Document Name:	Preface Report
Project Name:	Production Technology
Project Number:	2012-2
Course:	SFHO 03200 – H11 – Bachelor Thesis with project control
Availability:	3. year, Bachelor in Engineering at BUC – Buskerud University College
Supervisor:	Kjell Enger, BUC
Contracting Entity:	Kongsberg Protech Systems
Group:	
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Document History		
Rev.	**Changes**	**Date**
-		2011-11-15
1	Introduction, Project Model, Schedules, Budget, Standard and Guidelines, Spellings, Project Description.	2011-11-24
1.1	Grammar FrontPages and Footer.	2012-01-04
2	Chapter Security Instructions added.	2012-02-06
2.1	FrontPage and Header.	2012-02-06
3	Template update, grammar, minor changes in guidelines and standards.	2012-05-24

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1 Introduction

Production Technology is a Bachelor Thesis taken on by five mechanical engineering students from Buskerud University College in Kongsberg.

The Scope is limited to five study credits for the first semester (fall 2011), then 15 study credits for the second semester (spring 2012). This is estimated to 550 work hours per group member. There will be a higher priority on documentation then in a normal industry. This will give a better basis for evaluating the project.

The purpose of this project is to evaluate production models for Kongsberg Protech Systems (KPS). Kongsberg Protech Systems has developed a new product called Protector Medium Caliber that is going into production. To make the production effective they need to develop a specific production model that they can integrate in all their locations, and in different production scale.

The company has other similar products that are already in production. In the existing production there are used several Lean tools to make the production as efficient as possible. The difference between these products and the new one is the size and weight. The existing products are of smaller caliber and therefore smaller in size and easier to handle, than the new Protector Medium Caliber. Due to the size and weight of the product they need to develop a completely new assembly process. The production process is the backbone in the company and it is vital for the company to compete with others.

Our assignment is to make a main study that evaluates different production models and create concepts for the production of Protector Medium Caliber. The production is divided into two cases with different production rate, where Case 1 handles high rate production and Case 2 handles low rate production. For both cases, we will consider the need of cranes, lifts and other equipment to make the assembly as easy and effective as possible. In the production of Protector Medium Caliber there will be a need for a jig or a fixture to hold the product while assembling and testing. This jig will be designed in SolidWorks and integrated in our production model.

To be able to make a good analysis, we need to learn about production technologies and Lean manufacturing. By learning the basics of these subjects, we will ensure effective manufacturing of quality products and a safe and good environment for the workers. To accomplish this, two generic pre-studies will be produced as supporting literature. One study for production technologies and one study for Lean manufacturing. The two studies will be used as a support for arguments for the different choices and conclusions we make in our main study.

This Bachelor Thesis is a theoretical study and takes form of a written report with drawings and illustrations. The sources used are internet, personnel of KPS and literature in form of books. Project expenses are literature and printing of reports and poster.

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1.1 Document Overview

This document is one of many reports in the Bachelor Thesis 2012-2.

The Figure below will give an overview and placement of the reports and documents for the Bachelor Thesis 2012-2. The textboxes represents documents and the green box is representing this document. The Appendix documents are not listed.

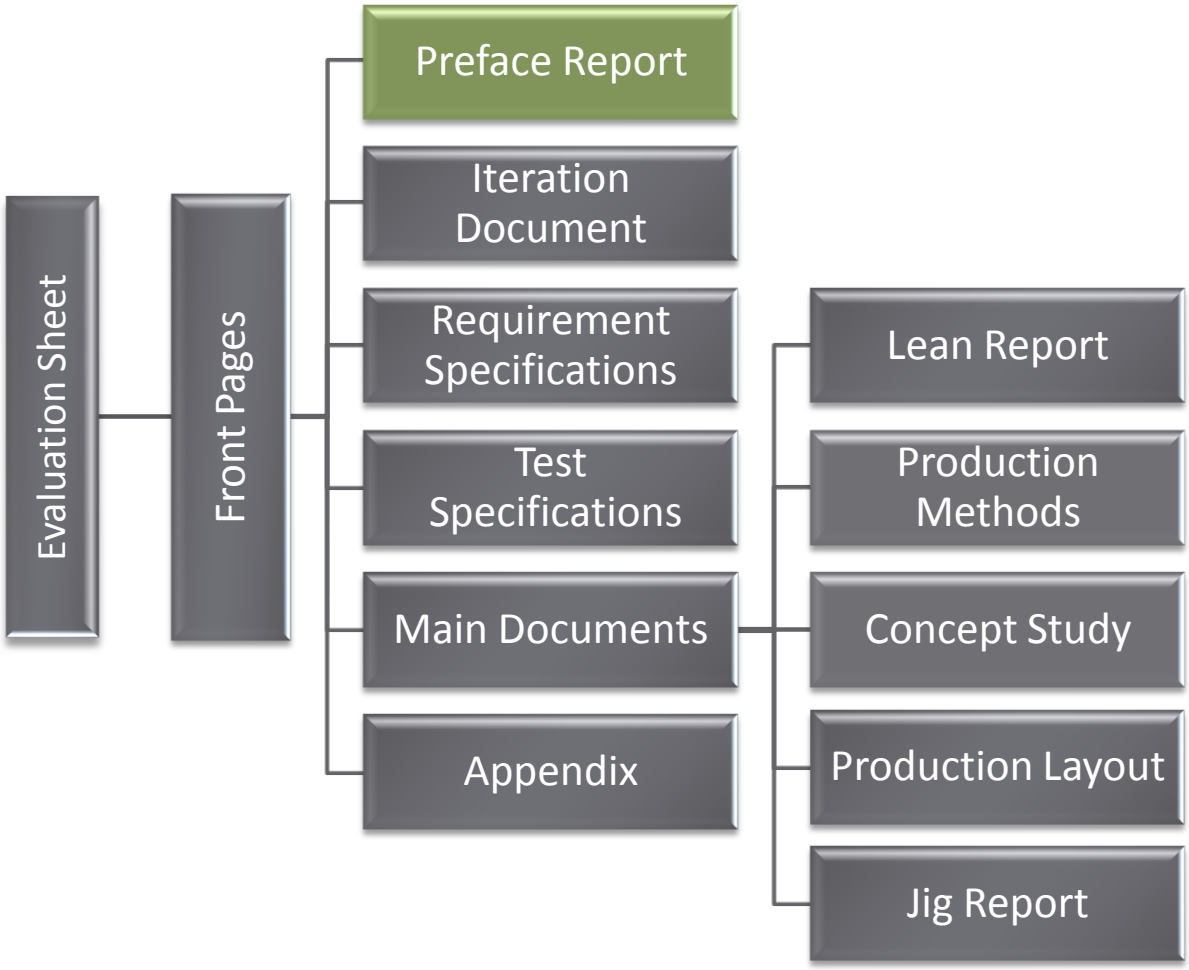

Figure 1 - Document Relation

1.2 Document Purpose

The purpose of this document is to introduce the project and explain the goals of this project. The document will give a detailed overview of how the project is planned to be executed.

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2 Organization

2.1 Project group

Halvor M. Eide (H.M.E), 1986-26-03
Educated in furniture design and room architecture
Experience: KDA - Navy & Surveillance, documentation (2011-2012)
Student contact for Tekna at BUC
E-mail: halvor.m.eide@gmail.com
Phone: 92 21 37 36

Ørjan Ohm (Ø.O.), 1988-08-02
Experience: Statoil ASA, Inspection
E-mail: orjan.ohm@gmail.com
Phone: 48 03 59 18

Sander K. Trandem (S.K.T.), 1986-06-12
Experience: Certificate as industrial technician. Apprenticeship performed at Esso refinery Slagentangen(2007-2009)
E-mail: sander_trandem@hotmail.com
Phone: 92 40 24 15

Knut Anders Lia (K.A.L), 1989-11-11
Experience: Nexans Norway, Halden. Production of sea cables and umbilicals
Manager for Tekna Student organization at BUC (2012)
E-mail: knutanl@hotmail.com
Phone: 90 15 74 41

Alexander Svendsen (A.S.), 1989-09-08
Experience: Infocare, Service technician
Student contact for Tekna at BUC
E-mail: alex89sve@gmail.com
Phone: 45 47 73 92

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2.2 Stakeholders

The stakeholders are shown in Table 1.

Table 1 - Stakeholders

Contact information	Position	Relation
Kongsberg Protech Systems		
Ole Magnus Raff Reinemo Ole.magnus.reinemo@kongsberg.com	Manager Process and Technology	External Mentor and Sensor
Alan Kåsin alan.kaasin@kongsberg.com	Production Engineering Mechanics Dynamic Systems	External Mentor
Sigmund Johannessen Sigmund.johannessen@kongsberg.com	Process Engineer Dynamic Systems	External Mentor
Buskerud University College		
Kjell Enger Kjell.Enger@hibu.no	Lecturer, Technology Division	Internal Mentor and Sensor
Olaf Hallan Graven Olaf.Hallan.Graven@hibu.no	associate professor, Technology Division	Internal Sensor
Åge Skaug Aage.skaug@hibu.no	Senior Engineer	Receiver of Documentation Elements
Project Group		
Halvor Mehlum Eide halvor.m.eide@gmail.com	Student	Project Manager Document Manager
Ørjan Ohm orjan.ohm@gmail.com	Student	Minutes of Meetings manager Web Page Manager
Sander K. Trandem sander_trandem@hotmail.com	Student	Economy Manager Communication Manager
Knut Anders Lia knutanl@hotmail.com	Student	Follow-up Manager Project Plan Coordinator
Alexander Svendsen alex89sve@gmail.com	Student	Test Manager

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2.3 Relation and Responsibility

All the managers in the project group have its own responsibilities. In most cases the task will therefore be handled by the person who are responsible, but managers can surly delegate these task to other team members. It will always be the respective manager who is responsible.

Internal Mentor:
His task is to support and guide the students during the implementation of the project. Internal mentor shall also be included in a panel of three people that put individual grades on the project participants. The other two participants in this panel are: internal sensor and external sensor. The project will be evaluated with standard grades from A to F.

Internal Sensor:
His task is to sensor all projects. Internal sensor should be included in a panel of three people who will put individual grades on the project participants. The other two participants in this panel are: internal mentor and external sensor. The project will be evaluated with standard grades from A to F. Internal sensor should also be a support for the internal guidance during the implementation of projects.

External Mentor:
His task is divided in two tasks: First, the external mentor is the representative of who initially gave the task and thus customer. Second, the external mentor is responsible for ensuring that the necessary resources are made available to the project group. Resources include in this case the equipment / software and technical information / guidance.

External Sensor:
His task is to censor the project group. External sensor should be in a panel of three people who will put individual grades on the project participants. The other participants in this panel are: internal mentor and internal sensor. The project will be evaluated with standard grades from A to F.

Project Manager:
His main responsibility is to make sure that the project is according to the plan and its goal. Good communication is one of the biggest parts in this process. He needs to make sure that different task and responsibilities in the project itself is divided on the other team members.

Document Manager:
His main responsibility is to make sure that all documentation is in the same format, standard and according to the other documents. It is also the document manager that control that non-public material is kept secret.

Communication Manager:
His responsibility is to coordinate meetings with Kongsberg Protech Systems and internal mentor from BUC.

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Minutes of meetings Manager:
His responsibility is to write minutes of meetings after the project standard in every meeting and send it out to all the other participants.

Economy Manager:
His responsibility is to make the projects budget (with the other members) and make sure that use of money is according to the budget at all times. It is also his responsibility to declare all purchases and keep all receipts preserved.

Follow-up Manager:
His responsibility is to make sure that follow-up documents is made and sent to the internal mentor. Therefore his job is to make sure that every team member is doing their scheduled task, and contact the project manager early if there are any delays.

Web-Manager:
His responsibility is to make a presentation of the project on a web site, and from that point, continuously update the web-page with the newest version of documents and process.

Project Plan Coordinator:
The coordinator is responsible for all inputs and updated in the Project Plan in Gantt Project.

Test Manager:
The Test Manager is responsible for test executions and test documentation.

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3 Project Introduction

Production Technology is a project taken on by five mechanical engineering students from Buskerud University College in Kongsberg. The purpose of this project is to evaluate production models for Kongsberg Protech Systems (KPS).

3.1 Project Background

Our employer has developed a new product which is going into production very soon. This is a product that is going to be produced in several different locations around the world. Because of this, they need to develop a specific production model that they can integrate in all their locations, but in different scales.

The company has several other similar products that are already in production. These products are produced based on several Lean tools to make the production as effective as possible. The difference between these products and the new one is the size and weight. The old products are much smaller and easier to handle, than the new one. Because of this they need to develop a completely new assembly process that takes the size and weight into consideration.

The production process is the backbone in a company and it is vital for the company to compete with others. It is very important to have a good and effective production model that is fast, safe and effective. These are the factors that make the company able to squeeze the cost lower than the competitors and the production rate higher.

3.2 Problem Description

We are going to make a main study that evaluates different production models and create two concepts for this new product. Taking size, cost and production rate into consideration. One of the concepts will handle low rate production and one will handle high rate production. We will also look at what is needed of cranes or lifts and other equipment to make the assembly as easy and effective as possible. When this is established, we are going to design a production jig that we will integrate in our production models

To be able to produce a good study, we need to learn about production technologies and Lean manufacturing. These are tools that are important to introduce to the work environment. This will increase effectiveness, quality, HSE and create a good environment for the workers.

To accomplish this, the group will create two prior studies. One study for production technologies and one study for Lean manufacturing. Then we can use these studies as arguments for the different choices and conclusions we make in our main study.

This is a theoretical study and does not need many resources. We can find mostly what we need on internet or in the school library. The only expenses might be buying of books and printing of the study in different formats.

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3.3 Project Scope

The Scope is limited to 5 study credits for the first semester (fall), then 15 study credits for the last semester (spring). This is equal to 650 hours of work per group member. There will be a higher priority on documentation then in a normal industry. This will give a better basis for evaluating the project.

Project aids:

Project data storage:	dropbox.com
Communication:	E-mail, Microsoft Office; Outlook
Transfer:	Dropbox, USB memory stick, e-mail
Homepage:	Wordpress
Simulation Tools:	SolidWorks Simulations
Documentation Tools:	Microsoft Office; Word, Exel, PowerPoint,
Project planer:	Gantt Project
Workspace:	Hydraulic lab at BUC facilities and office at KPS

3.3.1 Budget

For the project to be executed, there are several expenses for the project group that needs to be taken in consideration. As Kongsberg Protech Systems may take care of expenses such as printing of project report books, we will list all possible expenses for the project. This budget is an estimate for the expenses and do not separate the costs for KPS and the project group. There will be no follow-up on this budget for a later account. The budget is shown in Table 2.

Table 2 - Budget

Cost	Quantity	Unit	Price in NOK	Total NOK
Printing of books	12	piece	200	2400
Documentation DVDs	10	Piece	5	50
Poster	2	piece	500	1000
Office material	1	piece	600	600
Teambuilding Accessories	5	piece	100	500
Literature	3	piece	200	600
Domain/Server	1	Piece	250	250
Sum				**5400**

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4 Project Goals

This chapter describes in detail, the goals of the project, in perspective of all Stakeholders as the intern project group, Buskerud University College and the contracting entity.

4.1 Main goal

The main goal of the project is to integrate different “lean” tools in the evaluation of production methods and to develop concepts for the production jig. The concepts have to fulfill the requirements from KPS.

4.2 Secondary goal

To achieve our main goal, we have to consider these secondary goals.

- Acquire knowledge about “lean” tools used in KPS
- Acquire knowledge about production methods
- Make requirements specification for the production jig
- Dimension of jig
- Proper material selection

4.3 Process Objectives

From the group member point of view there is several goals in the working process of the project. Followed there is a list of process objectives:

- Learn to dispose time and resources.
- Learn to delicate work for a better result
- Learn to communicate with stakeholder
- Create a result together in a group
- Learn to perform in front of a crowd.

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5 Risk Analysis

When the project is started, there are risks that can affect the implementation of the project. Therefore we identify, assess, manage and eliminate these risks. Here we analyze the risks that can affect our project.

Problem-solving

In the implementation of the project there will be a lot of documentation. If we lose this documentation somehow, we will not have anything present or deliver to BUC and KPS.

Risk	**Low**	**Medium**	**High**
Consequence	**Low**	**Medium**	**High**
preventive measures	**Take back up of all documentation on different medias at all times.**		

Human failure

Diseases, accidents or death could affect the implementation of the project.

Risk	**Low**	**Medium**	**High**
Consequence	**Low**	**Medium**	**High**
preventive measures	**None.**		

Project members

If one or more team members does not do their work, or one of the members quits the study, it could affect the project implementation. It could result in more work for the other team members. It could also make it impossible to complete the project.

Risk	**Low**	**Medium**	**High**
Consequence	**Low**	**Medium**	**High**
preventive measures	**Make sure good communication in the project group. Varied tasks and make a responsibility list for every task. Regular meetings and follow-up document.**		

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Contracting entity

The contracting entity can change or add tasks in the project. This could make it difficult to complete the project. The contracting entity can also choose to back out of the project.

Risk	**Low**	**Medium**	**High**
Consequence	**Low**	**Medium**	**High**
preventive measures	**Make an internal contract between the project group and KPS to define the project and what we will deliver.**		

Mentors

Mentors can be unavailable when guidance and help is needed.

Risk	**Low**	**Medium**	**High**
Consequence	**Low**	**Medium**	**High**
preventive measures	**Send out minutes of meeting in time.**		

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6 Project Guidelines and Standards

This chapter describes in detail, the plan of what to deliver, how and to whom. It also describes systems for organizing documents.

6.1 Elements to be Delivered

Documentation is to be delivered in different forms and contents for different purposes.
Deliver: 2012-05-29, 14.00

Intern Sensor:
One Printed copy is for archival purposes, and is used by the internal sensor. This copy shall be complied with in a binder with blue color in 2012 and the project name, number clearly marked on the back. This binder will contain a paper record of all important documents on paper and a CD / DVD with all the material produced during the project, documentation, time sheets, poster, meeting notices and minutes as well as source code and drawings. This CD / DVD are to be in a plastic pocket trapped inside the cover.

Public Library:
One other Printed copy is for future lending. This copy is bound and contains all that is publicly available. The task bound with glued back if it is practicable. If everything is available, this version contains the same as the green cover, if such source will not be available to CD / DVD in the hard cover binder does not contain source code. The front page of the hardcover binder shall be a copy of the examination paper without grades.

College Archive on Brage:
One copy shall be delivered as a pdf file that is stored in the college archives, Brage. This copy contains the same that is on paper in the bound copy. Pdf file will be delivered on a CD / DVD. At the same time delivered a signed agreement on paper. This Agreement is printed and signed. "Agreement for publication of student work in Braga (BORA)" is stored on http://www.hibu.no/sfiles/64/00/1/file/studentavtale.pdf. The library ensures that the agreement will be filed in Ephorte and that the project is registered in the Brage.

Presentations:
Each presentation is to be submitted on a CD / DVD in three copies. It includes final presentation, the materials and an electronic copy of the posters. (The format poster is made of, and PDF.)

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Poster:
A project poster is to be delivered for public sight at Buskerud University College. Size of poster is 50x70 cm, landscape and includes following items:

- Formal assignment number and title at the top
- Project Number
- Official name
- Members of the group
- The project is performed at Buskerud University College, Department of Technology.

Evaluation Sheet:
Evaluation sheet is a page of information posted on the front cover page of the blue binder copy. It is a supplement to the final submission of five copies. The sheet includes:

- Project number
- Project Name
- Name of company that is contracting
- Name of the external supervisor.
- Some lines of summary of the project
- Three key words of the project
- Status of availability to the public
- The name of the project participants,
- Names of the three sensors at the bottom

Contracting Entity:
Printed copies with all information including CD/DVD off all work will be delivered as agreed with the contracting entity.

6.2 Requirements for Main Report Documentation

Table 3 - Main Report Content

Document Name	Description
Preface Report:	To understand the goals of this project and give a detailed overview of how the project is planned to be executed.
Project Plan:	Relevant information needed to execute the project.
Requirement Specification:	A list of the specific requirements intern and extern.
Test Plan/Specification:	Identify the strategy that's going to be used.
Concept documents:	Several documents about our solution
End Phase Analysis:	Development and concept solution
After Analysis:	Describes how the project was executed
Time schedule:	Shows the time for every work done
Minutes:	From every meeting, intern and extern.
Follow-up documents:	Appendix of monthly information of progress to internal mentor
Contracts:	All contracts signed between any stakeholders.

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6.3 Identification (ID) Number System

The purpose of this ID number is to mapping the documents identifications.

6.3.1 Main Report

The project documentation is organized in several individual rapports. Each rapport and its progress work have a folder with a number followed by the document name. The Identification (ID) Number consists of 4 digitals between 0001 and 9999 and the capital letter “P” or “S”. This letter stands for the availability for the document where P stands for Public availability and S stands for Sensor. A document marked with “S” will only by available for the Sensors. The two first number starts counting documents at “00” as the evaluator sheet. This number is the two first numbers in the document identification system. The two second digits is describes the documents part. If a document consists of several parts, the second part will be described as 02, where the fist is 01.

The first release of Preface Rapport has the ID number 0201P and Iteration Document 0301P. This information is to be found in each document in the header.

6.3.2 Appendix

Appendix documents has for ID number, the letter “A” followed by four digits, starting on 01, and. The appendix is categorized with letters in different fields and types of references and extra material.

6.4 References

When a reference is used it will be noted after a version of “Harvard Standard”. The references will be written as the three following examples:

1. *Aerospace specification metals, AISI 4340*
   http://asm.matweb.com/search/SpecificMaterial.asp?bassnum=M434AA
   (Downloaded: 11.11.04)
2. Matbase.com. *Data Table for: Polymers: Commodity Polymers: HDPE*
   http://www.matbase.com/material/polymers/commodity/hdpe/properties
   (Downloaded: 11.11.04)
3. Protex.com. *Heavy duty adjustable latch/overcenter fastener/toggle fastener/draw latch*
   http://www.protex.com/product/show/name/490-9000!170
   (Downloaded: 11.11.05)

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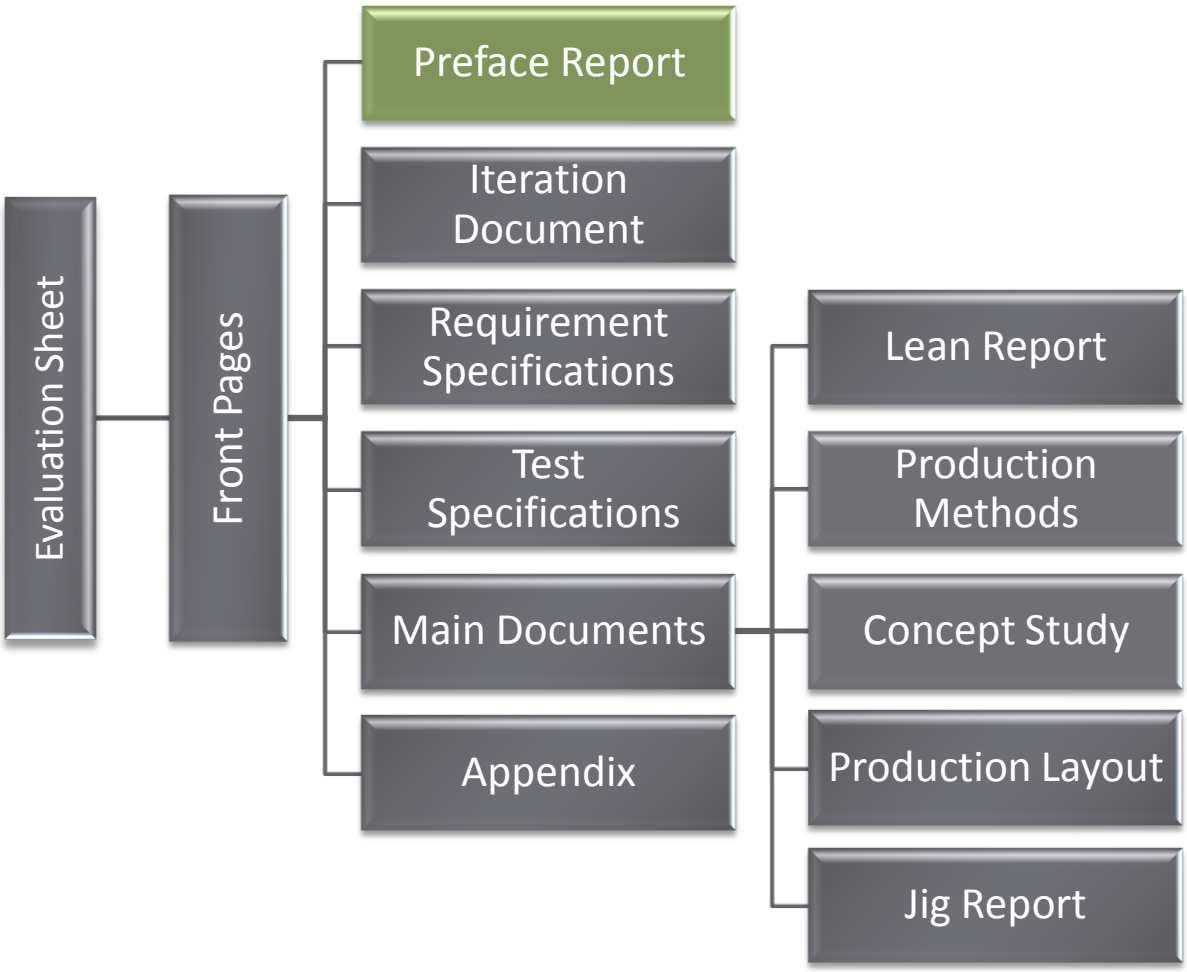

Figure 2 - Document Overview

6.5 Document History Documentation

All changes after the first release will be noted be the author with change, date and initials.

Rev.: Describes the revision of the document. A document has the revision "-", from the first relies, until the first approval of a new review of changes or relies. Every approved new review of change will have a new counting decimal number, starting from 0.1. Every approved new relies will have a new counting number, starting from 1, and count whole digitals.

Change: Describes with a short note, what and where the changes have been done.

Date: States the date of approved relies, new relies or new review of change. The date is written in the following form: YYYY-MM-DD

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7 Project Model

The purpose of project modeling is to divide the main task into phases. Giving you control and overview over the project and helping you to divide the work tasks for everyone.
It is used as a guideline in order to lead a project.

7.1 Choice of Project Model

After looking in to the different project model that's available, we have decided to use the project model named Rational Unified Process (RUP) since this project model fits best to our type of project. More of this and other project models can be found in appendix C01.

7.2 Unified process

The Unified Process is an iterative and incremental development process. Where use cases are used to capture the functional requirements and to define the contents of the iterations. Each interaction takes a set of use cases or scenarios from requirements all the way through implementation, test and deployment.

The project is divided in four phases:

1. Inception Phase
   - Establish a case for the project.
   - Establish the project scope and boundary conditions.
   - Identify risks.
   - Prepare a preliminary project schedule and cost estimate.

2. Elaboration Phase
   - Primary goal are to address known risk factors and to establish and validate the system architecture.
   - The final elaboration phase deliverable is a plan, including cost and schedule estimates for construction phase.

3. Construction Phase
   - Is the largest phase in the project.
   - System features are implemented in series of short, time boxed iterations. Each iterations resulting in an executing release of the software.

4. Transition Phase
   - The system is given out to the target users.
   - Feedback received from an initial release.
   - Includes system conversions and user training.

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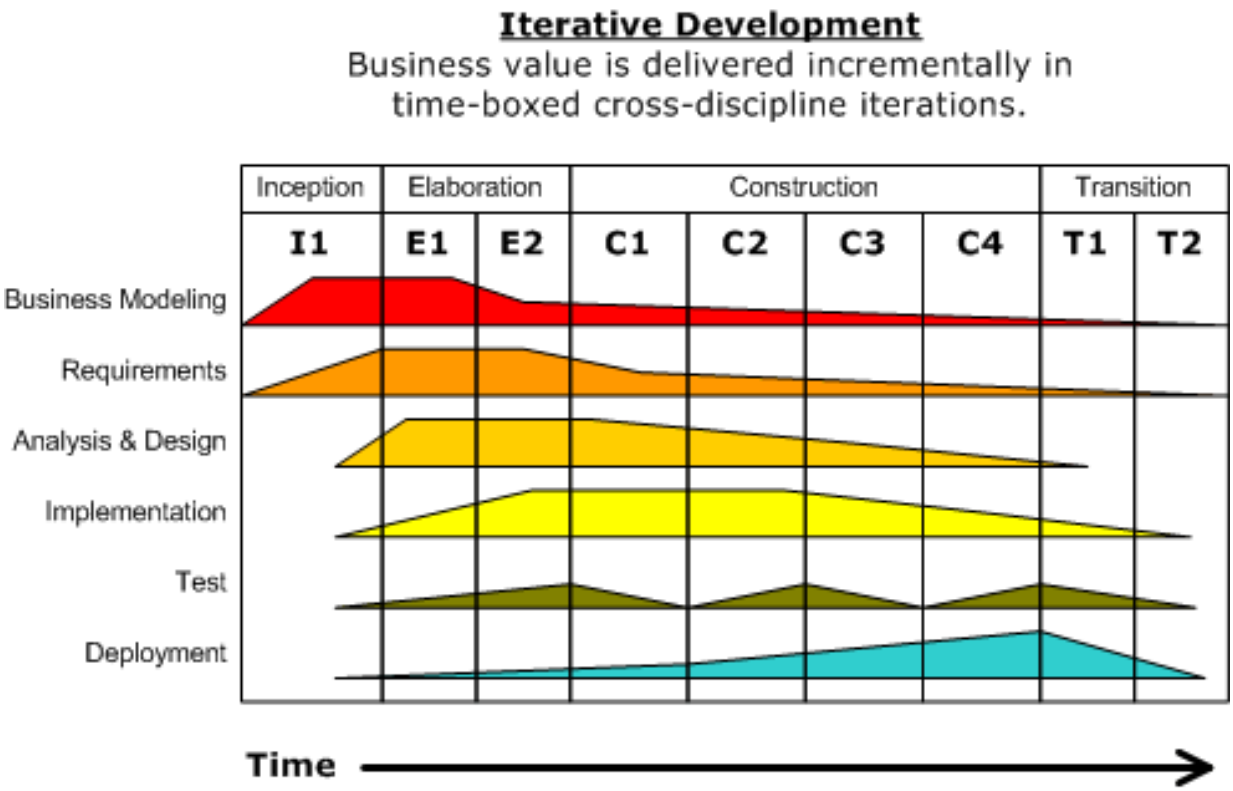

Figure 3 - Unified Process

8 Schedule

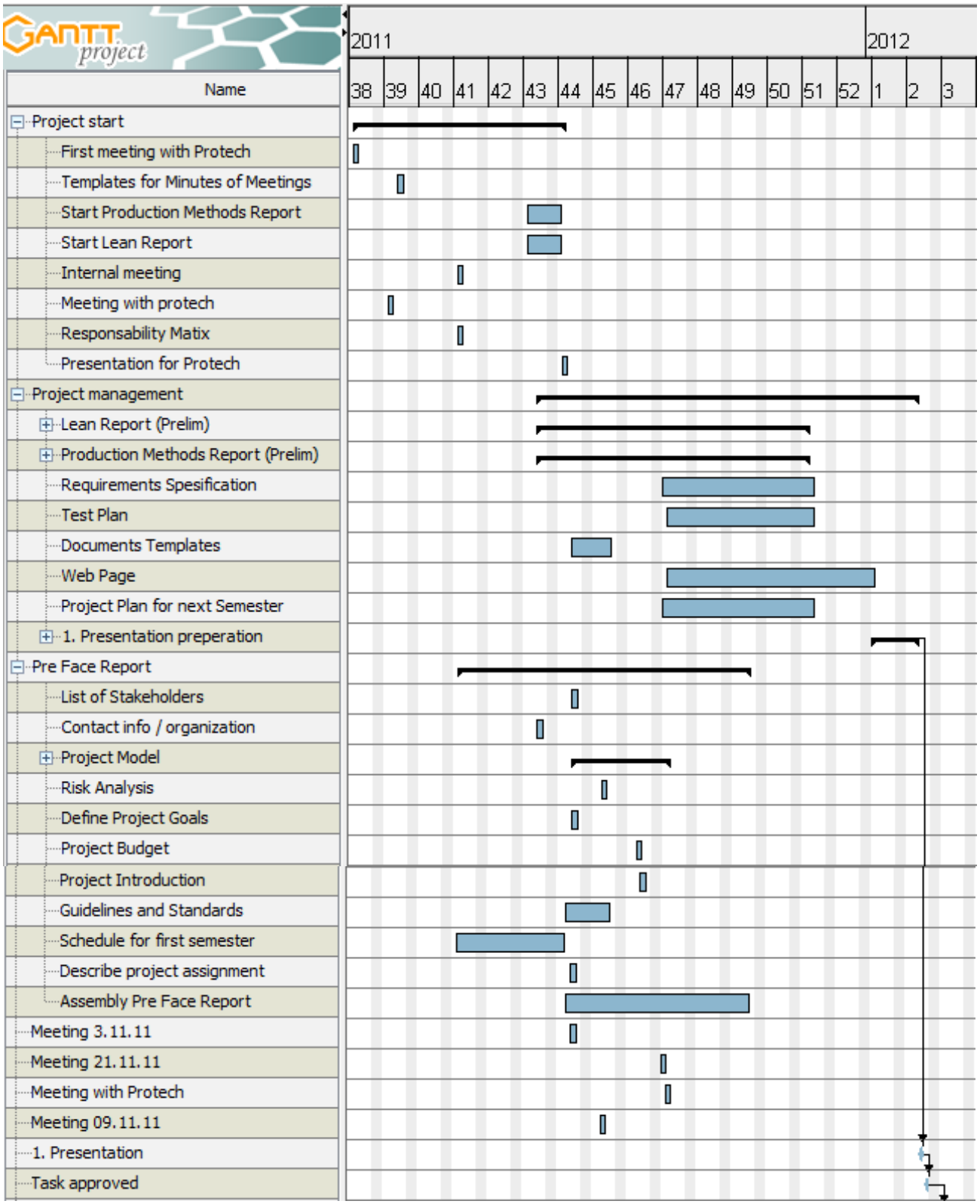

Figure 4 - Gantt Diagram

Table 4 - Milestone 1 – 2012-01-11

ID	Task	Halvor	Sander	Ørjan	Knut Anders	Alexander
1001	First version of Lean Systems Report			P/R	P/R	
1002	First version of Production Methods Report		P/R			P/R
1003	Requirements Specification	D/p	P/R	D	P	D
1004	Test Plan	D	p	D	D	P/R
1005	Documents Templates	P/R				
1006	Web Page			P/R	P	
1007	Project Plan	I/p			P/R	I
1008	PPP for 1. Presentation	P	D	p	R/p	D
1009	Minutes of Meetings	I	I	P/R	I	I
1010	Presentation of Lean and Production Methods		P/R	P	P	D
1011	Responsibility Matrix	D/p			P/R	
1012	Follow-Up Documents				P/R	
2001	List of Stakeholders		P/R		P	
2002	Contact Info/Organization	R/p	P	p	p	p
2003	Project Logo	P/R				
2004	Define Project Model	D	D	D	D	P/R
2005	Risk Analysis		P/R			
2006	Define Project Goals	P/R	P			
2007	Budget	P	P/R			
2008	Project Introduction	P		P/R		
2009	Guidelines and Standards	P/R	I	I	I	I
2010	Schedule for First Semester	p		I	P/R	
2011	Assemble Pre-Face Report	P/R				

Table 5 - Responsibility Diagram Descriptions

P	Performer
p	Partly Performer
R	Responsibility
I	Informed
D	Should be Discussed

1000 = Project Start/Management

2000 = Pre Face Report

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9 Abbreviations

Abbreviation	Description
BUC	Buskerud University College
KPS	Kongsberg Protech Systems
PDF	Portable Document Format
Rev.	Revision
RWS	Remote Weapon Station
USB	Universal Serial Bus

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