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Functional Requirement Specification for TIMS2

Approved 28.9.2016

Tekniikka
2016

VAASAN AMMATTIKORKEAKOULU
Tietoliikenne Tekniikka

TIIVISTELMÄ

Tekijä	Juha Kristian Hakala
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Kieli	Englanti
Sivumäärä	73 + 0 liitettä
Ohjaaja	Jukka Matila

Projektin tavoitteena oli tehdä toiminnallinen järjestelmäkuvaus tilauksien hallintajärjestelmästä. Perustana tälle projektille oli edellinen olemassaoleva järjestelmä, mille tämä on seuraaja.

Tuloksien saavuttamikseksi projekti tehtiin pienellä tiimillä, sekä käytettiin vesiputousmallia kehityksen apuna. Keskeisinä käsitteinä on projektin hallinta, tiimityöskentely, kehitystyö sekä ohjelmisto spesifikaation suunnittelu.

Projetin tuloksena oli hallintajärjestelmän toimintakuvaus jonka avulla voidaan itse ohjelman kehitys toteuttaa. Havaitsimme että käytetty prosessi oli hyvä tämän projektin toteuttamiseen, vaikkakaan ei välttämättä sovi kaikkiin projekteihin. Toiminnallisen järjestelmäkuvauksen tekeminen on tärkeää etenkin isommissa ja pidemmissä projekteissa, että kehityksen fokus säilyy läpi koko kehityskaaren sekä halutut ominaisuudet löytyvät lopputuotteesta.

Avainsanat Projekti, Ohjelmiston kehitys, FRS, Spesifikaatio
(4–5 avainsanaa)

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ABSTRACT

Author	Juha Kristian Hakala
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Name of Supervisor	Jukka Matila

The aim of the project was to create a functional specification for an order handling system. The basis for the project was the previously used version of the program. The end product for project holds the plans for a new version.

For archiving results, the project was made with a small team and the waterfall model was used for development resource in this project. The main concepts in this work are Project Management, Team Work, Development and Creation of Software Functional Specification.

End results of the Project’s was a functional requirement specification that enables creation of the Program. During this time it was noticed that the used waterfall model was good for executing this project, even if it is not good for all projects. The creation of Functional Requirements Specification is very important, especially in bigger, longer projects, so the focus stays on the goal during the development period coming after this step. Also this ensures that every wanted function is found in the end product as the functions are described in Functional Requirement Specification.

Keywords Project, Software Development, FRS, Specification

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1 ABBREVIATIONS

Most important abbreviations used in this document are:

Abbreviation	Explanation
CR	Code Resolution in SAP
FRS	Fuctional Requirement Specification
LevDoc	Order handling system predeceasing TIMS system
O&MM	Operation & Maintenance Manual
RBoEP	Record Book of Engine Parameters
SAP	SAP SE is a German multinational software corporation that makes enterprise software to manage business operations and customer relations. SAP is headquartered in Walldorf, Baden-Württemberg, Germany, with regional offices in 130 countries.
SB	Service Bulletins
SPC	Spare Parts Catalogue
SRS	System Requirement Specification
TI	Technical Information
TIMS	Technical Information Management System
TIMS 2	Technical Information Management System second(2) version
TKB	Technical Knowledge Base

TS	Technical Services
W-ES	Wärtsilä Energy Solutions
W-MS	Wärtsilä Marine Solutions
WS	Wärtsilä Services
4-Stroke	4-Stroke Engine Services organisation in Services

2 INTRODUCTION

This work studies the creation of functional requirement specification (FRS) and how to approach system requirement specification (SRS).

In this chapter I will present the background of the company, its organization and the department that the program is developed to.

2.1 Background Information about the Company and Services

Wärtsilä was founded in Tohmajärvi Finland on 12th of April 1834. Local government gave a permit to found sawmill on a nearby rapid. In 1851 Wärtsilä ended the sawmill and founded an iron smelting plant in the premises of the old sawmill.

In 1936 Wärtsilä bought a machinery plant from Onkilahti, Vaasa, Finland.

In 1938 Wärtsilä began to make diesel engines with a license agreement from Friedrich Krupp Germania Werft AG. The first engine was made in Turku in 1942.

In 1990 Wärtsilä merged with Lohan to create Metra Company.

In 1996 Services was created

In 2000 Metra changed its name back to Wärtsilä.

Wärtsilä employs people all over the world. At the end of 2015 there were around 18,800 employees in the company. Wärtsilä Services headquarters lies in Runsor factory premises in Vaasa. The address is Tarhaajantie 2.

The most important Wärtsilä products are Diesel- and Gas engines that are used in both Ships and Power plants. The role of Services is to take care of installations afterwards and to deliver parts for servicing them. Customers include most of shipyards and power producing companies all over the world. /1/

2.2 Organization

Within Wärtsilä there are 3 bigger organizations

Marine solutions delivers solutions to ships and shipyards from engines and propellers to designing the whole ship

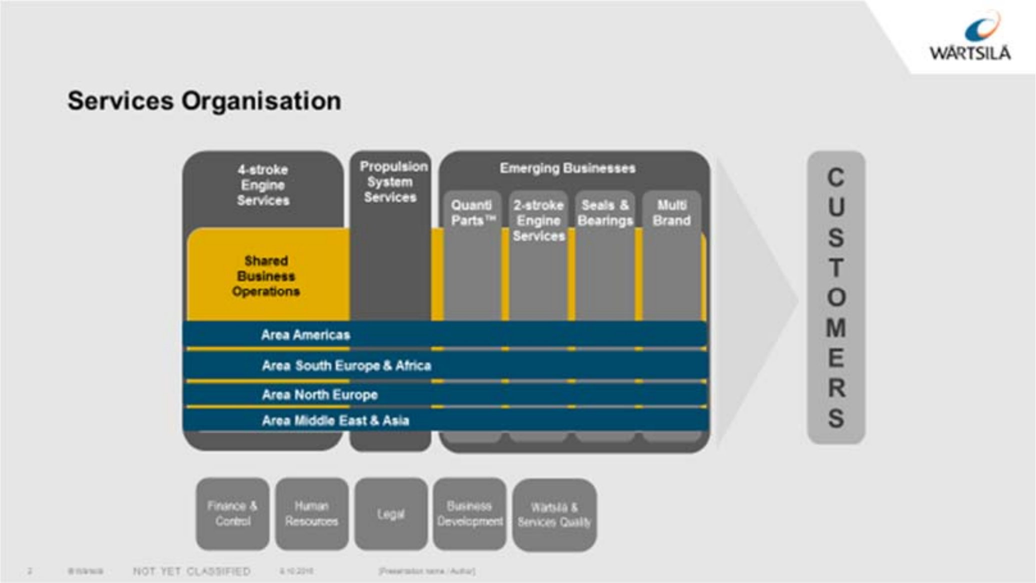
Energy solutions sells and delivers engines to power plants and also designs, builds and upkeeps whole power plant solutions

Services takes care of both organizations spare parts sales and service of the engines when need arises.

This work has been made for Wärtsilä Services and to its department Technical Information.

2.3 Wärtsilä Services and Organization Charts

This document shows the different responsibilities of different organizations and model for responsibility matrix through out the different areas. Crosscut of different organizations and their responsibilities are presented in Picture 1.



WÄRTSILÄ

Services Organisation

4-stroke Engine Services

Shared Business Operations

Propulsion System Services

Emerging Businesses

Quanti Parts™

2-stroke Engine Services

Seals & Bearings

Multi Brand

Area Americas

Area South Europe & Africa

Area North Europe

Area Middle East & Asia

CUSTOMERS

Finance & Control

Human Resources

Legal

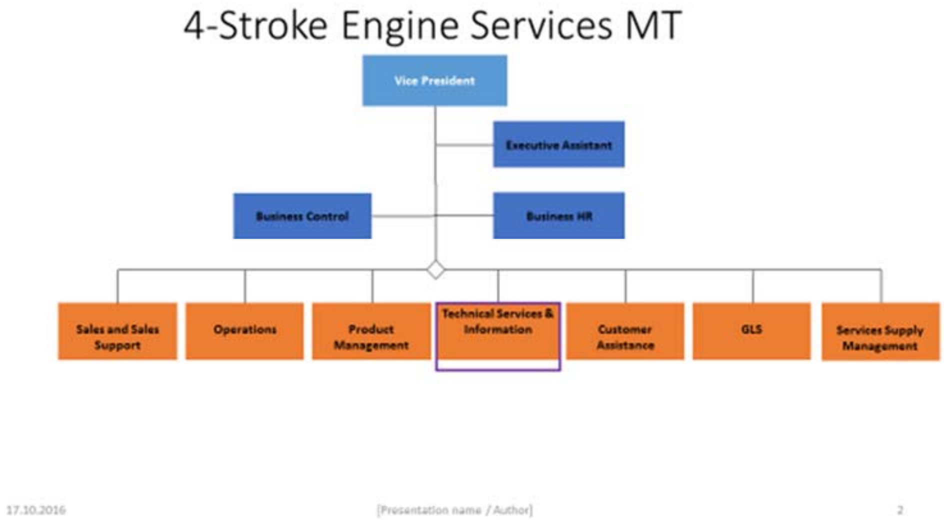
Business Development

Wärtsilä & Services Quality

2 © Wärtsilä NOT YET CLASSIFIED 6.10.2016 [Presentation name / Author]

Picture 1: Services Organization. /2/

The directives and ways of working come from 4-stroke engine services and there are used throughout the different emerging businesses and areas. This way there is a one way of working towards the customers.



4-Stroke Engine Services MT

Vice President

Executive Assistant

Business Control

Business HR

Sales and Sales Support

Operations

Product Management

Technical Services & Information

Customer Assistance

GLS

Services Supply Management

17.10.2016

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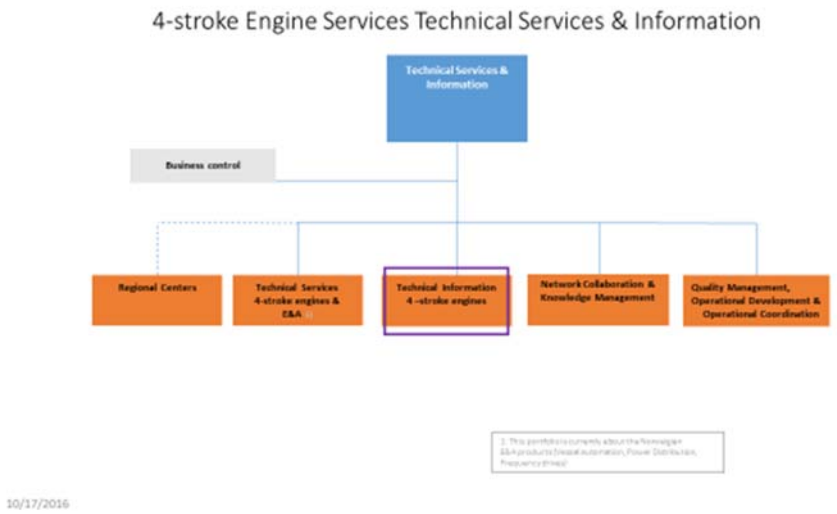
Picture 2: 4-Stroke Engine Services Organisation – Management Team. /3/

Picture 2 shows the top level organization of Wärtsilä Services. And these positions are included in Management team of Services.



4-stroke Engine Services Technical Services & Information

Technical Services & Information

Business control

Regional Centers

Technical Services 4-stroke engines & E&A 1)

Technical Information 4 -stroke engines

Network Collaboration & Knowledge Management

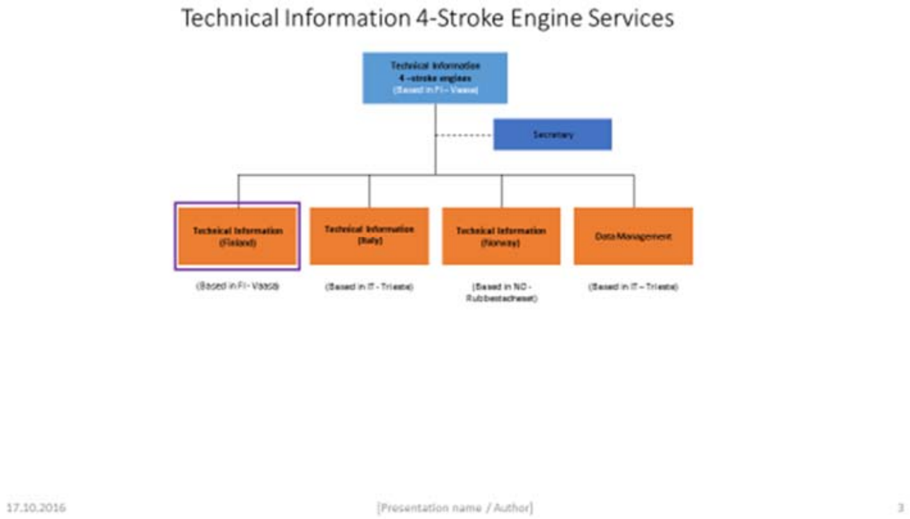
Quality Management, Operational Development & Operational Coordination

1. This portfolio is currently about the Norwegian E&A products (vessel automation, Power Distribution, Frequency drives)

10/17/2016

Picture 3: 4-Stroke Engine Services Organisation. /3/

Technical information belongs to Technical Services & Information department, which reports to management team.



Technical Information 4-Stroke Engine Services

Technical Information 4 -stroke engines (Based in FI – Vaasa)

Secretary

Technical Information (Finland)

(Based in FI - Vaasa)

Technical Information (Italy)

(Based in IT - Trieste)

Technical Information (Norway)

(Based in NO - Rubbestadneset)

Data Management

(Based in IT – Trieste)

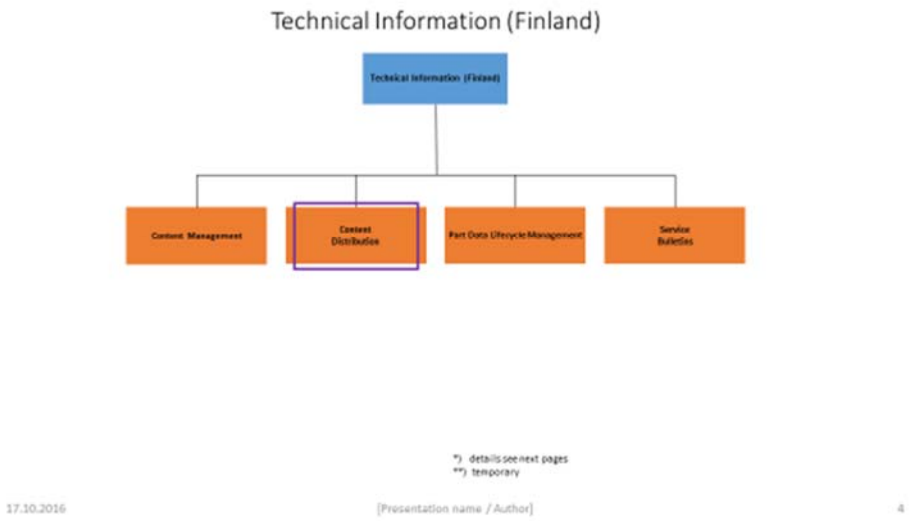
17.10.2016

[Presentation name / Author]

3

Picture 4: 4-Stroke Engine Services Organisation. /3/

Within TI this work was done in Technical Information – Finland. The department is located in Runsor, Vaasa.



Technical Information (Finland)

Technical Information (Finland)

Content Management

Content Distribution

Part Data Lifecycle Management

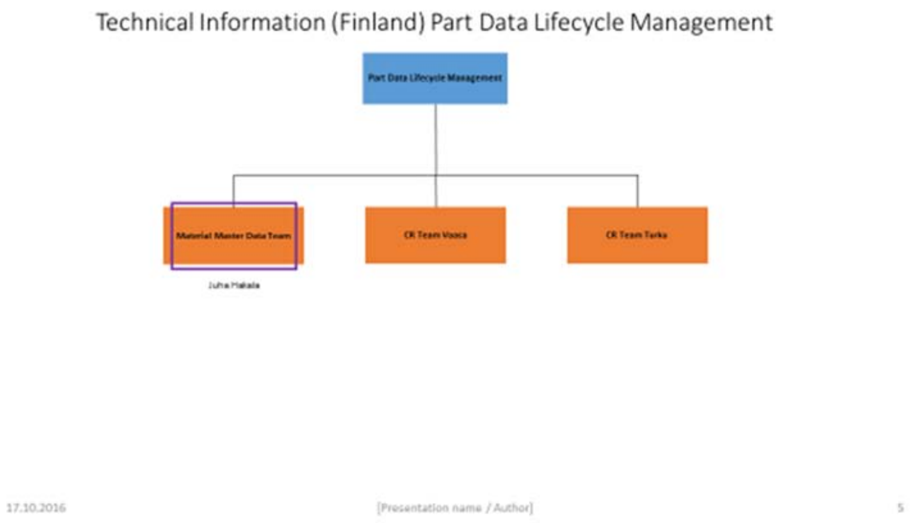
Service Bulletins

*) details see next pages
**) temporary

17.10.2016 [Presentation name / Author] 4

Picture 5: 4-Stroke Engine Services Organisation TI-FI. /3/

The department in TI was Content Distribution, also my position while creating this work was that of a Content Engineer in Content Distribution. Team consist of 6 persons, with one other person doing the same job as I was.



Technical Information (Finland) Part Data Lifecycle Management

17.10.2016 [Presentation name / Author] 5

Picture 6: 4-Stroke Engine Services Organisation PDLM. /3/

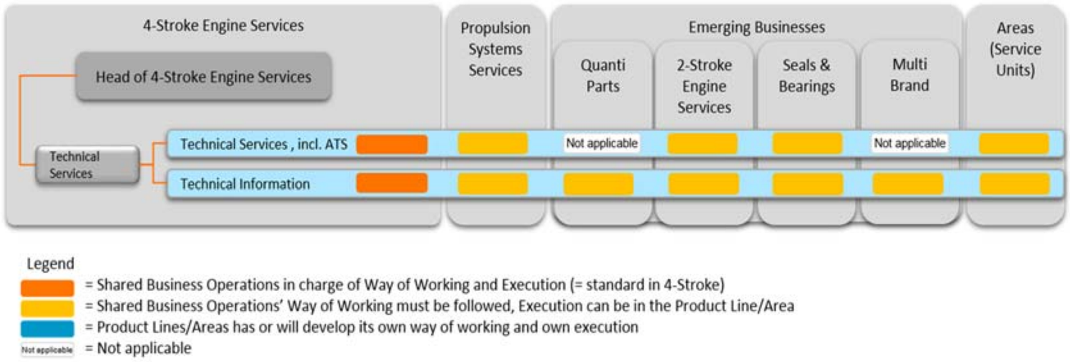
My current position in TI. I got a new position within TI just after finishing the Functional Requirements Specification. This was not a planned development, rather an opportunity to develop further. /3/

2.4 Shared Business Operations within Technical Services and Information

Following presents how the way of working and programs used are followed through different organisations. As seen on Picture 7, Technical Information is in charge and the programs developed here in TI-FI are then taken into use in other areas doing same kind of work.

“Shared Business Operations in Services secure that best practices and way of working are used for our customers of all our products. Technical Services and Information in 4-s Engine Services is responsible for and hosting the shared operations.

By sharing tools and best practises we want to achieve one Wärtsilä experience for our customers, delivered in a consistent and efficient way. This is strengthening our brand image and improving our business.”


4-Stroke Engine Services
Head of 4-Stroke Engine Services
Technical Services
Technical Services , incl. ATS
Technical Information
Propulsion Systems Services
Emerging Businesses
Quanti Parts
2-Stroke Engine Services
Seals & Bearings
Multi Brand
Areas (Service Units)
Not applicable
Not applicable
Legend
🟧 = Shared Business Operations in charge of Way of Working and Execution (= standard in 4-Stroke)
🟨 = Shared Business Operations' Way of Working must be followed, Execution can be in the Product Line/Area
🟦 = Product Lines/Areas has or will develop its own way of working and own execution
Not applicable = Not applicable

Picture 7: Shared Business Operations matrix. /4/

The target of the Technical Information organization is to make accurate and complete technical information available - whenever, wherever. /4/

2.5 Technical Information – Department

Technical Information is a global organisation located in four different countries: Finland, Italy, France and Norway, The Netherlands (propulsion). The setup of the organisation is according to the 4-stroke product responsibilities.

The Purpose and the Mission statement is as follows:

"Technical Information ensures that information for operation, maintenance, repair and overhaul of the installed Wärtsilä solutions and its equipment are accurate, complete and easy to use for our customers and for Wärtsilä employees.

Our target is to be a market shaper by constantly seeking and applying new, innovative and competitive delivery solutions.

Our target is to set the standard and best practices for processes and systems related to technical information

We deliver as promised and our goal is to exceed the expectations." /5/

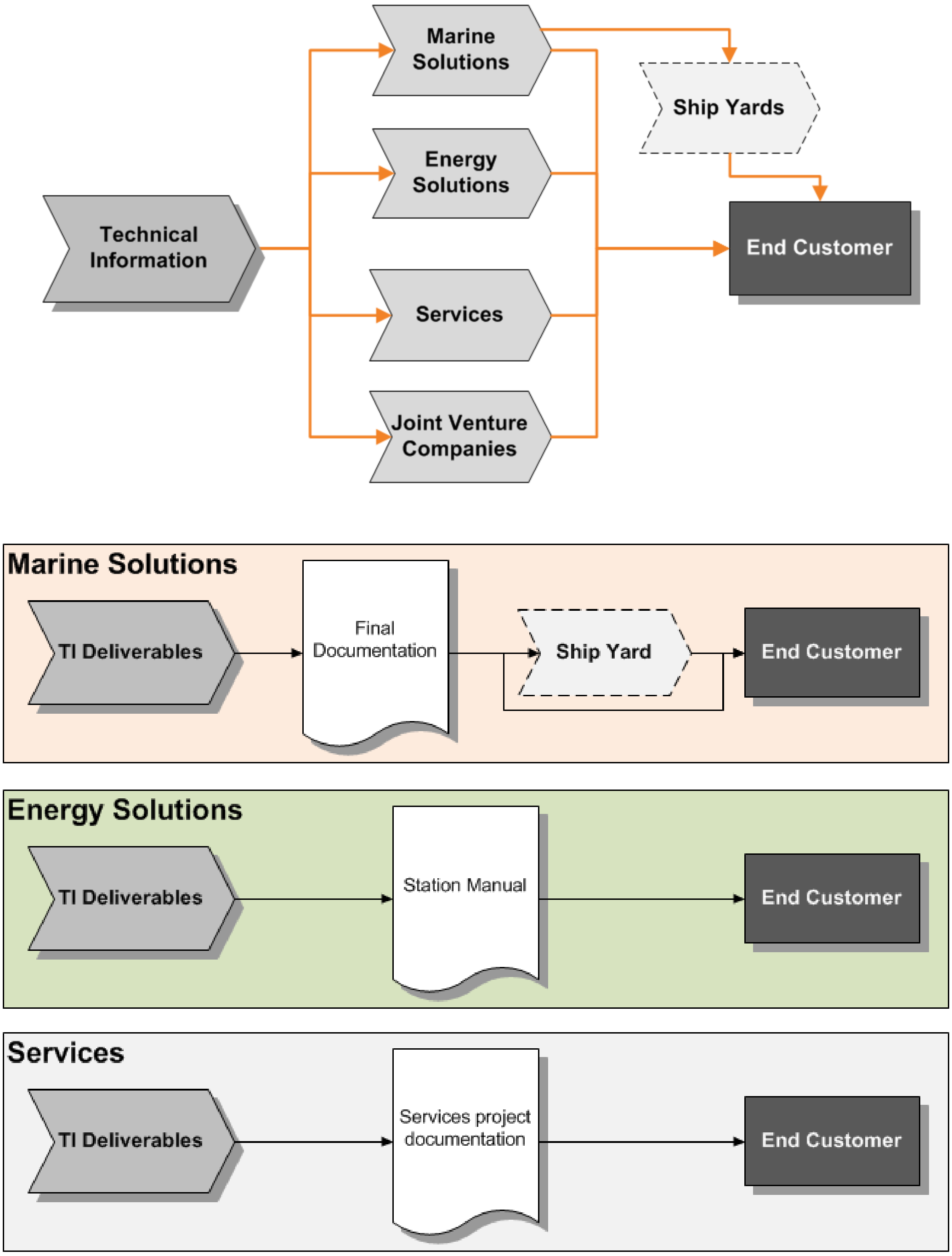
Technical Information is responsible for the production, distribution and support of information for operation, maintenance, repair and overhaul for the products.

2.6 Technical Information - Content Distribution Finland

Content Distribution is to make the content of the Main Deliverables available as requested by Technical Information delivery stakeholders.

Content Distribution Main Deliverables are:

- Spare Parts Catalogue. (SPC)
- Code Resolution (CR)
- Operation & Maintenance Manual (O&MM)
- Service Bulletins (SB)
- Record Book of Engine Parameters (RBoEP)



Picture 8: 4-s and SBO Technical Services and Information Procedures. /6/

3 BACKGROUND AND PURPOSE OF THE TIMS 2 PROJECT

In this chapter I will go through the current TIMS system and background on what is done and why.

3.1 Technical Information

“Technical information is any information with a purpose to explain how to operate, maintain, repair and overhaul the Wärtsilä solutions and its equipment’s. Examples of technical information are spare parts catalogues, operation and maintenance manuals and service bulletins made available through systems like Technical Knowledge Base, binders and code resolution.

Technical Information is also a global organization within 4-Stroke Engine Services that manages Technical Information for a range of Wärtsilä Products.

The purpose of Technical Information is to assure the availability of accurate and complete technical information for the installed Wärtsilä solutions and its equipment’s, both for solution operators (customers) and for Wärtsilä employees. The Technical Information organisation creates, maintains and publishes the technical information based on available life cycle data for the Wärtsilä solutions.” /7/

The departments’ three main focuses are

1. Production (O&MM, SPC, RBoEP)
2. Distribution (Request Management, Distribution Management)
3. Support (Tech Id, Material Master Data, CR, SB**)**

3.2 TIMS 2 – Project Start Shortly

TIMS 2 is short of Technical Information Management System 2.

The project's start was in the fall of 2014, when discussions started that TIMS program would need some upgrading and couple of bigger changes. After going through details with the software developer of TIMS project, it was decided that TIMS structure was so widespread that it could not handle the required changes. So it was decided that we should start to think about creating a second version of TIMS and do it properly this time with good plans. The previous TIMS project was developed "as we go" and different properties were added almost every meeting to it. The kick off meeting for TIMS 2 was held in December 2014 where I was elected as project lead for this project. Other members were Mr. Olli Asikainen, who was responsible of TIMS coding and Mr. Mathias Börg, who is responsible for requirement specification creation. The actual work for the TIMS 2 started in mid-January with collecting the data needed for requirement specification. We used different methods to get everything, gathering information from the previous version, asking the current users what they need and, of course, including the new needs for it.

TIMS 2 project was created from basis of TIMS 1 program and its purpose is to create a new and better version of the previous program. Within TIMS 2 –project it is planned to include TIMS1 features and use the learned experiences to develop those further and meet expectations of the users, while still making future needs possible. Also, demand for global usage was one of the design standpoints of the new version.

3.3 TIMS 1

TIMS - Technical Information Management System

TIMS is a tool for handling documentation orders and has been in use from 16.6.2014 in Technical Information Finland (TI-FI) and in Technical Information Italy (TI-IT) from 28.7.2014 and also Technical Information Norway (TI-NO) around the same time.

TIMS was created as a replacement of the old tool LevDoc that was in use for seven years but had come to end of its lifetime. LevDoc was put in read only mode on 1.8.2014.

Plans of replacing the LevDoc started a couple of years earlier but the development was slow and had to be restarted as only limited knowledge was available on what was needed from the new system and the resources transferring to the new challenges.

TIMS was started officially in 2013 and was developed in-house by the R&D team, main resource being Mr. Olli Asikainen. At the time I was asked to be project lead in this project and help it reach conclusion.

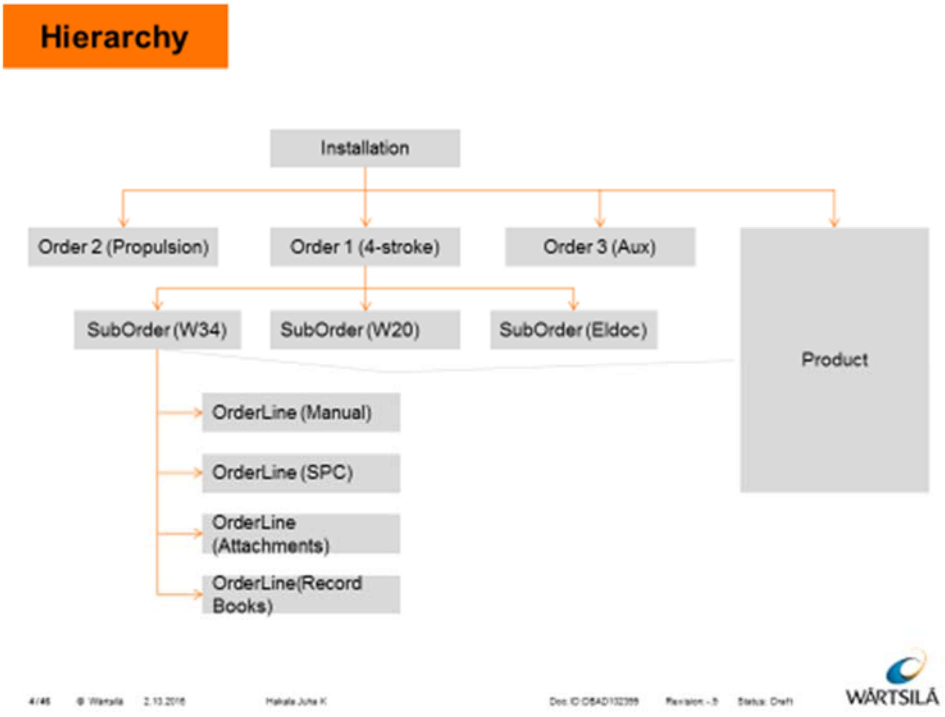
This was a challenge as the base of the program, the backend, was already mostly done and I jumped into the project mid development. Perhaps the biggest challenge was the knowledge on what the program should look like and what functions it should fill. The only paper on requirements was a vague requirements paper from the general manager that mostly specified technical requirements.

To start the project I arranged meetings with the main end users within TI-FI and the software developer to find out what we had and what functionalities we need. The end result was that TIMS development went on “as we go” style solution with some or most end users meeting once a week and seeing what was done and then agreeing upon what should be done next week. This was not good solution, but at least it made progress possible at the start as actual “what we need” was not known.

A couple of months later the program was on good head wind and I had time to actually gather some needs that the program should have when done. The end result was a working program that was presented and approved by end users in Technical Information Finland and management to take into use. After this it was presented to users in the Technical Information in Italy and in Technical Information in Norway and trainings were held to both departments with Skype. TIMS was in use in all TI departments in August 2014.

3.3.1 TIMS 1 System Functions

Purpose of the Technical Information Management System (TIMS) is that handling and monitoring of documentation orders is easy and transparent with the tool. And that it makes working on the projects possible globally.



Hierarchy

Picture 9: Hierarchy of TIMS 1 (TIMS User Guide).

In picture 9 the basic Hierarchy of the program is shown. Hierarchy is mostly a basic tree model with Marine- or Energy solutions installation being on the top level and all the Technical Information documentation orders are attached to it.

The difference is that the Products form their own entity that is separate from all the other links. Products are only attached to Installation and there is weak link to SubOrders of the orders. By weak link I mean that Products are maintained as their own entities and Products mentioned in SubOrder are only read from Products table and not actually linked to the SubOrder in question.

Orders are grouped by product type / responsibility area that they have under them. In this example:

- Order 1
    - Document orders for all Engines in the installation

    - Electronic documentation for those engines gathered in one file
- Order 2
    - Document order for Propulsion products
- Order 3
    - Document order for AUX products

Under each order there are a couple at SubOrders for each product type. In this example Reference types W20, W32 and Electronic documents. Into these are linked reference types engines, information on those are read from the products database.

Then, finally, for lowest level data there are OrderLines that have all ordered documents attached to.

- Operation & Maintenance Manual (O&MM)
- Record book (RB)
- Attachment
- Spare Parts Catalogue (SPC)

Each of these documents is made specifically for that reference type and engines that are mentioned in that book. Therefore, they are unique and only to be used for that product. In some cases there can be more than one similar document for one SubOrder as some of the Engines can have a quite different specifications when compared to other Engines in the project.

Also if the customer wants, all the Documents can also have an OrderLine for a translation. Some of examples of the Languages available include Spanish, Portuguese, Chinese and Turkish.

3.3.2 What is Inside of the Documents

To give a small idea of what is in those documents, here is a short overview.

Operation & Maintenance Manual (O&MM)

Directions and guidelines for service of the engine, for example on how to remove a cylinder head and what tools are needed for it.

Record Book (RB)

It has records of engine performance, emissions, test data etc.

Including EIAPP certificate, Technical File, Test Protocol

Attachments

For example electrical drawings and sub-supplier manuals for auxiliaries built on engine like: damper and turbocharger.

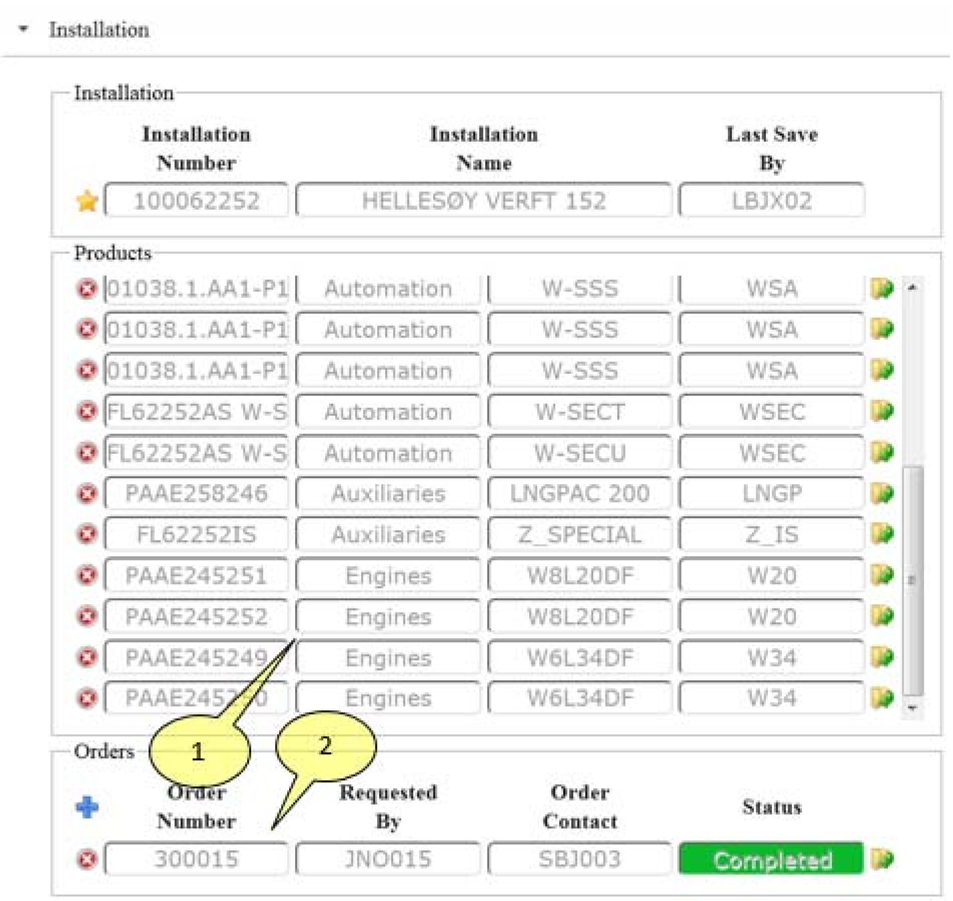
Spare Parts Catalogue (SPC)

The SPC has list of engine parts that have been installed to that engine from nuts and bolts to turbocharger to fuel system.

Each of these are made specifically for a set of products mentioned in the book.

3.4 TIMS 1 Main Data Views and Explanation

In this section I present some of the main views of TIMS 1. Firstly in the picture 10 there is topmost level in TIMS 1, the Installation view.



Installation

	Installation Number	Installation Name	Last Save By
★	100062252	HELLESØY VERFT 152	LBJX02

Products

01038.1.AA1-P1	Automation	W-SSS	WSA
01038.1.AA1-P1	Automation	W-SSS	WSA
01038.1.AA1-P1	Automation	W-SSS	WSA
FL62252AS W-S	Automation	W-SECT	WSEC
FL62252AS W-S	Automation	W-SECU	WSEC
PAAE258246	Auxiliaries	LNGPAC 200	LNGP
FL62252IS	Auxiliaries	Z_SPECIAL	Z_IS
PAAE245251	Engines	W8L20DF	W20
PAAE245252	Engines	W8L20DF	W20
PAAE245249	Engines	W6L34DF	W34
PAAE245250	Engines	W6L34DF	W34

Orders

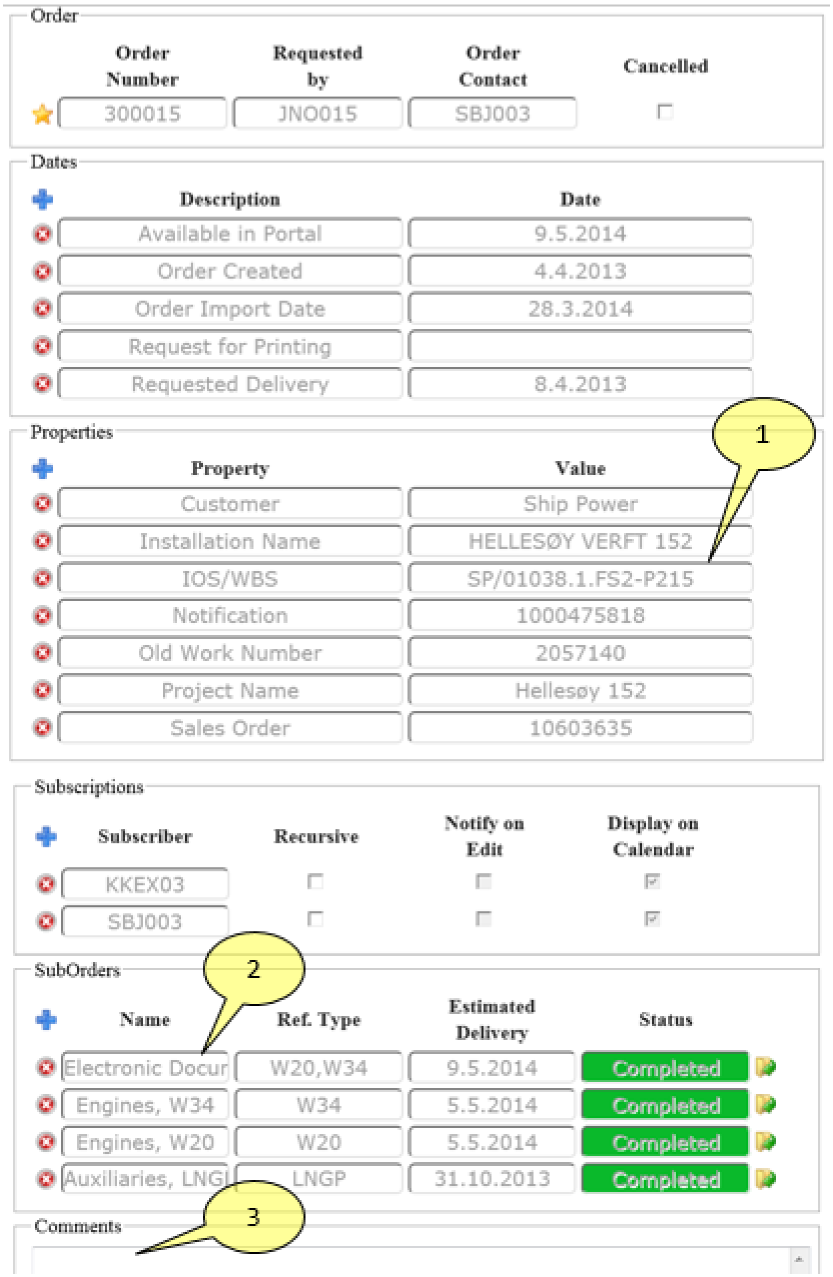
Order Number	Requested By	Order Contact	Status
300015	JNO015	SBJ003	Completed

Picture 10: Installation View Page (TIMS User Guide).

In Installation view you can find

1. Installation specific information, like Products (engines, auxilillaries etc.)
2. TI Documentation orders

The folder icon at the bottom right takes to Order View shown in Picture 11.



Order

Order Number	Requested by	Order Contact	Cancelled
300015	JNO015	SBJ003	□

Dates

Description	Date
Available in Portal	9.5.2014
Order Created	4.4.2013
Order Import Date	28.3.2014
Request for Printing	
Requested Delivery	8.4.2013

Properties

Property	Value
Customer	Ship Power
Installation Name	HELLESØY VERFT 152
IOS/WBS	SP/01038.1.FS2-P215
Notification	1000475818
Old Work Number	2057140
Project Name	Hellesøy 152
Sales Order	10603635

Subscriptions

Subscriber	Recursive	Notify on Edit	Display on Calendar
KKEX03	□	□	☑
SBJ003	□	□	☑

SubOrders

Name	Ref. Type	Estimated Delivery	Status
Electronic Docur	W20,W34	9.5.2014	Completed
Engines, W34	W34	5.5.2014	Completed
Engines, W20	W20	5.5.2014	Completed
Auxiliaries, LNG	LNGP	31.10.2013	Completed

Comments

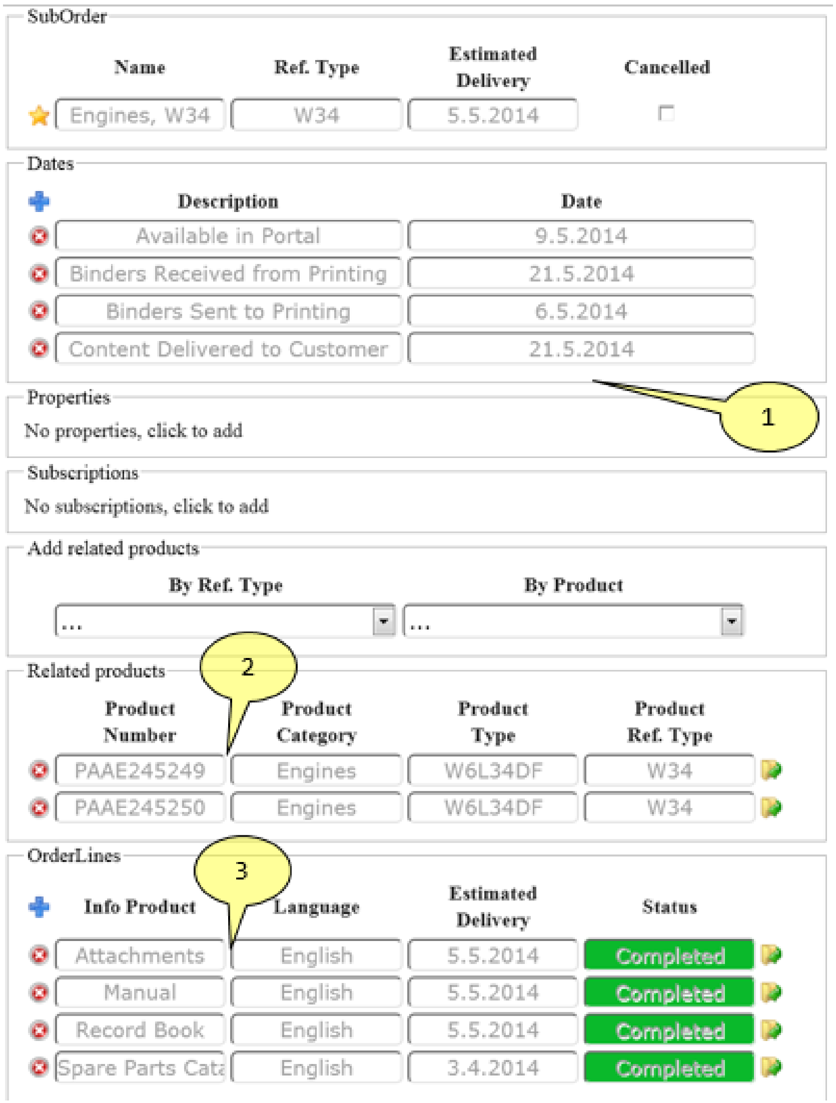
Picture 11: Order View (TIMS User Guide).

Main features of the Order View level are the following:

1. The Properties contain a lot of important information, such as WBS-element, Project Name and Sales Order.

2. Under SubOrders can be seen all the Documentation projects that need to be done
    - Eldoc
    - Reference type W34 engine documentation
    - Ref.type W20 documents
    - LNGPack auxiliary documents
3. Comments concerning the Order

By clicking a folder icon you go to SubOrder that is shown in following Picture 12.



SubOrder

	Name	Ref. Type	Estimated Delivery	Cancelled
★	Engines, W34	W34	5.5.2014	□

Dates

+	Description	Date
⊗	Available in Portal	9.5.2014
⊗	Binders Received from Printing	21.5.2014
⊗	Binders Sent to Printing	6.5.2014
⊗	Content Delivered to Customer	21.5.2014

Properties

No properties, click to add

Subscriptions

No subscriptions, click to add

Add related products

By Ref. Type	By Product
...	...

Related products

	Product Number	Product Category	Product Type	Product Ref. Type
⊗	PAAE245249	Engines	W6L34DF	W34
⊗	PAAE245250	Engines	W6L34DF	W34

OrderLines

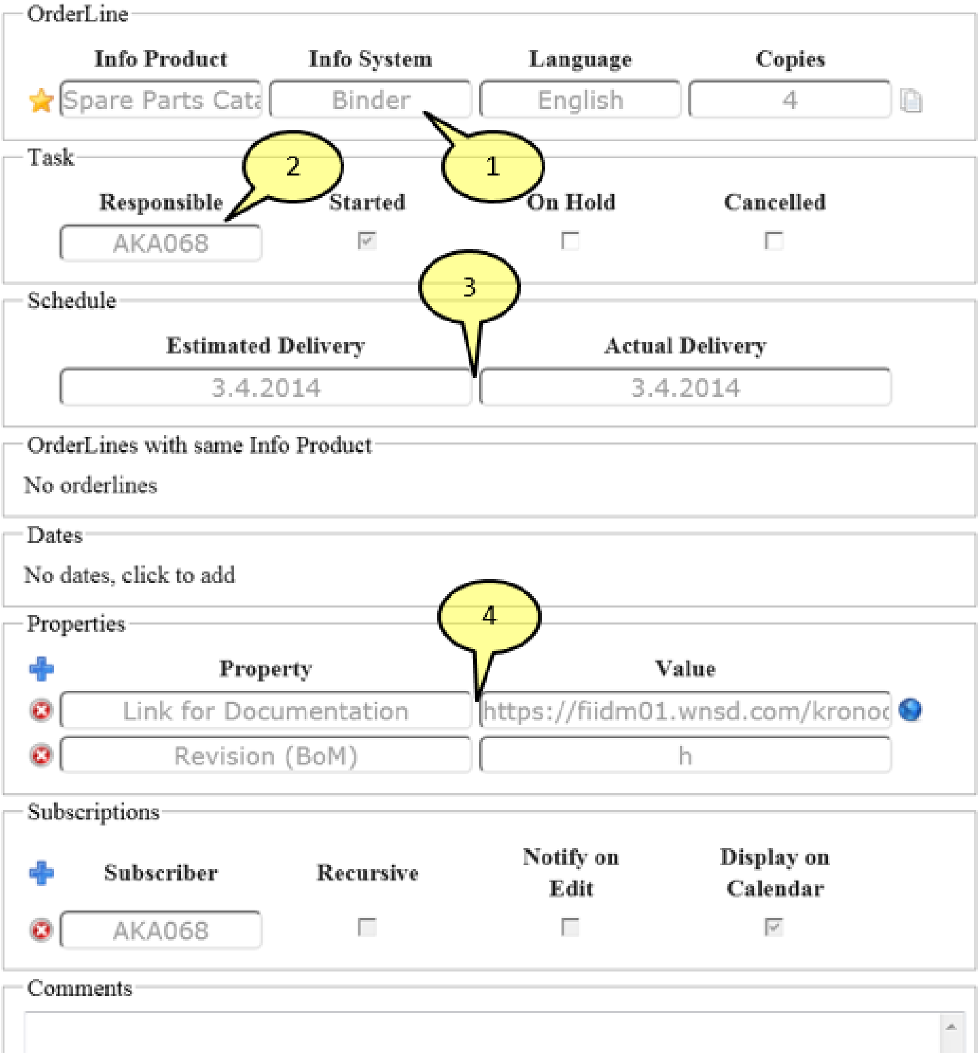
+	Info Product	Language	Estimated Delivery	Status
⊗	Attachments	English	5.5.2014	Completed
⊗	Manual	English	5.5.2014	Completed
⊗	Record Book	English	5.5.2014	Completed
⊗	Spare Parts Cata	English	3.4.2014	Completed

Picture 12: SubOrder View (TIMS User Guide).

In SubOrder you the following information is stored:

1. Dates are filled in TI-FI/IT by a Subcontractor when the content is delivered
2. Products linked to the Documentation order
3. Order specific Info Products such as Operations and Maintenance Manual (O&MM), Spare Parts Catalogue (SPC), Record Books etc.

The fourth and lowest level in TIMS 1 is OrderLine, Picture 13, here you see links to documentation and completion dates.



OrderLine

Info Product	Info System	Language	Copies
Spare Parts Cata	Binder	English	4

Task

Responsible	Started	On Hold	Cancelled
AKA068	☑	□	□

Schedule

Estimated Delivery	Actual Delivery
3.4.2014	3.4.2014

OrderLines with same Info Product

No orderlines

Dates

No dates, click to add

Properties

Property	Value
Link for Documentation	https://fiidm01.wnsd.com/kronoc
Revision (BoM)	h

Subscriptions

Subscriber	Recursive	Notify on Edit	Display on Calendar
AKA068	□	□	☑

Comments

Picture 13: OrderLine view (TIMS User Guide).

Explanation of Picture 13 as follows:

1. The type of wanted document
2. The person responsible
3. The estimated delivery date and the actual delivery date
4. An IDM link to the document

3.5 Problems of the current version (Issues)

The current version is in production use and as such is a functionally solid and mostly all the bugs and kinks have been worked out. The design of Technical Information Management System (TIMS) is flexible and different fields and functions can be still added to the system. This means that there is no immediate need for system renewal.

However, that is also one of the root causes for needing a remake of the TIMS system. While the flexibility was actually needed when the basic design of the system was made, as the needs of the users were not accurately known, the freeform design also enables too much freedom to the users. The freedom causes data to spread around different areas of the system as users can create new data fields to suit their need.

Data spreading causes a need for clean up the system regularly by combining differently spelled data or moving/deleting un-necessary data that might be in a wrong place. That also increases the need of knowledge of the data administrator to clean it up as moving wrong data or combining wrong fields can cause problems including but not limited to data loss.

Also, when designing the system in the beginning all the functions were targeted to biggest department that is located in Vaasa. The normal design does serve also other departments, but international needs were not highly prioritised at the start. Also, those needs were pushed to the time when we actually had a working program already. Of course the program being flexible, those functions could be added to the program and all the needed fields were added, even if they were not included in original plan.

One of the problems that caused the need for a new version was that when new function was proposed and it was discussed with the developer, the limitations of the current program came up and the dispersed nature of the backend code. While the code served its purpose and program as is, it did not enable adding new functions in the future. While adding to the current program was, of course, doable the increase to the development time and additional un-stability was making it unwise to keep on adding to it.

3.6 Correction to be made in new version

Things that we had planned to improve in the next version, or thought that they need more attention in the next version of the program are shown in the following list.

1. More strict rules
2. Better access control
3. Defined Way of Working (WoW)
4. New version to enable addition of new functions
5. Support for external users/organization ex. For Marine Services
6. Defined process to control requirements
7. Planned development
8. Coding made to support the future needs

4 THEORETICAL BACKGROUND

4.1 What is a Software Requirement Specification (SRS)?

1. “Requirements engineering is an interdisciplinary function that mediates between the domains of the acquirer and supplier to establish and maintain the requirements to be met by the system, software or service of interest.” /8/
2. The result of SRS is hierarchy of requirements to
    a. Enable an agreed understanding between stakeholders (e.g., acquirers, users, customers, operators, suppliers)
    b. Provide a basis of verifying designs and accepting solutions.
    c. Be validated against real-world needs, can be implemented. /8/

4.1.1 SRS Creation

Needs of the stakeholders should be collected and then transformed and defined into requirements.

Defining requirements begins with stakeholder intentions (referred to as needs, goals, or objectives) that evolve into a more formal statement before arriving as valid stakeholder requirements. Initial stakeholder intentions do not serve as stakeholder requirements, since they often lack definition, analysis and possibly consistency and feasibility.

4.1.2 Good Requirement

According to (ISO/IEC/IEEE 29148:2011) standard, a good requirement is as follows:

“Well-formed stakeholder requirements, system requirements, and system element requirements shall be developed. This will contribute to requirements validation with the stakeholders, and ensure that the requirements accurately capture stakeholder needs.

A well-formed requirement is a statement that

- Can be verified,
- Has to be met or possessed by a system to solve a stakeholder problem or to achieve a stakeholder objective,
- Qualified by measurable conditions and bounded by constraints, and
- Defines the performance of the system when used by a specific stakeholder or the corresponding capability of the system, but not a capability of the user, operator, or other stakeholder.

This description provides a means for distinguishing between requirements and the attributes of those requirements (conditions, assumptions, design decisions and constraints).” /9/

4.2 What is a Functional Requirement Specification (FRS)?

“A Functional Specification in software development is a document that specifies the functions that the system or component must perform” /10/

The purpose of functional specification is to define the requirement to be implemented by the software solution.

4.2.1 Why make FRS

Functional specification is needed to give direction and guidelines to the next group of people that are responsible for implementation of the project and the creators of Technical Requirement Specification.

In FRS you should specify how the program should look when coded, how different functions should work and User Interface (UI) just to name few of the purposes. This is the phase where are knit all the requirements that you have collected together in system requirements specification from future users and/or ordering party.

You should avoid limiting the tools to be used, for example what coding methods to be used unless it is required for some part to work. Choosing the tools is mainly part of next step that is Technical Specification.

4.3 What is Technical Specification?

“A technical specification describes the internal implementation of the program. It talks about data structures, relational database models, choice of programming languages and tools, algorithms, etc.” /11/

“A technical specification describes the minute detail of either all or specific parts of a design, such as:

- The signature of an interface, including all data types/structures required (input data types, output data types, exceptions);
- Detailed class models including all methods, attributes, dependencies and associations;
- The specific algorithms that a component employs and how they work; and
- Physical data models including attributes and types of each entity/data type.” /12/

Technical Specification should be made before starting the actual coding project so actual doers have limitations set and all the data access points clear before starting the work.

Also, what it helps in handling the project and if any differences in opinions appear between client and creator, technical specification can been looked at to see how it was planned to complete, hopefully dissolving the different opinions.

4.4 FRS Schedule

The delivery schedule was discussed with the management and rough estimates for time usage were made. As for the official schedule a plan was created, show in Table 1.

Area	Planned month(s)	Meetings	Weeks	Hours	End week	Rounded weeks
Order creation	1	6	2	15	38	2
Order viewing	0,5	3	1	7,5	39	1
Order modification	0,5	3	1	7,5	40	1
Cancellation	0,25	2	0,67	7,5	41	1
Invoicing	0,5	3	1	7,5	42	1
Work flow	1	6	2	15	44	2
Portal	0,25	2	0,67	7,5	45	1
Training					46	1
Simon's	1	6	2	15	48	2
Reports	1	6	2	15	50	2
Archive	1	6	2	15	52	2
Legacy import	0,25	2	0,67	7,5	1	1
Summary	0,5	3	1	7,5	2	1
Totals:	7,75	48	16	127,5		18
				Workhours		Weeks
Ratio	0,53					
			36	start week		
			31.8.2015	Start date		Vacations not accounted for
			31.12.2015	End date		Also Christmas and new year eve are at this time period
			4,07	months todo		
			2,5	hours meeting		
			3	meetings per week		

Table 1: TIMS 2 Schedule

The development team’s own estimates were a little more pessimistic as the daily jobs were done as the first priority and project development was in the side with 20% effort estimate. The team’s own estimates put the end date a month or a half forward from this timetable that was agreed upon. However, the management wanted a slightly faster schedule as shown here.

At the end the team’s estimate were more correct as the actual first “complete” revision of TIMS2 FRS was ready just after the beginning of February. The last meeting was held on 5.2.2016 before a break was taken for a month.

However that was not the end of the project or the work that still needed to be made for it and lots of it. Also this part was unaccounted for in the actual project scheduling, the mistake being mostly mine.

The work that was left to be done was refining the FRS. While all created mock-ups and FRS generally was good, it still needed work. Streamlining some of the functions and making sure all the areas actually work together with other areas as intended still needed to be done. Link placement and investigating that every page can be accessed was also needed. Double checking many things so nothing was missed was also required. Also, marking SRS requirements to FRS into the start of each new area so the requirements can be easily tracked and assurance that every requirement is actually fulfilled needed to be taken care of.

4.5 Waterfall method as project tool

The Waterfall Model was the first Process Model to be introduced. In a waterfall model each phase must be completed fully before the next phase can begin. This type of a model is basically used for projects which are small and there are no uncertain requirements. At the end of each phase, a review takes place to determine if the project is on the right path and whether or not to continue or discard the project. In this model the testing starts only after the development is complete. /13/

4.5.1 Advantages of waterfall model

This model is simple and easy to understand and use. Also it is easy to manage as the model is quite rigid – phases have specific deliverables and a review process. Models are processed and completed one at a time, phases do not overlap.

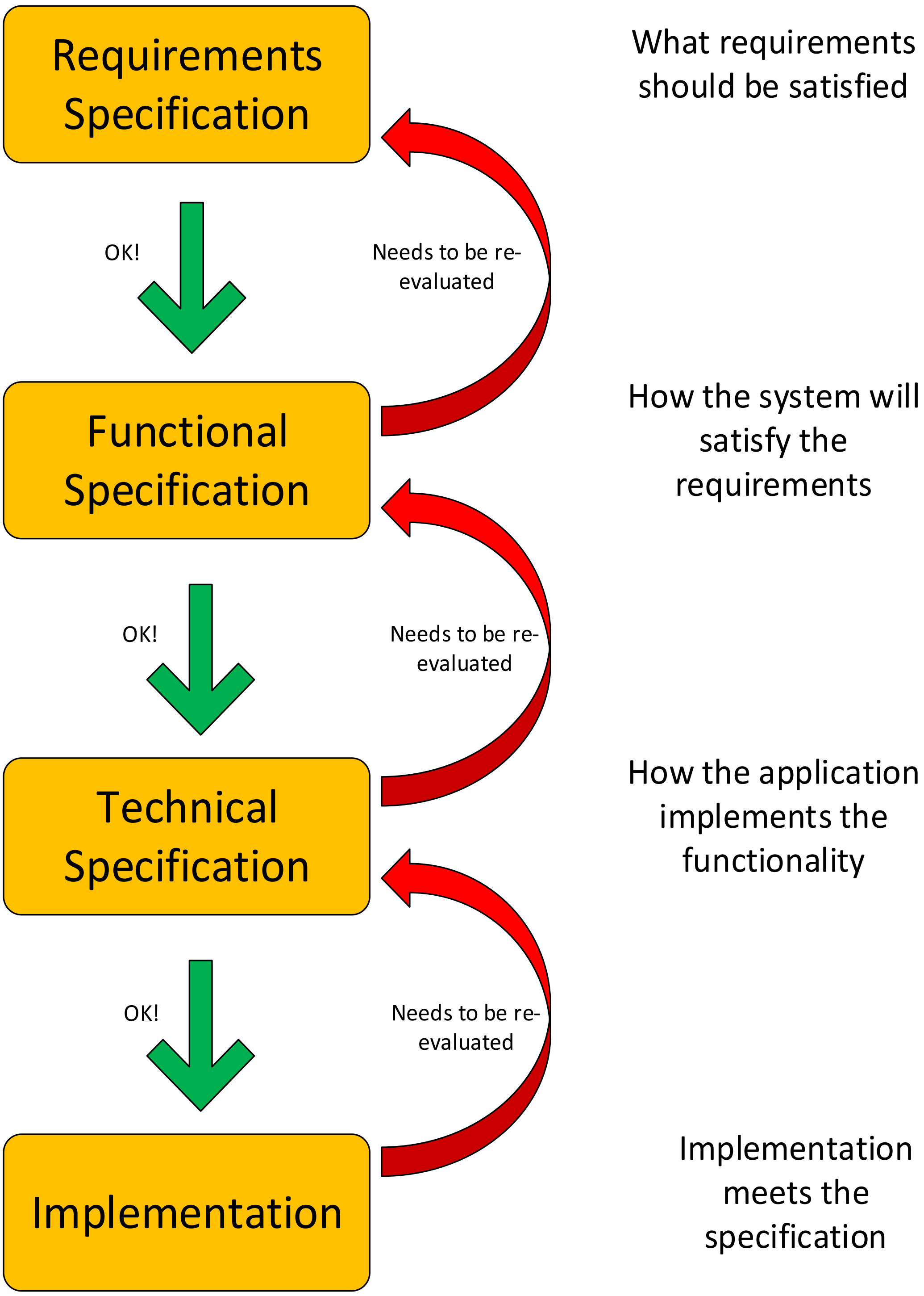
4.5.2 Disadvantages of waterfall model

Once the application is at the testing stage, it’s very difficult to go back and change something that was not well-thought out in the previous stages. Also, working software is produced late during the project. This is not suitable for the projects where requirements are at a moderate to high risk of changing

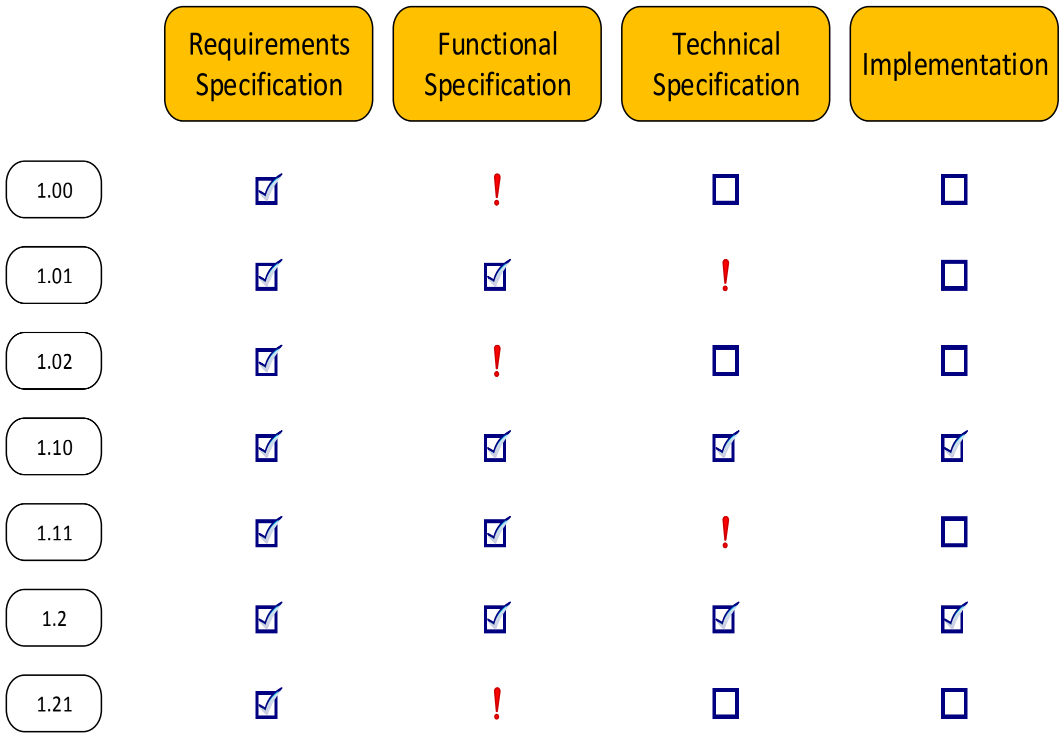
4.6 Waterfall model in this project

The waterfall model was chosen for this project as it is simple to use and follow. The requirements of the future software also are known and should not change much in near to intermediate timeframe. Also, the development team is new, with little to mediocre experience in project management, so taking a harder but perhaps a better model could worsen the actual result. The project was done in KISS-principle (Keep It Simple Stupid) and we tried not to get involved in hard procedures and avoiding structures in FRS that could cause problems in the coding stage.

The model used in this project can be seen in Picture 14.


Requirements Specification
What requirements should be satisfied
OK!
Needs to be re-evaluated
Functional Specification
How the system will satisfy the requirements
OK!
Needs to be re-evaluated
Technical Specification
How the application implements the functionality
OK!
Needs to be re-evaluated
Implementation
Implementation meets the specification

Picture 14: TIMS 2 Waterfall model.



	Requirements Specification	Functional Specification	Technical Specification	Implementation
1.00	☑	!	□	□
1.01	☑	☑	!	□
1.02	☑	!	□	□
1.10	☑	☑	☑	☑
1.11	☑	☑	!	□
1.2	☑	☑	☑	☑
1.21	☑	!	□	□

Picture 15: Example of development structure.

As picture 14 shows, the waterfall model in this project's as simple as possible.

Picture 15, shows an example of how development could go ahead in the long run, not an actual cycle of how it went.

5 APPROACH AND CREATION OF FUNCTIONAL REQUIREMENTS SPECIFICATION

We had created a Software Requirement Specification (SRS) where all requirements from the users of the previous version had been collected and also the requirements from the management for the new revision were included.

The SRS had been evaluated and presented to the management and it had also been approved for the next step. This step was the functional requirement specification (FRS).

The project team consisted of the end user of TIMS and project lead (Juha Hakala), programming resource (Olli Asikainen) and as well as one of the end users and the main user of one part of the program (Mathias Börg). This kept the team agile while having a lot of knowledge to lean on.

The team agreed to meet weekly and after a discussion it was decided that three meetings a week and 2½h at a time should be the most efficient time usage, as we had normal daily jobs to do as our primary task.

5.1 SRS of TIMS 2

5.1.1 Start of the project

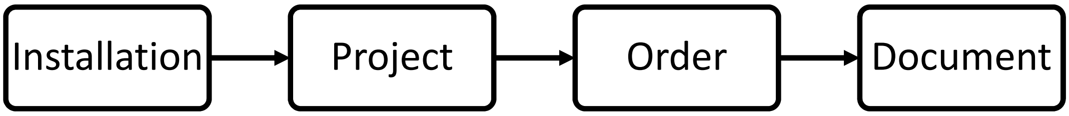
We had defined some design standpoints for the new system before even starting to gather information and requirements from the end users. These had come up during the preliminary phase when it was considered if a new system was actually needed.

Design standpoints include:

- Scope known at start
- Will be started from fresh table
- Better planning before implementation
- Data transferrable from old to new

- New data model
- Program core on more firm base
- More control over user rights
- Suited for global use

The business data model we had at the start of SRS was the same as with the old one. And that model was the starting point for data modelling in the new version as shown in the picture 16.



Picture 16: Business data model.

5.1.2 Step one – Identifying Stakeholders

With the initial data the project could be started and first step was to identify the stakeholders that are the users of the end product and those that have an interest towards the software.

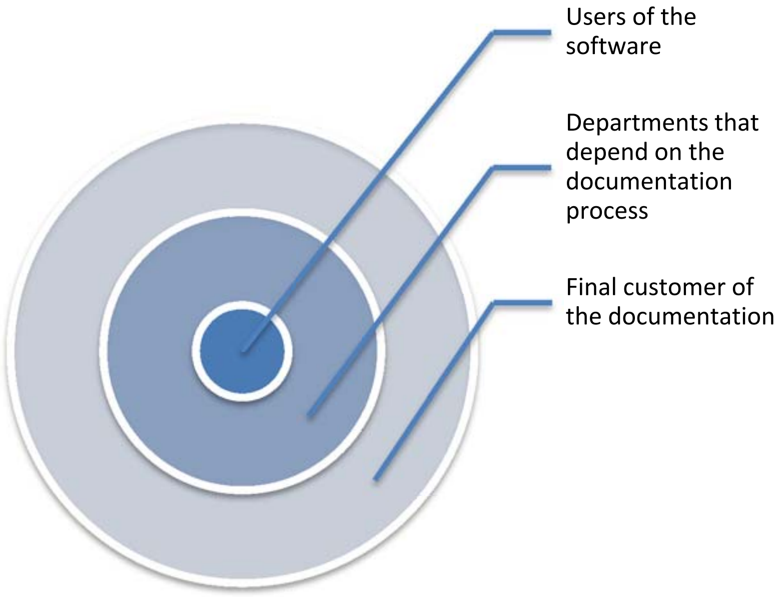
Possible stakeholders in TIMS 2	Asked about current use?	Improvements?
Contents Distribution	yes	yes
WFI-TI	yes	no
WIT-TI	yes	no
WNO-TI	yes	yes
WNL-P-TI	yes	no
TI director	yes	yes
Manager TI-FI	yes	yes
Manager TI-IT + general manager TI	yes	yes
TI-NO manager	yes	no
TI-NL-P manager	yes	no
Key user TI-NO	yes	yes
Key user TI-IT	yes	no
Key user Citec	yes	yes

Key user WFI-MS	yes	yes
ES	no	no
Services	no	no

Table 2: Stakeholders.

The list includes the key users of each location by name and the managers of each site. Most of the possible stakeholders were asked if they had some update requirements and some of them responded. Energy Solutions (ES) and Services were skipped as their need is the same as in Marine Solutions (MS) and it was decided that MS is enough for outside feedback as their documentation department has been the most active with the TIMS 1 usage.

The biggest stakeholder in this project is the department that is the main user of the TIMS. Other stakeholders are all departments that rely on the documentation and the creation process of the documentation. The final customers that rely on that they receive the documentation they have ordered are also a stakeholders in this system. The goal for this is that all information stored regarding the documentation creation process is stored in the same manner regardless of from where the documentation is done/delivered as shown in Picture 17.


Users of the software
Departments that depend on the documentation process
Final customer of the documentation

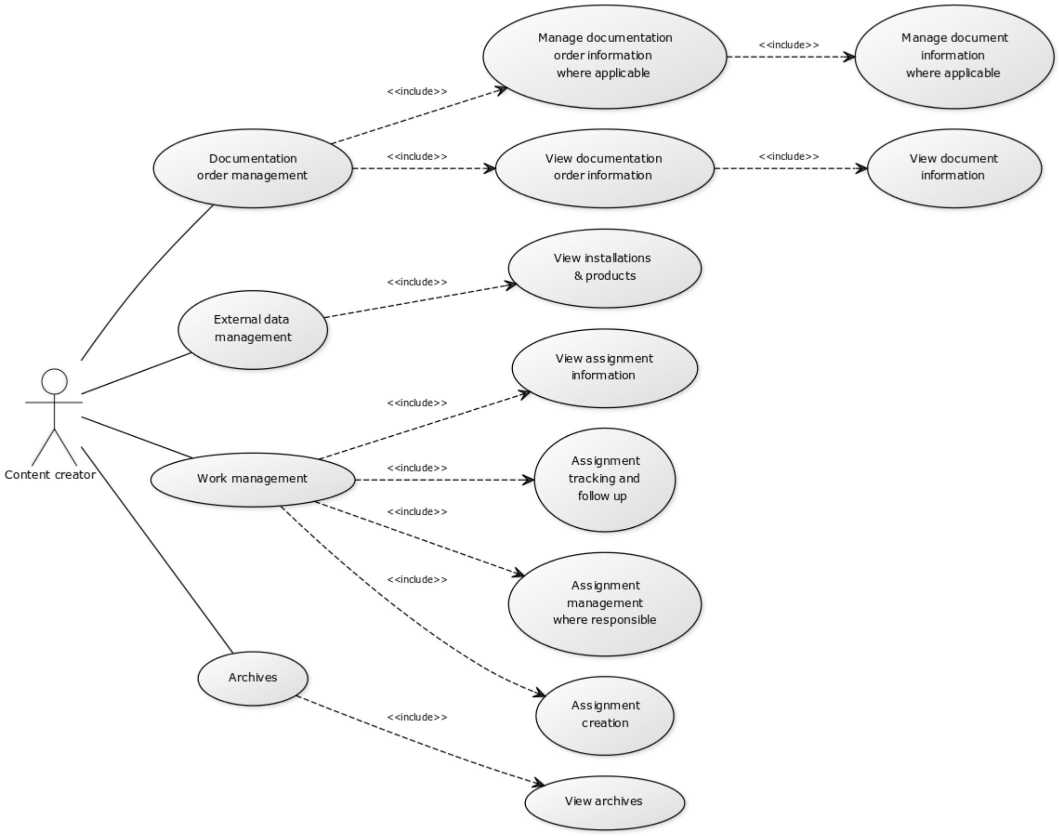
Picture 17: Simplified stakeholder map. /14/

5.1.3 Step two – Use Cases

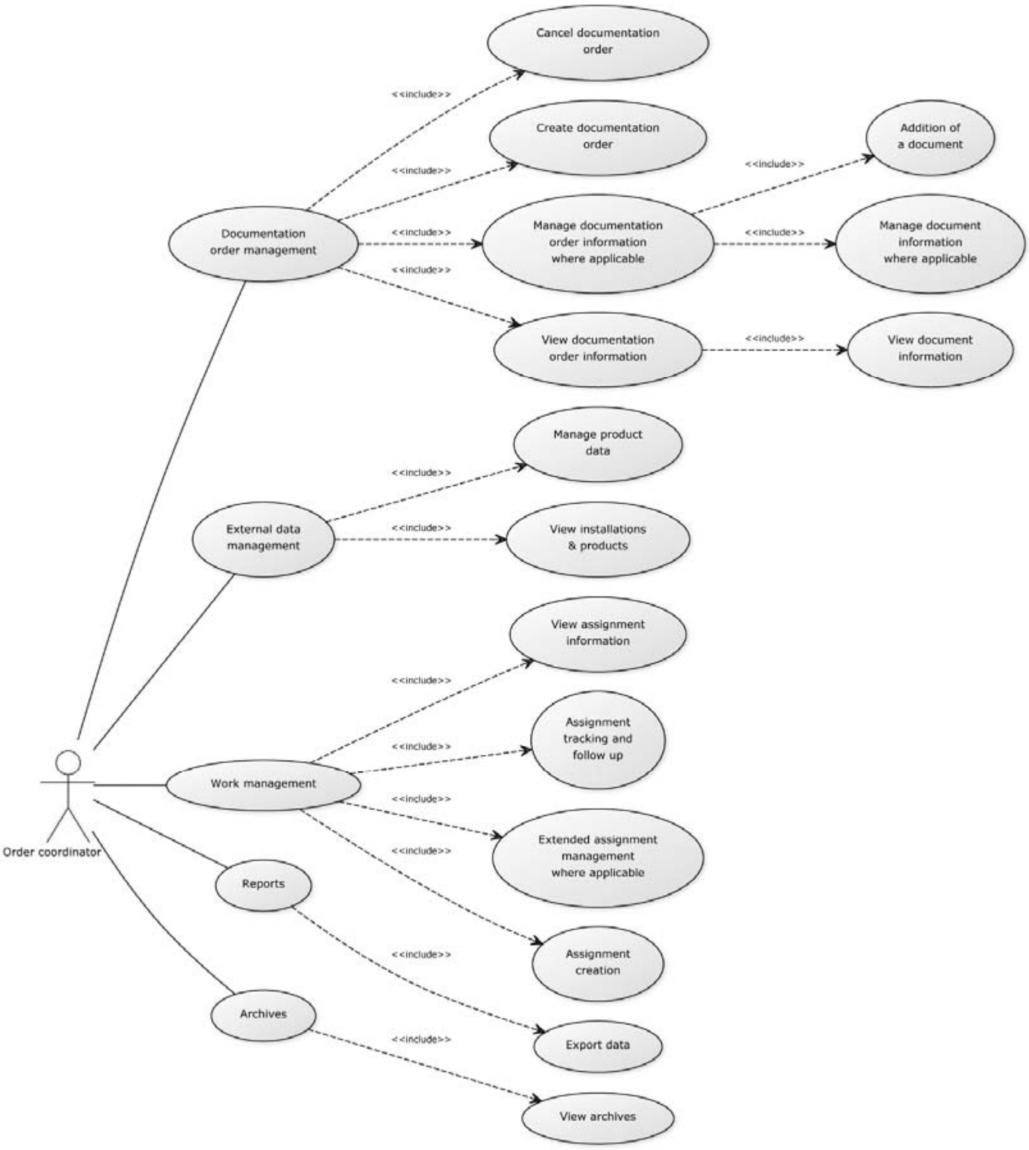
The following use cases were created with the lead of Mr. Mathias Börg who was appointed for the task.

The following Information shown in Pictures 18, 19, 20 is critical for next few Figures

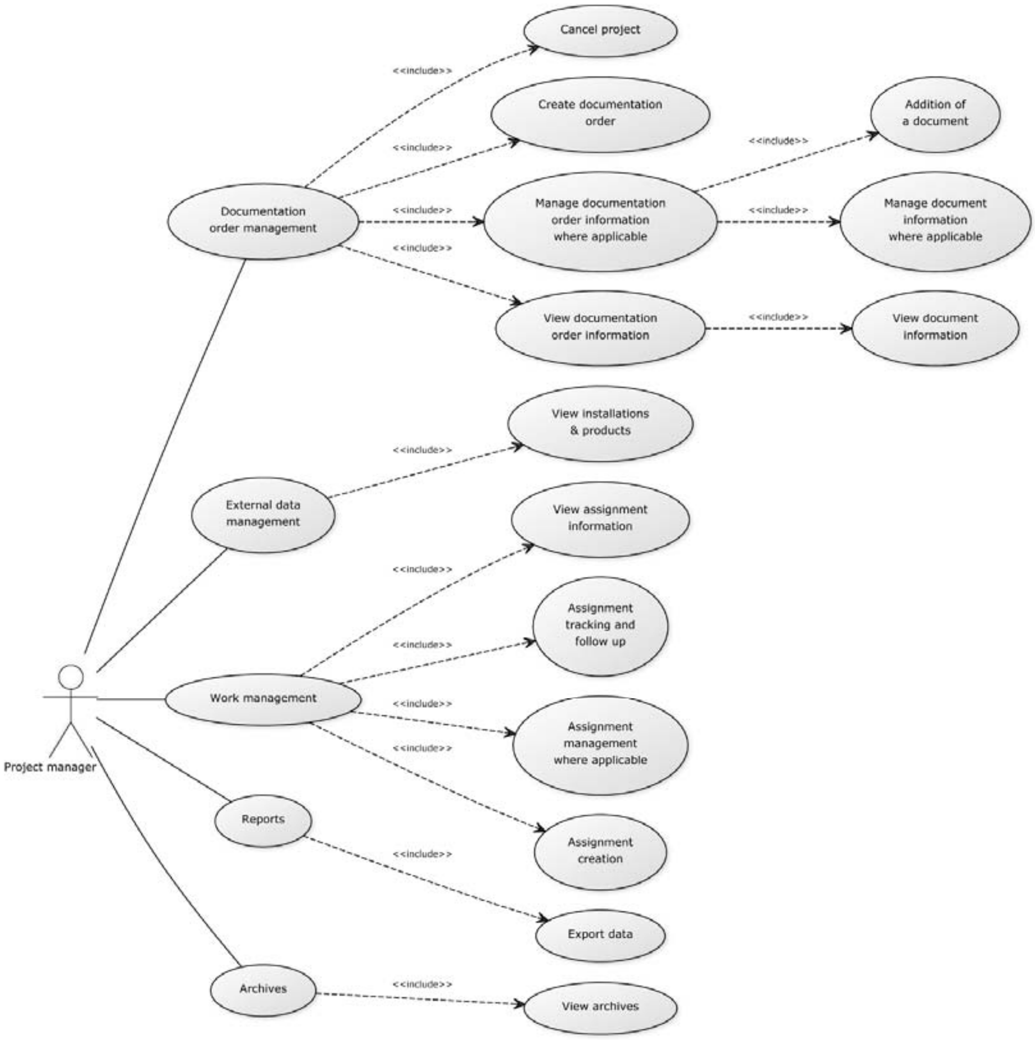
- Content creators = persons that create the documents.
- Order coordinators = persons that are responsible for documentation orders.
- Project managers = persons that are responsible for the projects and that the needed documentation is ordered.


Manage documentation order information where applicable
<<include>>
Manage document information where applicable
<<include>>
Documentation order management
<<include>>
View documentation order information
<<include>>
View document information
View installations & products
<<include>>
External data management
View assignment information
<<include>>
Content creator
<<include>>
Work management
Assignment tracking and follow up
<<include>>
<<include>>
Assignment management where responsible
Archives
Assignment creation
<<include>>
View archives

Picture 18: Content creator’s usage of TIMS.


Order coordinator
Documentation order management
External data management
Work management
Reports
Archives
Cancel documentation order
Create documentation order
Manage documentation order information where applicable
View documentation order information
Addition of a document
Manage document information where applicable
View document information
Manage product data
View installations & products
View assignment information
Assignment tracking and follow up
Extended assignment management where applicable
Assignment creation
Export data
View archives
<<include>>

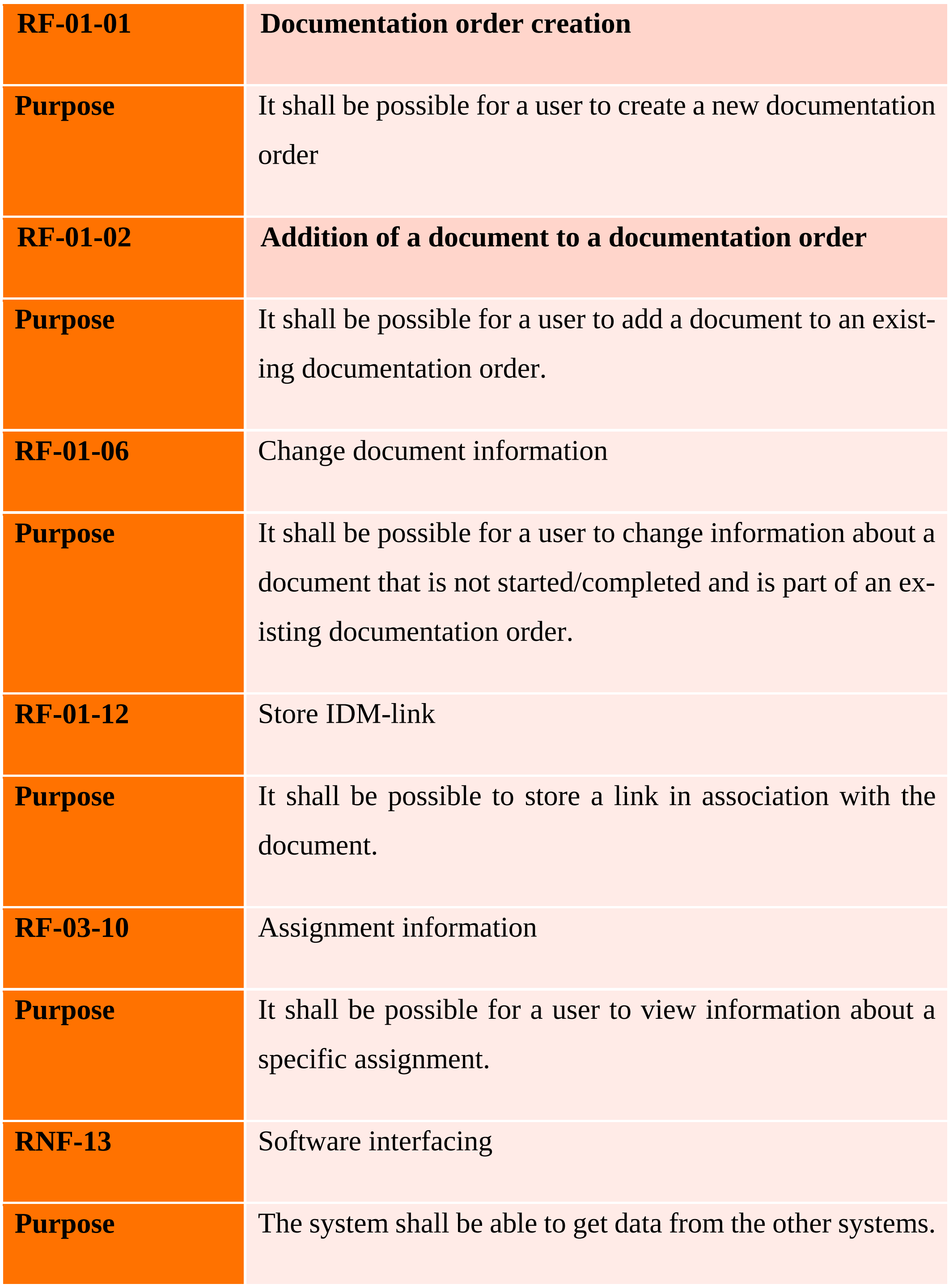
Picture 19: Order coordinator’s usage of TIMS.


Project manager
Documentation order management
External data management
Work management
Reports
Archives
Cancel project
Create documentation order
Manage documentation order information where applicable
View documentation order information
Addition of a document
Manage document information where applicable
View document information
View installations & products
View assignment information
Assignment tracking and follow up
Assignment management where applicable
Assignment creation
Export data
View archives
<<include>>

Picture 20: Project manager’s usage of TIMS. /15/

The use cases in Pictures 18, 19, 20 were then used to design the program further and also as help when decisions were made. Usefulness of use cases comes from enabling a bigger picture view to the actual usage, as it is so easy to focus on to minor details and forget the whole.

5.1.4 Example requirements from the TIMS2 SRS



RF-01-01	**Documentation order creation**
Purpose	It shall be possible for a user to create a new documentation order
RF-01-02	**Addition of a document to a documentation order**
Purpose	It shall be possible for a user to add a document to an existing documentation order.
RF-01-06	Change document information
Purpose	It shall be possible for a user to change information about a document that is not started/completed and is part of an existing documentation order.
RF-01-12	Store IDM-link
Purpose	It shall be possible to store a link in association with the document.
RF-03-10	Assignment information
Purpose	It shall be possible for a user to view information about a specific assignment.
RNF-13	Software interfacing
Purpose	The system shall be able to get data from the other systems.

Picture 21: Software Requirements. /16/

These are just a few of SRS requirements that were gathered, the actual SRS has requirements in long form with descriptions, exceptions etc. The final SRS is 42 pages long.

5.2 Coding platform selection

SRS was presented to the primary user group on 21.4.2015 and received mostly well. Some points still needed to be discussed more closely, mostly concerning invoicing. Then on 24.5.2015 SRS was presented to the management and accepted with some feedback for additional development.

Development continued next week. During this additional development period a question was asked whether development should be done in-house from scratch or should a platform already in use be used.

A meeting was held about Polarion on 22.5.2015 by the development team. After discussions it was decided that at least we should take it into account and do a comparison of the systems. Mr. Olli Asikainen was nominated for the task as he has the best know-how on coding. The problem, of course, was that Polarion is a platform made by Siemens and no-one had done any coding for it, so finding out about the system was somewhat challenging.

After couple weeks Mr. Olli Asikainen was ready and we had some kind of an end result. At the end the plusses and minuses we recompiled into points shown in Table 3.

Globally usable program	Globally usable program
No monthly costs	Should be easy to do test "proto versions" and perhaps faster to develop
program can be specified from ground up to suit our needs	Common platform for all TI-functions
"Unlimited" amount of users at same time	Polarion program UI will be closer to old levdoc than current TIMS
Program updateable when need arises, thru gate model.	limits options, some features might be needed to drop, others hard to do
Updates tested before applying them to production environment	Monthly costs, 80users+ and 3½ users per license
user interface is created by us and can be created flexible	Licenses limit users, causes problems

Longer development time?	Polarion platform updates 4/y, might cause our software to fail. Need to do bug tests every time
Risks apply to developing with only one person	
If faults appear while program created , those cannot be seen untill late into development. Proto version creation is harder and takes longer	

Table 3: Own coding vs Polarion use.

To the left is the coding from scratch, to the right there is Polarion used as the base. After meeting with the managers in mid-June 2015 it was decided that the in-house route will be pursued.

5.3 How to fill requirements in TIMS2 Software requirement specification

The team spent the first few meeting to decide how to handle the SRS as it was quite large, around 40 pages, and to discuss what the best way is to analyse what is actually required.

After some tries and effort to brute force it, it was decided that the best way is to try to split SRS apart and see if we could get it to easier to handle parts. Mr. Olli Asikainen purposed that we could do a low tech approach and just put all the requirements into small slips of paper and start to gather similar requirements to piles.

The requirements were printed on A4s and then cut up and glued them on to A3s. This worked well and showed that this formed quite naturally system function groups. After some refinements, few of the requirements were transferred to a different group that was a better fit for the requirement and then we had something more to go on.

5.4 Planning - Splitting the project into smaller parts

After we had the project split into easier to handle sections we started to evaluate the different functions on the level of importance for the program to work.

In the end we had 11 total function groups and of those we ended up with 4 core functions and 7 additional pieces.

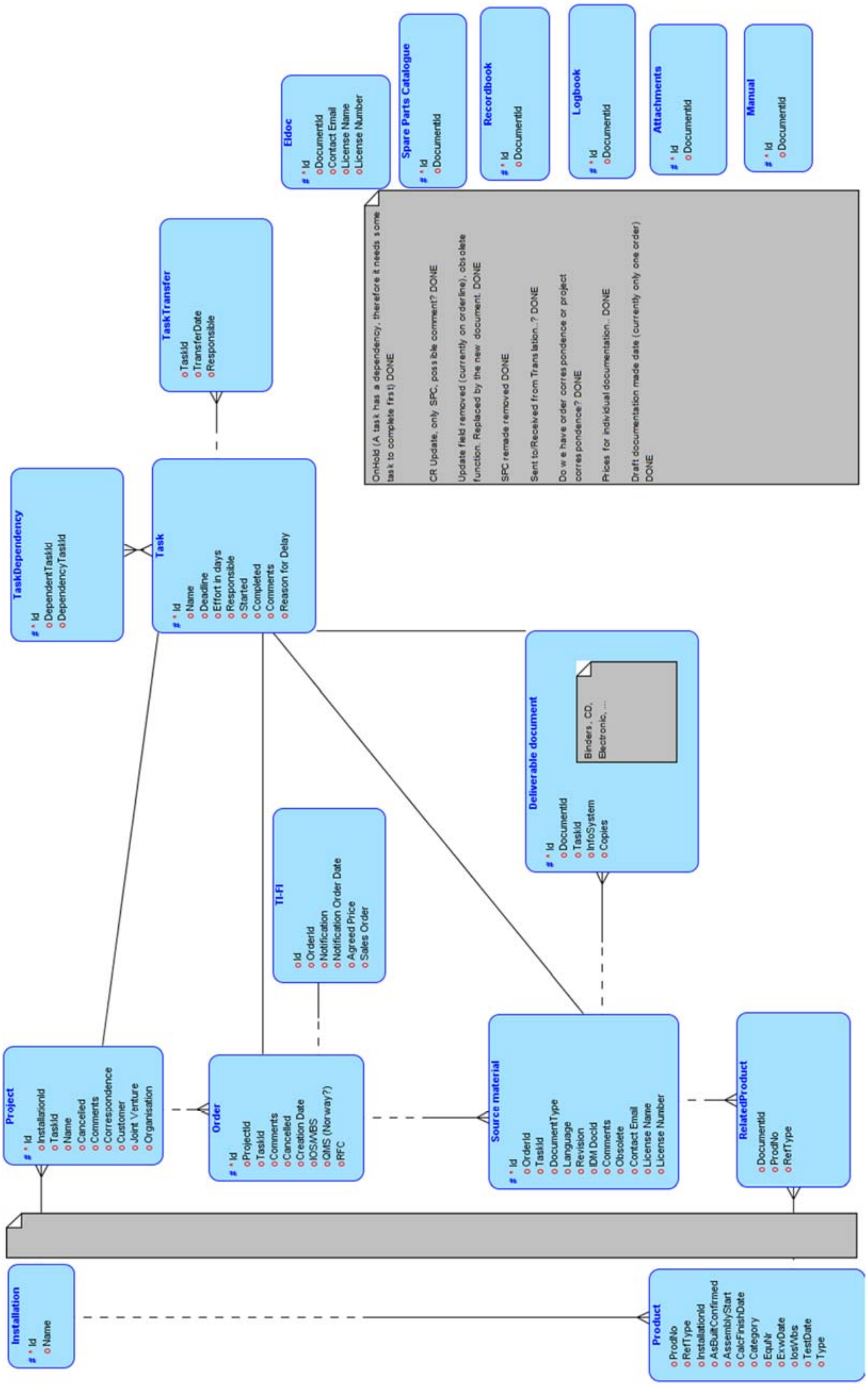
The core functions were:

- Creating orders to the system
- Order Viewing
- Order Modification
- Workflow
    - Task management
    - Scheduling

The additional functions (not in importance order) were:

- Non-conformity
- Search & Archives
- Reports
- Utilities
- Invoicing
- Legacy Import
- Cancelling, including obsoleting items

At this time we also ended up with a conclusion that we dont actually have a clear view of how the program would actually function and how the functions interact. It was decided that a preliminary data model would be really helpful. Luckily we had Olli in the team who had already some ideas on creating it and we started to work on that. The result was the image shown in Picture 22.



OnHold (A task has a dependency, therefore it needs some task to complete first) DONE

CR Update, only SPC, possible comment? DONE

Update field removed (currently on orderline), obsolete function. Replaced by the new document. DONE

SPC remade removed DONE

Sent to/Received from Translation..? DONE

Do we have order correspondence or project correspondence? DONE

Prices for individual documentation.. DONE

Draft documentation made date (currently only one order) DONE

Picture 22: Preliminary Data Model of TIMS 2.

5.5 Implementation - Selecting correct tool for the work

The next step was to decide how we would present the different functions and to visualise different ideas and concepts. After discussions we ended up with the plan to create visualisation of the program windows and use that as a basis.

The team spent several meetings searching for a good tool, one that preferably would be free to use. There was no specified budget and applying for expensive programs would cause a delay.

We tried some tool but found them lacking and/or designed for mobile platform use. Finally we found Pencil-program that didnt fill all the functions but was good enough. It had some clumsy functions, but they could be worked around or avoided and it was free.

The program can be found at: http://pencil.evolus.vn/ this tool was used to create mock-ups of the future functions.

5.6 Ideas for FRS

The plan that developed while making the preliminary Data Model was that perhaps we should not keep Installation as the top level of the structure as we had it in TIMS 1. That would mean that we would have Project as the top level and installation is just linked to the project. This is better as we handle the incoming orders as deliverable projects and we not actually so interested about where installation is. This is also because one installation can have many orders, either extension projects or just multiple organizations involved. Also, the project level can be used as point of contact for persons outside the executing organisations. They can find all of their documents for that instalment from under one project.

The structure of TIMS 2 is divided into 3 levels: Project, Order and Document with installation loosely linked to Project. Each Project can have more than one Order and each Order can have multiple Documents. Documents in this case do not mean a physical product, rather a general name for the structure level that has Documents in it.

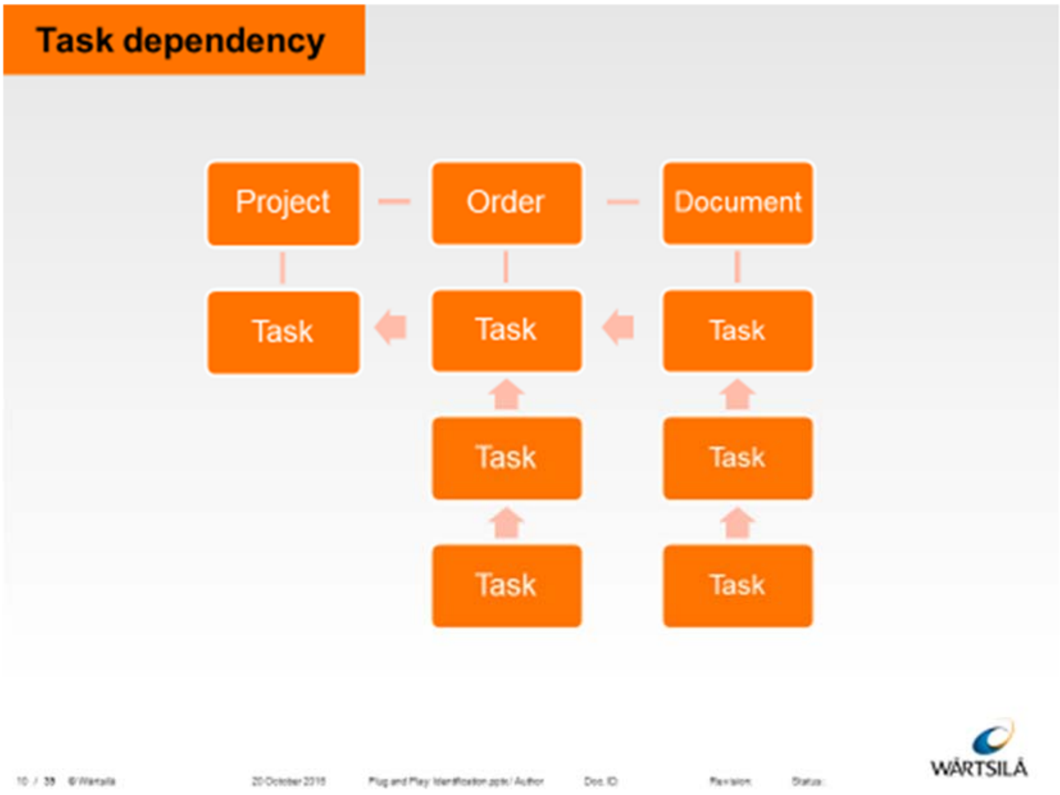
Also, quite early in the development we had a great idea of how the program would work, Tasks. A fundamental idea on what we based the design on. So, what are tasks?

By definition: It was “Task, a usually assigned piece of work often to be finished within a certain time”. /17/

In TIMS 2 tasks are used to assign work for someone. Also, for a user of tasks to easily identify work that needs to be done and how much work there is.

With TIMS 2 there are three levels: Project, Order and Document; tasks were set like this: Each of these levels have a Primary task that can be completed when Primary task(s) on a level below it have been completed. So, Project task cannot be completed if Document tasks are completed but the Order task is not.

Primary tasks can have one or more subtask(s) assigned to it. These subtasks report only to their Primary task, depending on the level it was created, and do not affect the ability to complete the Primary task. A Subtask can also have a subtask(s) attached to it so users can even create complex work structures to suit their needs. The task structure can be seen in Picture 23.


Task dependency

Picture 23: Task Dependency.

This structure is used through out the whole system and it is the basis for of workflow management and because of that critical design point for the FRS. Changing or removing Task management will cause major changes to the program plan.

5.7 System Requirements Follow-up

To keep track with the requirements in the SRS and that every requirement in that document is actually resolved in the FRS, we included "Requirements met" in the start of each function in FRS. Also, a short overview what the Function covers was included.

Following text is an example of Order Modification function.

Modify

This section introduces features for modifying projects, orders and documents.

Requirements met

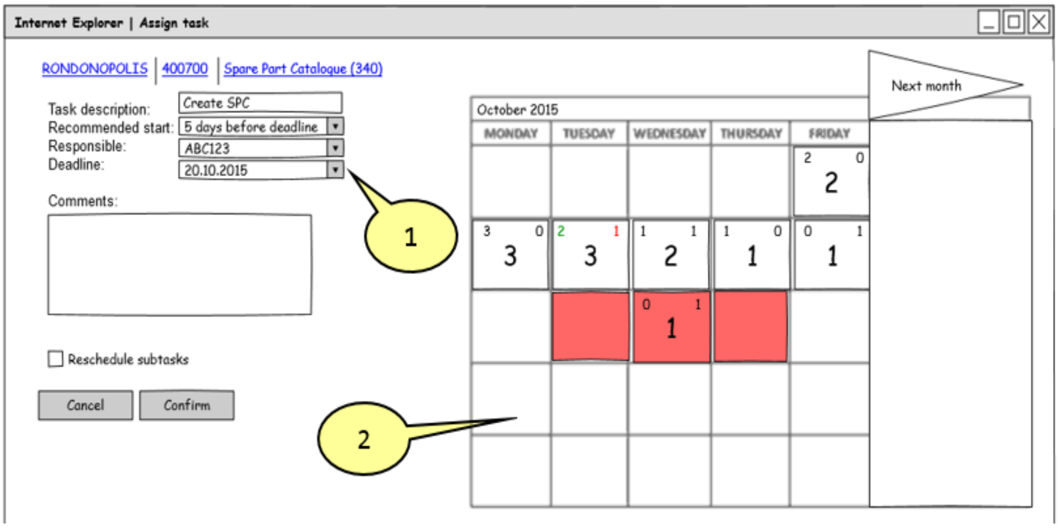
- RF-01-02
- RF-01-05
- RF-01-06
- RF-01-07
- RF-01-12
- RF-01-13
- RF-01-14
- RF-01-15
- RF-01-16
- RF-01-18
- RF-01-19
- RF-01-20
- RF-01-25
- RF-01-26

This way it can easily be seen where each requirement is done for the first time. If something should change, it can found out from the list where change will affect the FRS.

5.8 Mock-up's of the TIMS 2 FRS

In this part I will partly go through the TIMS FRS that we have created. The full FRS is 122 pages long, so I will only pick some parts.

Let's start with task management that was touched on previously. In Picture 24 you have a picture of Task creation. This wizard is used to assign all the tasks in the system.


Internet Explorer | Assign task
RONDONOPOLIS | 400700 | Spare Part Catalogue (340)
1
2
Next month
Cancel
Confirm

Task description: Create SPC

Recommended start: 5 days before deadline

Responsible: ABC123

Deadline: 20.10.2015

Comments:

□ Reschedule subtasks

October 2015

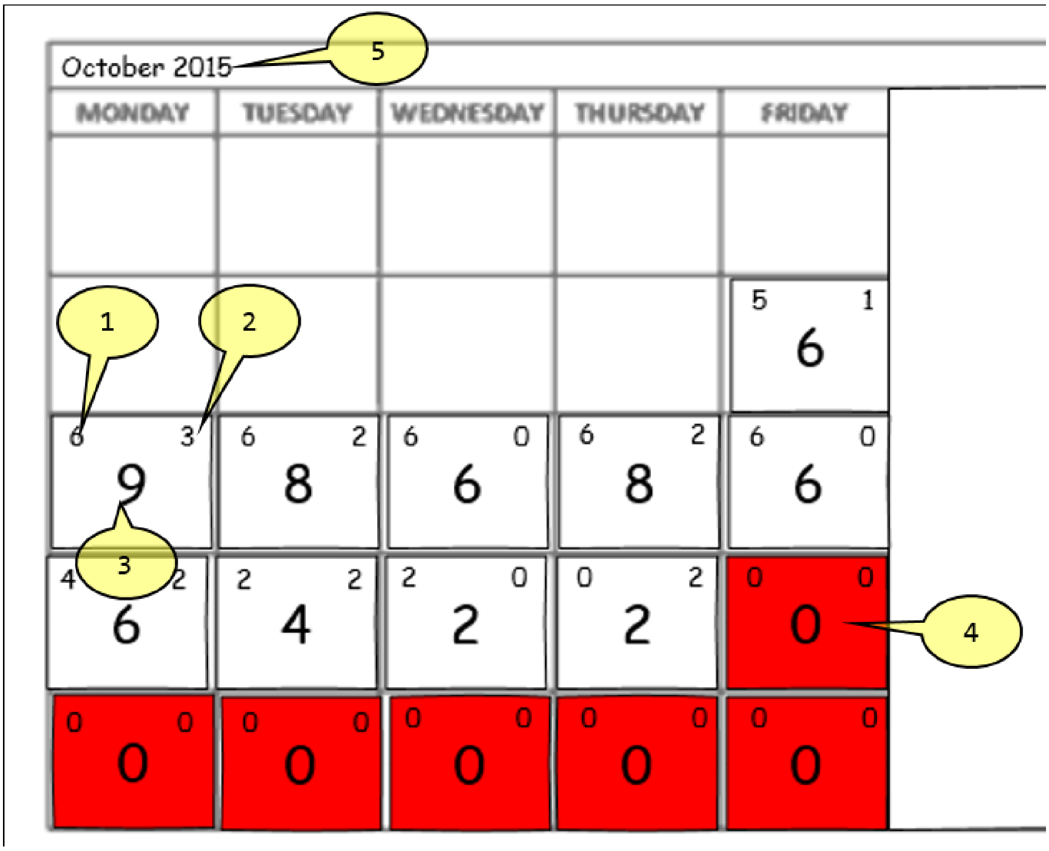
MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
				2 0 2
3 0 3	2 1 3	1 1 2	1 0 1	0 1 1
	🟥	0 1 1	🟥	

Picture 24: TIMS 2 Task.

1. Assign responsible, deadline and others
2. Work overview, explanation after Picture 25
    - View changes to show workload of the person that is selected as responsible

Picture 25 is a presentation of how the tasks are used to create workload calendar.

Workload calendar



October 2015

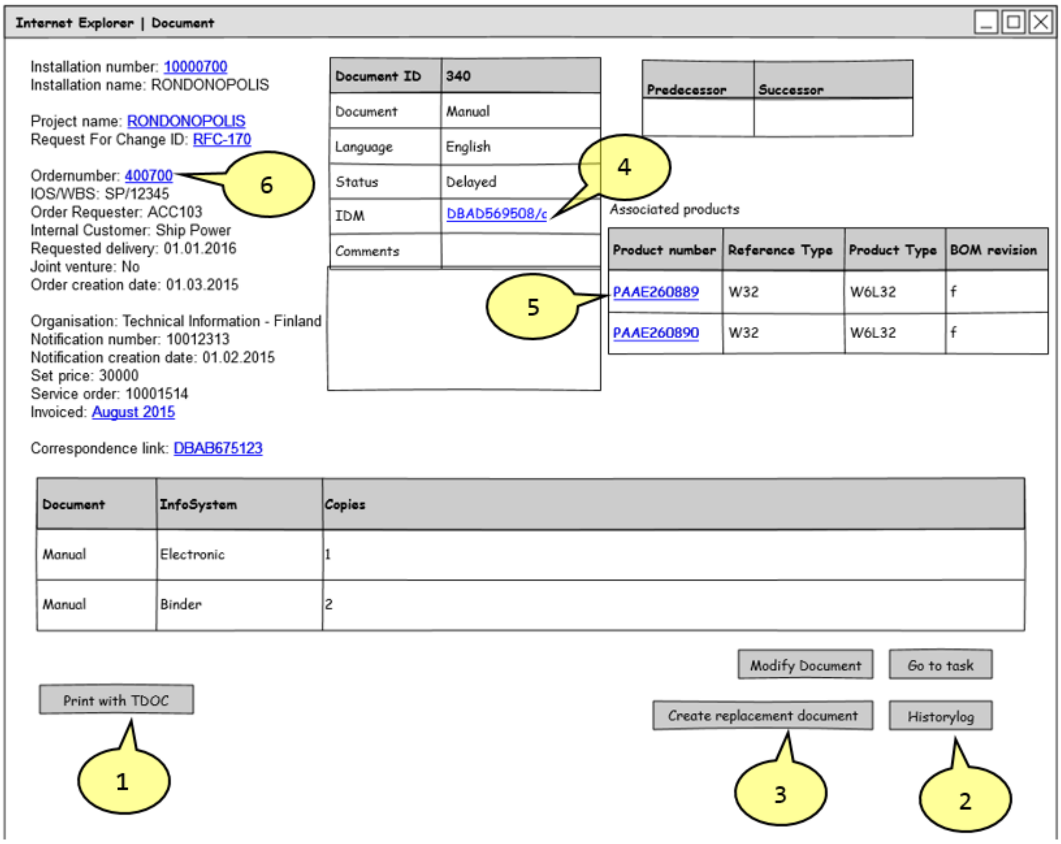
MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
				5 1 6
6 3 9	6 2 8	6 0 6	6 2 8	6 0 6
4 2 6	2 2 4	2 0 2	0 2 2	0 0 0
0 0 0	0 0 0	0 0 0	0 0 0	0 0 0

Picture 25: Workload Calendar

And the explanation of how this actually works is as follows:

1. Sum of tasks ongoing that day
   - Delayed tasks (not completed)
   - Started tasks (not completed)
   - Recommended tasks to start (not completed)
2. Sum of tasks that have deadline that day
3. Sum of [1] and [2]
4. Absence
5. The calendar is fetched based on chosen person and month

Following Picture 26 is an example of Document primary task view. From here all the necessary information about the documentation executing person needs to know can be gained. What type document is ordered, on what language it is needed and also links to other parts of the program are all available.



Installation number: 10000700
Installation name: RONDONOPOLIS

Project name: RONDONOPOLIS
Request For Change ID: RFC-170

Ordernumber: 400700
IOS/WBS: SP/12345
Order Requester: ACC103
Internal Customer: Ship Power
Requested delivery: 01.01.2016
Joint venture: No
Order creation date: 01.03.2015

Organisation: Technical Information - Finland
Notification number: 10012313
Notification creation date: 01.02.2015
Set price: 30000
Service order: 10001514
Invoiced: August 2015

Correspondence link: DBAB675123

Document ID	340
Document	Manual
Language	English
Status	Delayed
IDM	DBAD569508/c
Comments	

Predecessor	Successor

Associated products

Product number	Reference Type	Product Type	BOM revision
PAAE260889	W32	W6L32	f
PAAE260890	W32	W6L32	f

Document	InfoSystem	Copies
Manual	Electronic	1
Manual	Binder	2

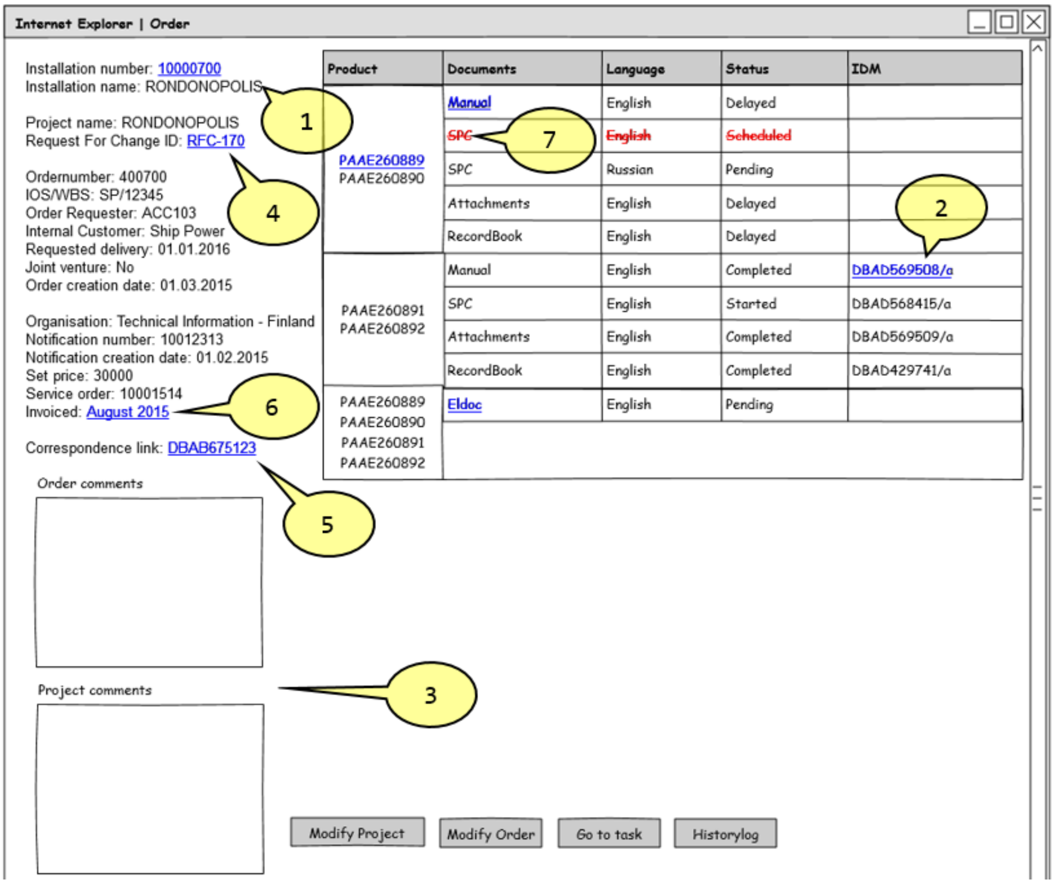
Picture 26: TIMS 2 – Document View.

Explanation to the bubbles in Picture 26:

1. Goes to TDOC printing – Link to external program
2. Show log
3. Obsoletes current document and creates new with same items
4. Link from external document storage
5. Products linked to this Document order and also functions as link to that Product.

6. Link to Document's Order, also shows important data from order to the Document creator.

This is the Order level mock-up of the program. Here it can be seen what Documents have been ordered for what products. Also all the languages needed and the completion status of document task in question, the link to the complete document are found here too.



Internet Explorer | Order

Installation number: 10000700
Installation name: RONDONOPOLIS

Project name: RONDONOPOLIS
Request For Change ID: RFC-170

Ordernumber: 400700
IOS/WBS: SP/12345
Order Requester: ACC103
Internal Customer: Ship Power
Requested delivery: 01.01.2016
Joint venture: No
Order creation date: 01.03.2015

Organisation: Technical Information - Finland
Notification number: 10012313
Notification creation date: 01.02.2015
Set price: 30000
Service order: 10001514
Invoiced: August 2015

Correspondence link: DBAB675123

Product	Documents	Language	Status	IDM
PAAE260889 PAAE260890	Manual	English	Delayed	
	~~SPC~~	~~English~~	~~Scheduled~~	
	SPC	Russian	Pending	
	Attachments	English	Delayed	
	RecordBook	English	Delayed	
PAAE260891 PAAE260892	Manual	English	Completed	DBAD569508/a
	SPC	English	Started	DBAD568415/a
	Attachments	English	Completed	DBAD569509/a
	RecordBook	English	Completed	DBAD429741/a
PAAE260889 PAAE260890 PAAE260891 PAAE260892	Eldoc	English	Pending	

Order comments

Project comments

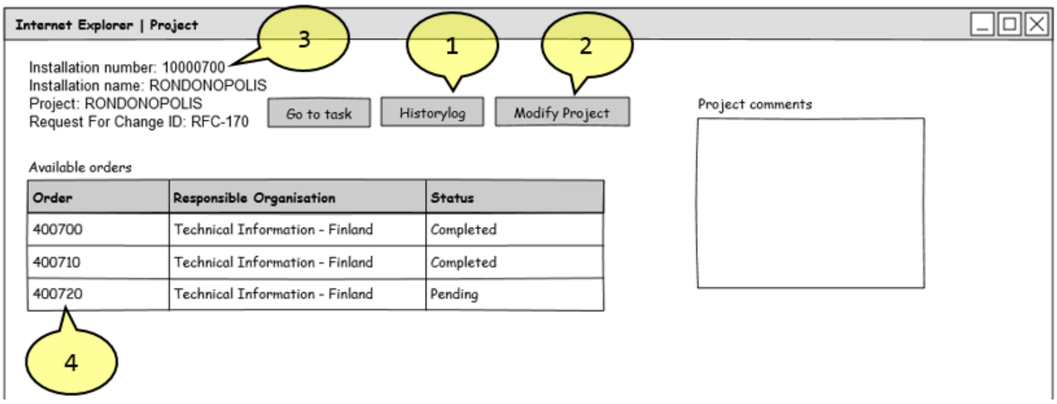
Picture 27: TIMS 2 – Order View.

The following is explanation of Picture 27:

1. Installation name fetched from live master data
2. Link from external document storage

3. Comment fields, Order comments shows just here and Project comments are shown in each Order linked to it.
4. Link to Polarion – external program
5. Correspondence for this order, mails etc.
6. Link to invoice where this order was invoiced
7. Example of obsolete Document. The table lists all the Documents ordered in this Order, for what products and status of those Documents linked to them.

This picture 28 is from Project level. It shows all orders that have been linked to the Project and their status. Buttons here are used to edit, see log and go to project Primary task.



Installation number: 10000700
Installation name: RONDONOPOLIS
Project: RONDONOPOLIS
Request For Change ID: RFC-170

Project comments

Available orders

Order	Responsible Organisation	Status
400700	Technical Information - Finland	Completed
400710	Technical Information - Finland	Completed
400720	Technical Information - Finland	Pending

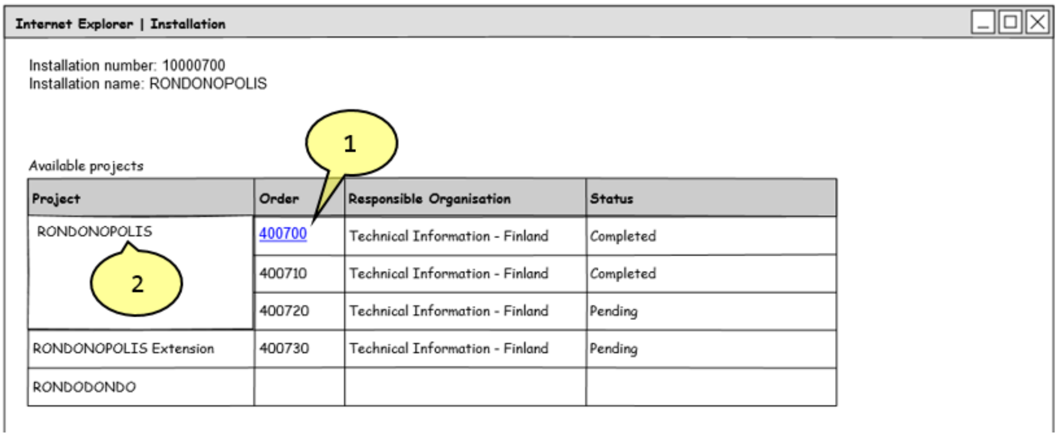
Picture 28: TIMS 2 – Project View.

Legend of Picture 28:

1. Show log
2. From here you can modify the projects data
3. Useful information, like projects name that you have open and installation that is linked to it

4. List of Orders that are in this Project and their statuses and organization.

This picture 29 is Installation View, it can be accessed from all the other levels. It shows every project that shares the same installation and Order status in them. There is no other functionality than links to order and project levels.



Installation number: 10000700
Installation name: RONDONOPOLIS

Available projects

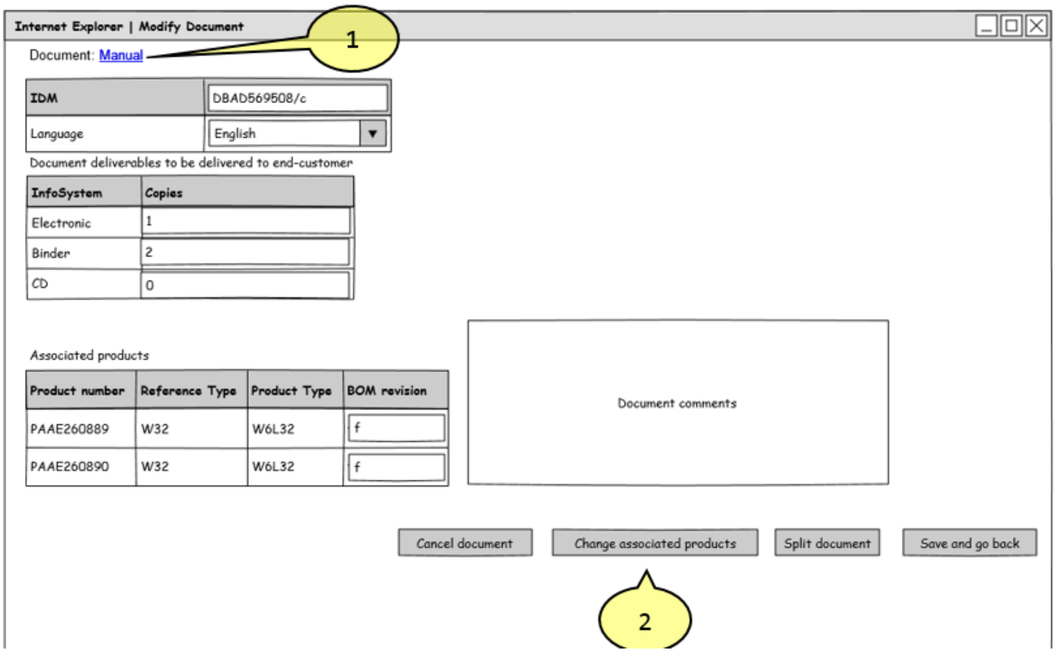
Project	Order	Responsible Organisation	Status
RONDONOPOLIS	400700	Technical Information - Finland	Completed
	400710	Technical Information - Finland	Completed
	400720	Technical Information - Finland	Pending
RONDONOPOLIS Extension	400730	Technical Information - Finland	Pending
RONDODONDO			

Picture 29: TIMS 2 – Installation View.

Explanation of Picture 29:

1. Shows Order numbers linked to this installation's projects and their statuses can be seen at the status field
2. Names of the projects this installation is linked to

Picture 30 is example of the modifying function. Usage is quite simple, buttons are used for saving and functions as they say. Editable fields are those that are stored in the system, fixed fields are loaded from an external system. The same kind of pages are available also to Order and Project levels.



Document: Manual

IDM	DBAD569508/c
Language	English ▼

Document deliverables to be delivered to end-customer

InfoSystem	Copies
Electronic	1
Binder	2
CD	0

Associated products

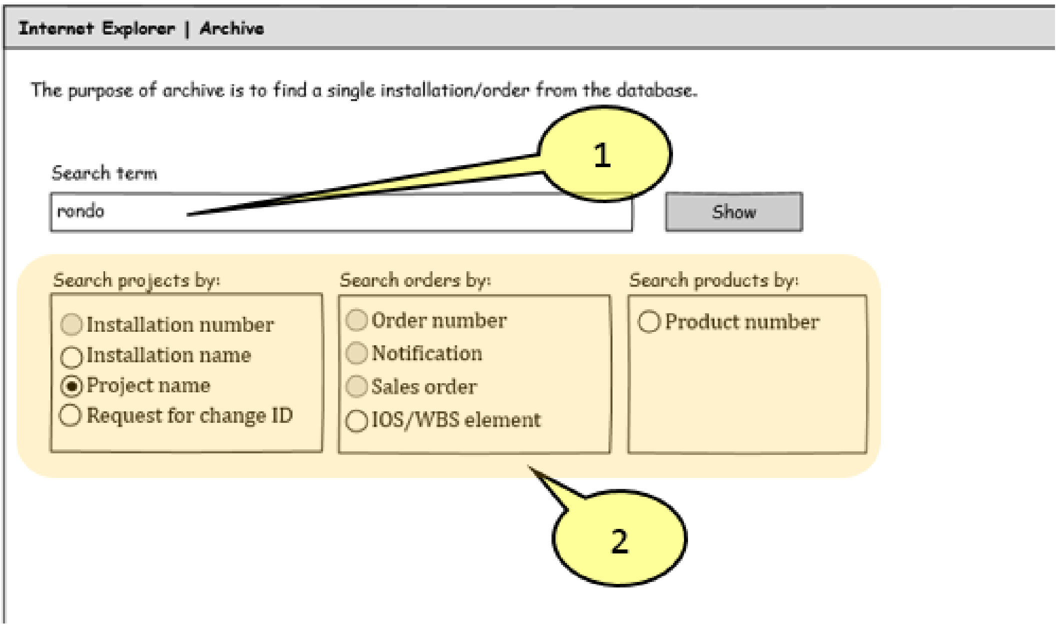
Product number	Reference Type	Product Type	BOM revision
PAAE260889	W32	W6L32	f
PAAE260890	W32	W6L32	f

Picture 30: TIMS 2 – Document Modify.

Information about functionalities in Picture 30:

1. Back to Document, no save
2. Change the products that are attached to this document

Picture 31 is the search engine, called archive as it finds the already executed items. In this sample a person is trying to find something with text, perhaps a project. There is auto detection in place that limits available search field depending on if the entered search is numbers or letters. Example search result is shown in Picture 32.



Internet Explorer | Archive

The purpose of archive is to find a single installation/order from the database.

Search term: rondo

Search projects by:

- ○ Installation number
- ○ Installation name
- ● Project name
- ○ Request for change ID

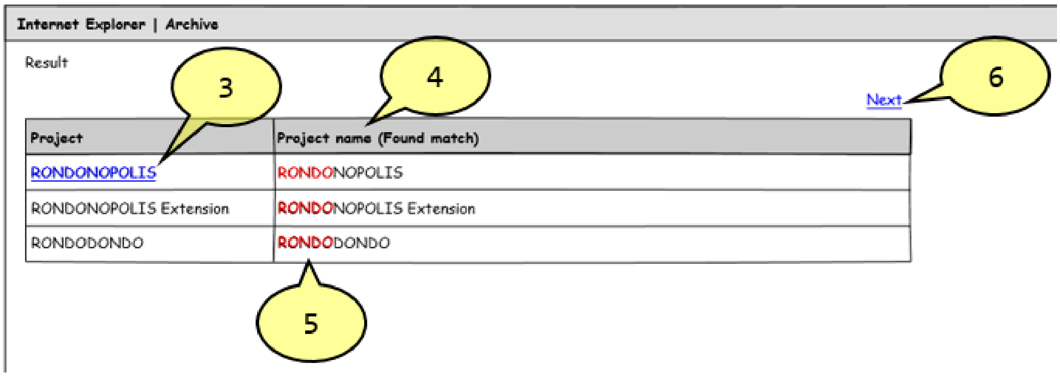
Search orders by:

- ○ Order number
- ○ Notification
- ○ Sales order
- ○ IOS/WBS element

Search products by:

- ○ Product number

Picture 31: TIMS 2 – Archive Search Function.



Internet Explorer | Archive

Result

Project	Project name (Found match)
RONDONOPOLIS	RONDONOPOLIS
RONDONOPOLIS Extension	RONDONOPOLIS Extension
RONDODONDO	RONDODONDO

Picture 32: TIMS 2 – Search Result.

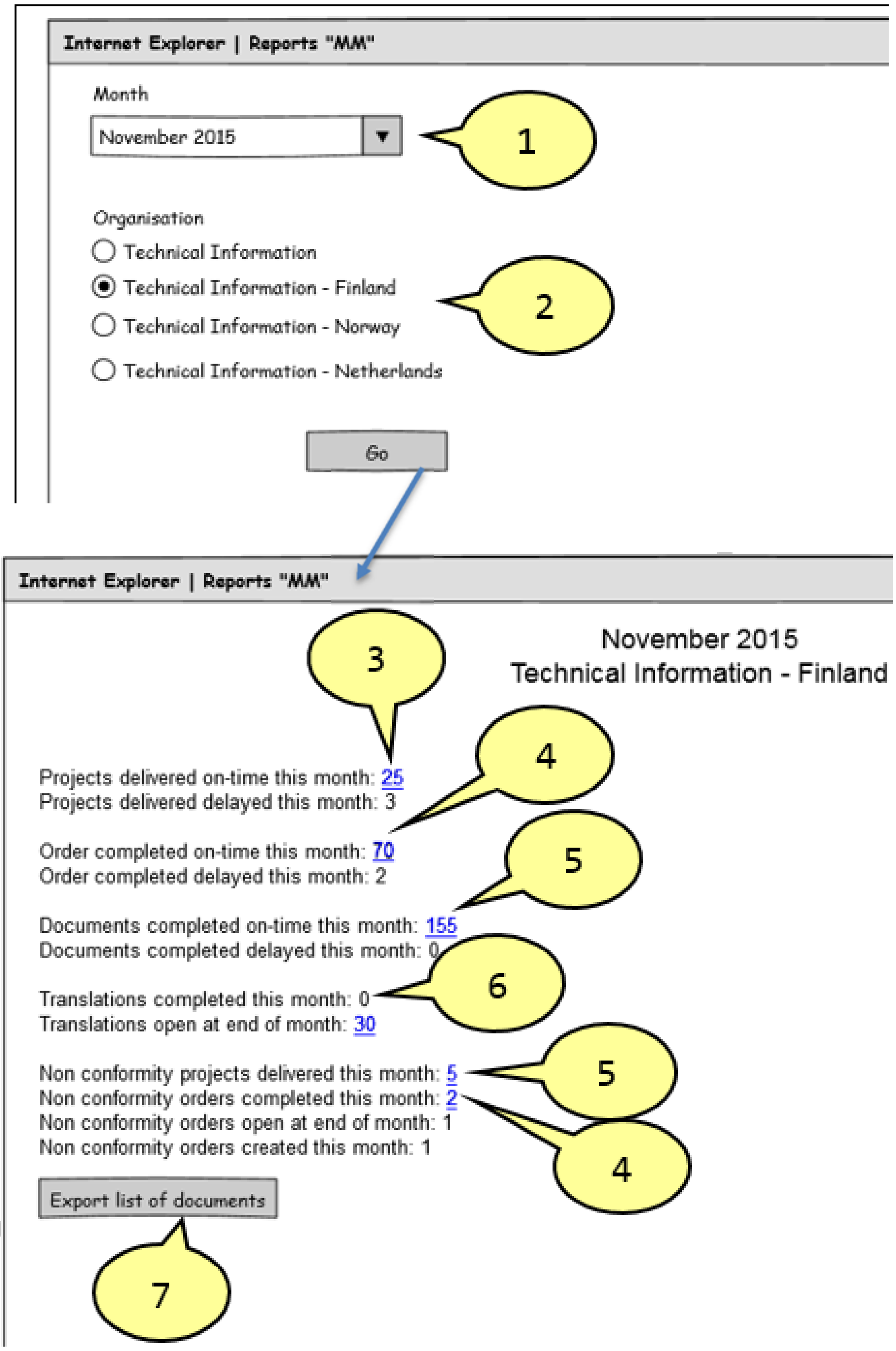
Explanation of functions shown in Pictures 31 & 32.

1. Search term
2. Search property, auto detection text vs numbers enabled. This is used to select what you want to find, with limitation on entered data (text or numbers).
3. Link to search result (usually Document/Order/Project)
4. Searched type

5. Searched term
6. Show more results

The Reporting functionality of the program is shown on next page with Picture 33.

9.0 Choose month for Technical Information report



Internet Explorer | Reports "MM"

Month

November 2015 ▼

Organisation

○ Technical Information

● Technical Information - Finland

○ Technical Information - Norway

○ Technical Information - Netherlands

Go

Internet Explorer | Reports "MM"

November 2015
Technical Information - Finland

Projects delivered on-time this month: 25
Projects delivered delayed this month: 3

Order completed on-time this month: 70
Order completed delayed this month: 2

Documents completed on-time this month: 155
Documents completed delayed this month: 0

Translations completed this month: 0
Translations open at end of month: 30

Non conformity projects delivered this month: 5
Non conformity orders completed this month: 2
Non conformity orders open at end of month: 1
Non conformity orders created this month: 1

Export list of documents

Picture 33: TIMS 2 – Monthly Report Tool.

Explanation of Picture 33 functionalities:

1. Select month
2. Select organization
3. Results, amount of Projects
4. Amount of Orders
5. Amount of Documents
6. Amount of Translations
7. Gathers the data and compiles it into exportable form to excel or similar program.

The reporting function is made for quick monthly overlook and then enabling the export functionality so the data can be then analysed more in a program more suitable for it. TIMS 2 is not supposed to be a reporting tool, but enabling data export was one of the design standpoints.

There if a lot more of the FRS of course, but I only included some parts of it into this thesis report. Partly because of space limitations and partly so no one can use the design for themselves.

5.9 Keywords and Definitions within FRS

While we have a list of Requirements from SRS at the beginning of each FRS function, we did produce a lot of keywords that are used within that specific function. These were placed at the end of the each function. This is so we can define one keyword at the end and then use it in every necessary place, without the need to put complex formulas or functionalities all over the document.

As an example some keywords from the workflow part of the FRS are shown.

Assigning/Reassigning of a task deadline

The following rules are applied:

- Deadline of the task that is being (re)assigned cannot be set earlier than today.

- Deadline of the task that is being (re)assigned cannot be set later than the dominant task deadline

The following rules are applied if also rescheduling subtasks:

- The number of workdays between old and new deadline of the reassigned task is calculated
- The number of calculated workdays is added/subtracted to each immediate subtask deadline.

Create a template

Creating a template means cloning the secondary tasks of a specific task.

Each clone includes task description and task suggested start.

Templates are user specific.

Primary task

A primary task is directly linked to a project, order or document.

Secondary task

A secondary task is a subtask of a primary task.

6 OUTCOME OF THE PROJECT

The outcome of the project is the Functional requirement specification of TIMS2.

FRS of TIMS 2 was presented to the management on 1.6.2016 in a presentation held by me. Most of the stakeholders of Technical Information were present, including the General Managers of TI-FI and TI-IT. The presentation went well, some questions were raised and most of them I, and the team, was able to answer on the spot.

After the presentation a two week period was set for the involved persons to get back to development team and have time to ask more in-depth question and suggest improvements. During this time a few questions and improvement suggestions were gotten. Also one clarifying meeting with primary stakeholder Contents Distribution was held on 8.6.2016

The FRS of TIMS 2 was approved at the end of June, with the additional wishes that we will look into the suggestions given. And a promise was made to do so.

The development team was not able to gather together during most of the summer as at least one of the team members was on summer holiday or otherwise unavailable. It was decided that the continuation meeting would be held after the holiday period would be over.

On 23.8.2016 was the date that we finally got a meeting together. At time I and Mathias learned that our software developer Olli had found new work and was going to transfer there in three weeks. We agreed upon that we will hold additional meetings in rapid succession and see if anything is left to do or improve.

Some improvements were made together with some streamlining of the functions. At the end FRS was running well and been thru full scrutiny three times. I believe the specification is in good working order.

The creation process was long, with time allocation making it much longer than it needed to be but, of course, daily jobs need to be done too. A lot of different things were learned through the project from project leading aspects and from creation of specifications. None of us had good knowledge at the beginning, but after the project each one could be a valuable asset in the following projects should they come our way.

One of the things I learned was the handling of group dynamics and how differently people understand different things. One might need written information to analyse the case while for others the discussion on the topic is fine. Also persons might be talking about the same thing, but just from a slightly different perspective and they actually do not understand others point because of that.

The specification creation process is hard and long, but I think that it is very beneficial to the success of the project. It lays sound foundations for the developers and assurance to the customer that the important things are actually known and will be dealt with. Also, the one thing that cannot be brushed away is feature creep. The menace of long projects is that new functionalities are invented during the development period and those ambush the team and wreak havoc on the timetable and plans. Having a clear structure of how the development proceeds causes new ideas either to wait for the next revision, if minor, or the team to make a plan for it, if major, (like platform change). Also, if SRS requirement collection has been successful, there should be no new big features as those are already collected before. Of course sometimes organisations or way of working change and that causes aftershock to the development plans currently on the way.

But as for this project, I believe this was a successful project even if took more time than planned. Next time I will be more prepared for different time consumptions of project phases. That is where experience is very helpful.

This FRS that we have created will be a great base for a programming team to start their work and I think the project made with this base will be a great success.

7 WHAT'S NEXT – HOW THE PROJECT CONTINUES

Things at the case company have been changing after this work was done and accepted by the managers. The plan was that after completing the FRS, the focus would be to start preparing the coding process and Technical Specification after that.

As it happens, one of the worst scenarios came to be and the main resources for project changed jobs. I changed to another team, which is not critical to the project. Also the project developer changed to another firm and that was critical to the project continuation.

As I write this, the TIMS2 project has stopped dead on tracks. At least for now, TIMS2 is not going further. Luckily FRS is complete and the project can continue from this point with some effort. I have made three suggestions about what to do with the project from this point on and all of them are equally valid.

1. A new person could be recruited in the coding department and assigned to TIMS2 project. Hopefully that person is skilful enough to create a good new version of the program. After a period of getting used to our WOW and learning the specifications, coding can start and the project could continue.
2. A decision will be made that TIMS2 project shall be ordered from an external company and the project will continue with assistance from Wärtsilä personnel
3. The TIMS2 project has reached its end and will be shut down until further notice, perhaps even permanently. The project has encountered a critical incident and that is it. With no resources to be found inside and no funds to order development from outside resources, project has reached its end.

Each of these possibilities has its own merits and the first two require that a new project lead to be appointed to this project. My suggestion is that a person from the requirements development team should be the number one selection for position change like this. Reason being that while developing a requirements for a project, persons included in it will develop lot of inside knowledge that might be on the document but for sure some of it will not be in written form. The insights of a person who has been part of the planning of the previous specifications is extremely valuable in the next stages.

The pros/cons of the three suggestions are.

1. Hiring a person to do coding
    a. Pros: development stays in house and can be accurately followed and new features/changes might be easier to make. Expenses are not very high, mainly involved salaries and equipment.
    b. Cons: uncertainty of the quality and ability of the new person, only really known after work is already well on its way. Time consuming, one resource is one resource and it will take time to familiarize that resource to the systems and to the project.
2. Hiring external resources
    a. Pros: Faster completion of the project, timetables can be agreed ahead of time. More resources to use into the project. Assurance that the program will actually be complete at some point.
    b. Cons: Expensive, the costs probably will be many times the expenses of proposal 1. It also needs additional time, care and knowledge from project lead to actually get everything wanted from an outside company. The result might be end up as paying upkeep costs and, of course, the cost of fixing things. Additional features to the program might surprise with costs.
3. Stopping the project
    a. Pros: No more expenses. Project has ended. Was the project necessary? If not, it was much better to stop here than force it.
    b. Cons: There was a need for the project at the beginning, has that changed? Lot of effort has been put into this, at least some part of it will go to waste. Expenses and time lost are going to be lost for good.

What shall become of the TIMS2 project? No one knows, time shall tell.

What is known, is that the System Requirement Specification and the Functional Specification for TIMS 2 have been completed successfully and approved by the management. These documents stay and will at least serve as a basis if the project continues at some point. And if not, those can be used as a reference and a starting point for new system if that is implemented in the future.

And one always should remember, a stopped project is not a failed project. A failed project is the one that was made when it should have been stopped half way thru.

As project lead in this project I thank all the participants in this and creating detailed project plan was an educating experience.

Juha K. Hakala

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