more and more in whole organizations among people in order to avoid mistakes and rework. In this respect, this thesis concentrates on Gassco's investigation to find problems and improve them, then develop the system.

<u>Scope and Objective:</u>

Scope: I have some tasks regarding to company's investigation which I can divide them in 5 groups.

1. Literature review regarding topic, such as knowledge transfer and sharing, organizational and individual learning, and information technology and so on.
2. How is the system used?
3. How does the usage of the system create the desired results? Or what are the desired results of system usage?
4. What are the challenges in using the system, and how can deal with thesis challenge?
5. How can we develop the system further?

In order to do all these 5 tasks, I should understand their system and visit company 2 or 3

times and talk with them. Then, I need to interview with some people within organization, and ask them some questions regarding to my tasks and research questions. After interview, I should find challenges that people face in using of system, and then find main problems. I need these problems, and also people's suggestions in order to be able to develop system in the way which is useful for Gassco and employees in company. Moreover, I should analyze all data after interview, and link them to theories. And finally, I should suggest a way to develop the system in Gassco after analysis the data.

Purpose: this thesis follows very important purpose, since this purpose is very important for the company as well. The company needs to investigate its experience transfer system to be able to develop it. Because, experience transfer plays an important role for top management in Gassco, so they would really like to develop this part of their system in order to learn from previous experiences.

Consequently, this thesis has four aims, first one, understands of the system; second one, find the problems and challenges in the system, third one, development of the system, and the last one, transfer experience more and more which is possible after developing the system.

<u>Research methodology:</u>

I can divide my thesis into three parts, theoretical, practical, and discussion part. The first part is theoretical part which is literature view from different articles. The second part is the case company as practical with workshop and interview. In this practical part, I will follow the qualitative method such as interview with people within Gassco. This way of collecting data is qualitative method which is my research method. So, first I will attend to a workshop which people actually are transferring their experience, and I will observe all steps in experience transfer, and also I will see how the system works and is used by project people. Then, I will interview up to 5 or 6 people in Gassco to find problems of people in using of the system, and I will analyze them to be able to suggest some useful solutions to develop the system. And the last part is discussion part which I am going to combine theory from articles and data from interview and workshop with each other, then analyze them.

Structure of project	
Chapter 1	**Introduction of Topic**
	1.1 Company
	1.2 Industry
	1.3 Delivery/outcomes
Chapter 2	**Research methodology**
	2.1 Research question
	2.2 Combination of Interview(Qualitative) and Questionnaire(Quantitative)
Chapter 3	**Theory part 1**
	3.1 Knowledge management
	3.2 Knowledge transfer and sharing
	3.3 Organization and individuals learning
	3.4 Information technology
	3.5 Information technology and knowledge
Chapter 4	**Case Company, GASSCO as Practical part 2**
	4.1 Understanding and Explanation current system
	4.2 limitation of current system
	4.3 Analysis Current System
Chapter 5	**Development of system**
	5.1 analysis the data and suggest solutions for development
Chapter 6	**Discussion part 3**
	Combination of theory and practical
Chapter 7	Conclusion and limitations

Table 1: the structure of master thesis

Table 1 shows my master thesis structure with seven chapters. Chapter 1 expresses introduction of topic, such as company, industry, and outcomes. Chapter 2 is research methodology in this master thesis. In chapter 3 as first part, I am going to talk about theories, like knowledge management, knowledge transfer and sharing, organizational and individuals learning, information technology and knowledge. Chapters 4 and 5 as second part are going to indicate understanding the current system of Gassco, limitations in the current system, analysis of challenges that people face currently with the system for example in using, and in

chapter 5 finding the problems by analysis of data and suggest new solutions. Chapter 6 is third part which reflects my discussion and analysis of theory and practical parts.

In this respect, I have five research questions;

1. How can information technology as system help knowledge and experience transfer?
2. How is the system used in the organizations?
3. How does the usage of the system create the desired results?
4. What are the challenges related to using the system?
5. How can we develop the system?

These research questions are my master thesis which I should find their answers from literatures and especially practical part. So, the answers of the questions are my master thesis. In this thesis, I should reflect my own ideas and solutions in Gassco, so I should give my suggestion to top manager in Gassco to use them.

Planning of my project:

I planned my project by MS-project, I put all my tasks and milestones in this software and this software gave me the Gantt chart and time of my project. Figure 21 shows this plan. But, there is a delay in my plan due to delay in receiving official assignment milestone. This plan is overall plan for project, and it does have not plan of trip. But I can include the trip in investigation current system task. And I will add trip as another task in another plan schedule.

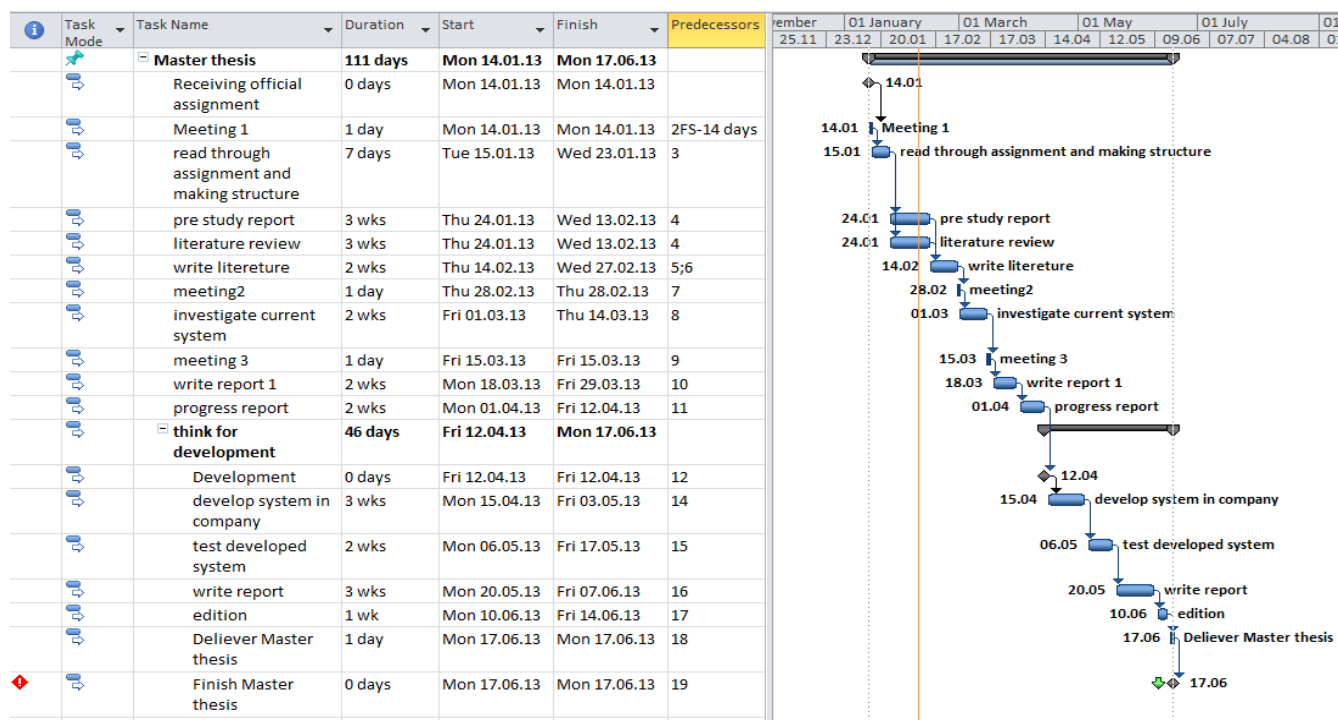|	Task Mode	Task Name	Duration	Start	Finish	Predecessors
		Master thesis	111 days	Mon 14.01.13	Mon 17.06.13	
		Receiving official assignment	0 days	Mon 14.01.13	Mon 14.01.13	
		Meeting 1	1 day	Mon 14.01.13	Mon 14.01.13	2FS-14 days
		read through assignment and making structure	7 days	Tue 15.01.13	Wed 23.01.13	3
		pre study report	3 wks	Thu 24.01.13	Wed 13.02.13	4
		literature review	3 wks	Thu 24.01.13	Wed 13.02.13	4
		write litereture	2 wks	Thu 14.02.13	Wed 27.02.13	5;6
		meeting2	1 day	Thu 28.02.13	Thu 28.02.13	7
		investigate current system	2 wks	Fri 01.03.13	Thu 14.03.13	8
		meeting 3	1 day	Fri 15.03.13	Fri 15.03.13	9
		write report 1	2 wks	Mon 18.03.13	Fri 29.03.13	10
		progress report	2 wks	Mon 01.04.13	Fri 12.04.13	11
		think for development	46 days	Fri 12.04.13	Mon 17.06.13	
		Development	0 days	Fri 12.04.13	Fri 12.04.13	12
		develop system in company	3 wks	Mon 15.04.13	Fri 03.05.13	14
		test developed system	2 wks	Mon 06.05.13	Fri 17.05.13	15
		write report	3 wks	Mon 20.05.13	Fri 07.06.13	16
		edition	1 wk	Mon 10.06.13	Fri 14.06.13	17
		Deliever Master thesis	1 day	Mon 17.06.13	Mon 17.06.13	18
		Finish Master thesis	0 days	Mon 17.06.13	Mon 17.06.13	19

Figure 21: plan of project

Appendix 4: progress report

Progress report

This is a report that should be reported in the middle of project. It includes purpose, plans, and interview of project managers in gassco.

Purpose: this report follows two purposes, first showing the progress of my master thesis and my plan, such as tasks which are done so far, and which will be done in rest of working. Second the whole of interview that I done in Gassco, I collect here, since I focus on main problems and solutions in final report.

Plans: I update my plan in MS-project program, but here I summarized the main tasks that I am done, and also task that are left.

- ✓ Plan of my master thesis
- ✓ Pre-study
- ✓ Find articles and literature review
- ✓ First travel for understanding the system
- ✓ Second trip
    - ✓ Workshop for experience transfer
    - ✓ Interviews
    - ✓ Finding problems and solutions
    - ✓ Reflection of problems and solution with development group
    - ✓ Improvement and development
- ✓ Progress report
- ➔ Write final report
    - introduction
    - Theoretical part
    - Practical part
    - Discussion part
    - Conclusion
    - Etc.

So, according to plan list, I have done tasks which have check mark, and currently I am

writing final report and now I am in the theoretical part which 60% finished. After that I am going to start typing the practical and discussion part with other parts, like introduction, conclusion, and so on as well. Figure 1 indicates plan of my thesis in MSP software.
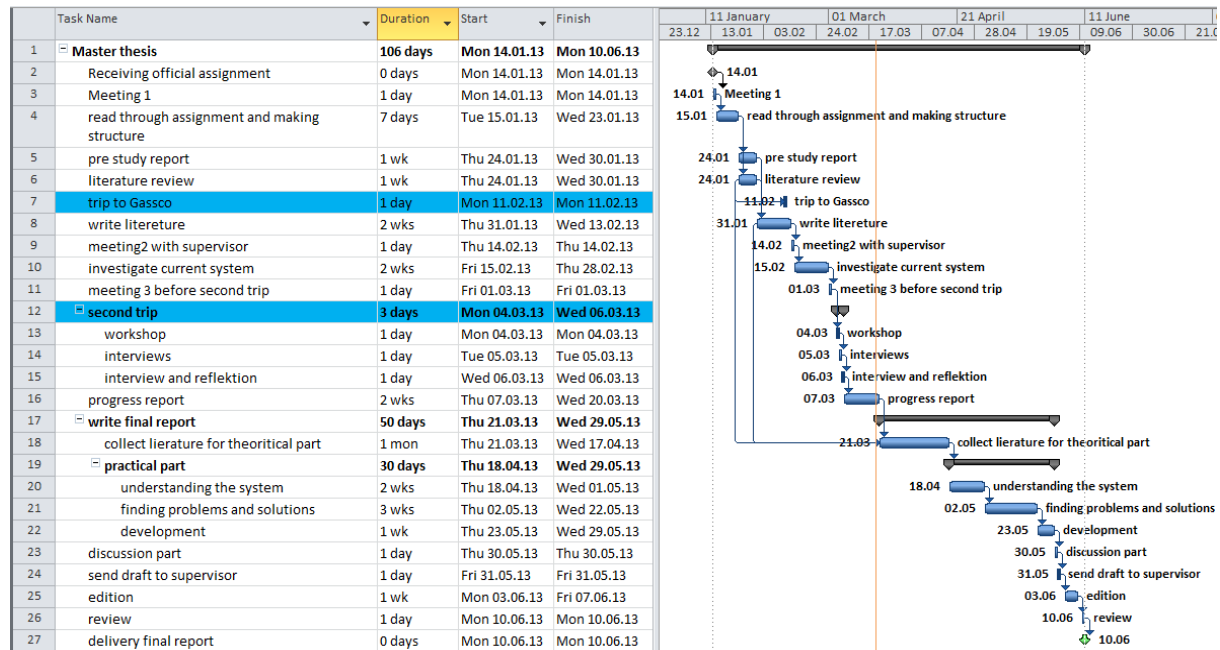

Figure 22: plan of my thesis in MSP

Person 1:

The first three persons are project managers from PRO department which is responsible in Gassco for projects. This person works with experience transfer system every 6 or 5 months. He believes that is not good to put experience right during project into the system, since there are some experiences which cannot be relevant for others. So, he and his project team have some meetings during project execution and they discuss about their experience, and then collect all of their experiences into the Excel sheet for themselves separately, and at the end of project they have workshop and select most relevant and important experiences, and then put them into system. In this respect, they judge themselves which experience is relevant and which one is not relevant to put into system. Because, they think if all people just put experiences into system, after a while there are too many experiences, and it will be hard to find and use the most relevant and important ones. But this view can be wrong, since how they can judge that their experiences cannot be useful for others; they may be very relevant or useful for other people. People can find the most relevant and suitable experiences from

system by themselves and they can choose which one is the best. Also, sometimes the small experience can be very useful for somebody.

Therefore, I think, it is better to put their experiences during project into experience transfer system instead of Excel sheet. And they can do it alone behind their own desk or in the workshop with all project team members by brainstorming, so that all people can find and read all their experiences, because maybe some of them are relevant for some people, and some others are relevant for other people.

In this regards, this person mentioned some problems with some solutions which I collect here with advantages and disadvantages of solutions.

New procedure: there will be a procedure for experience transfer system, which people can find information about the experience transfer system. This is a new procedure for experience transfer system in Gassco with more, clear, and specific information about experience transfer system. This new procedure includes 4 requirements, such as project execution with TSP and without TSP, DGSP procedure, and project development DG1-DG4 with less text. However, some text removed from new procedure, but all these 4 requirements in project referred and referenced to new procedure. So, new procedure and 4 requirements linked with each other. It has some stages in order to follow for using. This person is responsible to make a new procedure as well.

Problems:

1. There will be a lot of experiences and it is hard to find and use the most relevant and important one.

2. Rating systems in PIMS R3 and in experience transfer system for putting comment are confusing. There is rating system when people put experience into system, and another one when people want to put comment. Also, the most relevant experiences are next to less important experiences, and it makes people confusing.

Solutions:

   3. More filtering in the system in the process area, like divide project development into 3 categories such as feasibility, concept, and feed, and also divide project execution into

3 categories, like detail engineering, constructions, and commissioning as well. It means filtering projects according to their types.

❖ **Pros:** more filtering can be very nice idea, and this solution mentions to more filtering. More filtering according to projects type and location can help user to find more relevant and important experience easier and faster.

❖ **Cons:** system is limited to divide project development and project execution, since they have already defined. But there is project type icon that people can choose the suitable experience from this icon by choosing the type of project. And the type of project will be available when project manager approve them.

4. Classifying project experience according to top 10 most important and relevant ones based their impact.

❖ **Pros:** it can help to find more relevant and important experience easier and faster that people need.

❖ **Cons:** it will be very hard to judge, since system is limited in this case and cannot judge itself. And people have to judge themselves which experience is relevant and which is not relevant to put into system. But all people think that their experiences will be useful and relevant. So, judgment will be hard about the relevancy of experience. Therefore, I think it is good solution that project team put all their experiences into system, although they are important or not, and then others can choose the most relevant and important one by their own search.

5. One person from project team take responsibility to find the most relevant and important experience before meetings and workshops.

❖ **Pros:** this solution can be very wise idea and other project teams can use it, since in the meetings they do not have to look for and find relevant experiences to evaluate, and they have ready experiences to discuss in their meetings.

6. Delete rating system from experience transfer system and PIMS R3.

❖ **Pros**: experiences are important and play an important role for learning. So, when they are important, they should be used and read by other people. Thus, there is not point to rate them according to numbers, because they will be confusing, and also people will not pay attention to experiences with low rate like zero or one. And, the same for comment, if comment should be read, there is not point to rate them.

Person 2:

Person 2 used to using system to put experience into system in the meeting and brainstorming, also he put experience into system when he is behind his desk. But he has not used the system PIMS R3 since last year. Moreover, he did not read experience from previous project, because there was not any experience in the system, since system is new. He believes it is very helpful system to avoid problems; also experiences should be recorded during and after project. This system is much easier to use than before. But it is quite new system and it needs some workshops and procedure. He did not know how to use it, since lack of procedure.

Problems:

1. It takes so much time to fill up and keep it updated all part of the system due to too many levels in the system. It means system is a little complicated.
2. Lack of Learning about system, since he needs to know when he and his project team shall use the system, how they want to use the system. It means lack of procedure.

Suggestions:

1. Avoid complexity in the system; for example some part of experience object can be deleted from PIMS R3.
   A. Since the system should be easy to use and understand.
   B. And also, it should be easy to fill up.
2. Define a procedure and stages in order to say how to use the system, when use the system.
3. He suggests, add PIMS R3 in the middle of Detail engineering, construction after shut down, and commissioning for new procedure.
4. Define help, since when people forget something, they can refer to help and remember items.

Person 3:

This person he has never used the system and he forgot to use as well, but he is very interested to use system and read experience and learn from them. So, he has his own way for

gaining experience, and he has two views, also he recommends these views as well.

Views	
People	System
The best way for learning and experience transfer is communication with others and talk and discuss with colleagues. Face to face communication, like in meeting, coffee bar, lunch, and ask them directly can be better way for experience transfer.	Data in computer can be good as well; especially system shows negative, positive, and neutral experience. But people should put experience with quality in to gain experience with quality out.

Table 1: summary of person 3 views

Problems:

He had some problems, since he did not use system yet, such as;

1. Lack of trainee and workshop, since he did not learn how to use the system
2. Lack of procedure to show how people can use the experience in the project.
3. There was not any plan and schedule in his milestone and agenda to remind him to put experience in.

Suggestions:

1. System should be easy and simple to use, like open question to explain more in the system.
2. There should not be too much information from people in their explanation of experiences. It means people should put experience with high level information and good explanations.
3. It should be identified milestone in his projects, for example there should milestone of PIMS R3 in his schedule module in PIMS.
4. Having demonstration once year what we shall put in, also how the system can be grown. It means there should be procedure.
5. There should be workshop to learn

Person 4:

This person is from Asset Management Process Plant department, and he is participant. In the project team, they document all experience, and then they use system just 3 times in a year to put their experiences, since they just put the most critical, important, and biggest ones into system. They believe there is no time to check every ting, and also for small experiences they want to ask each other face to face, since there will be a lot of project and it will be difficult to find the most important ones. They have large project and gain experience from previous project, so they are using experience transfer system as well, since they think, it is very beneficial.

Problems:

They have not used experience transfer system, because this system is a new system. He recorded experience for himself in the Microsoft word, since there was not any system before, but they have been using PIMS R3 for recording the experience. In this respect, he faces some problems;

1. It is not clear what kind of experience should be recorded or not recorded. And also, how often experiences should be recorded.
2. There will be too many experiences and it will be hard to find relevant and important ones.

Suggestion:

He suggested clarifying top 10 experiences in the system like person one, so there is the same pros and cons. But he suggested;

1. Establish a clear procedure to say people, how to use, how often to use, and what shall be recorded and not recorded.
2. Search area in the experience transfer system should be very strong, like search according to name of people, or even every key word.
3. Put some workshop and trainee in the plan and milestone.

Person 5:

This person is from Infrastructure Development (ISD) and he is project manager. He and his project team collect specific experience that they think is special, and then put experiences

into system, but at the end of project, while they should do it during project execution. And also, they have experience from experience transfer system, but they do not use it, since they do not know how to use this system. Besides this system, they believe face to face communications, and he mentioned when they have any problem, they go directly to people and ask them, so he thinks it can better and easier, since it is hard to explain and write experience into system. But in this respect he and his project team have some problems;

Problems:

1. They did not learn how to use system.
2. There should be a studying to say, what shall be filled up? What kind of input should be in the columns? It means there is no explanation.
3. There is no plan in their milestones or agenda to put experience into system, and it is not regularly to record.

Suggestions:

1. Give more educational procedure in order to show how to use the system.

Development group:

I had interview with developers of the system as well. One of them is facilitator in the meetings, and responsible to help project teams and type their discussion into PIMS R3 and another one is programmer and he can add or delete icons in the system.

Programmer receives task from his supervisor at Gassco to program the system. He is not user, so he does not record his own experiences. If he records his own experience, that would be great, since maybe he leave company in future and company still needs his positive or negative experiences.

Facilitator is responsible to help project teams in their workshops and teach them. So, project managers should book facilitator for their meeting before. Also, he types and puts project teams' discussion into system.

Problems of development group:

When people have problem, they come to this group and talk with them. So, this group

mentioned some problem that people face usually.

1. There is missing in the system and people need them, like a button, link such as procedure link, and people ask for help, like system working or "how can I attach file?"
2. There is not any location of project in the experience transfer system, while there is location in the PIMS R3.
3. There are too many experiences in the system, and the challenge is hard to use them.
4. Making a new procedure is another problem especially reflection of 4 requirements of project execution in the procedure. So far there is not any procedure.

Suggestions:

1. People come to developer and ask more and more for helping and reflect their views and demands for the system, like adding a button, link, and so on into the system by developers.
2. Add location of project in the experience transfer system, since it is useful to find experiences according their location easier.
3. Link between modules, since every project has linked to team document, and adding experience transfer as an action in this area, it can help people to use experiences, also it reminds them to record their experiences. So, linking between modules can be very important.
4. Adding milestones in the system and procedure can help people to remember and record their experiences into system.
5. There should be a tag and tick mark to help people choose some experiences with each other, and then send them to team document in order to be available for other people in the project team.

Reflection: I had a meeting with development group and reflected all people's problems to this group. So, it is supposed to have meetings with project managers and discuss about all suggestions and problems and develop the system after brainstorming with them. I suggested some solutions to develop the system as well, such as;

1. Adding help area in the system, in order to help people find their questions directly from system, like other software and system which have help.

2. Changing the color of experience transfer system, in order to be attractive for people. And also sorting experiences according to type of experiences, negative red, positive green, neutral white.

   Pros: it can help people to find relevant experience easier and faster. People will pay attention more to negative mistakes, so it helps to avoid them. And also, if somebody wants to learn, he/she can see green color very easily and choose them.

   Cons: maybe people ignore experiences which are green or especially white, since they think that red experiences are more important than others.

3. Remove unnecessary icons, button, and area from the system, since they can be confusing for people.

Table 2 shows the summary of problems and solution that I collected in the interviews from people.

Main Problems	Main Solutions
Lack of procedure	➢ They are preparing a new procedure, and also 4 project requirements should be referred in the new procedure
Lack of trainee and workshop	➢ There should be workshop with facilitator and developer to teach people ➢ Define a help button in the system
Too many experience and hard to find relevant and important ones from experience transfer system	➢ More filtering like according to type and location of project, like adding projects location (Dornum, Dunkerque, Emden, etc.) ➢ A person in the project team find the relevant and important experience from system before meeting ➢ There should be a tag and tick mark to help people choose some experiences with each other. ➢ Search according to name of people and project, topic, location, and every key word of projects ➢ Sub-solution; Sorting according to color, negative is red, positive is green, and neutral is white
It takes so much time to fill up all items in the system	➢ Remove unnecessary items, button, and area.
Forgetting to record the experiences	➢ Define milestones of experience transfer in the projects agenda or in the new procedure. ➢ Linking between modules in the team documents
Sub-problems	**Sub-solutions**
Rating system in PIMS R3 and in experience transfer system are confusing	➢ Delete rating system from experience transfer system and PIMS R3.
Any problem and questions about system and adding something in the system	➢ People come and ask from developer
Hard to express and write	➢ Face to face communication

Table 2: summary of problems and solutions