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# Hissin ovien kustannuslaskentaprosessi ja työkalukehitys



Ammattikorkeakoulun opinnäytetyö

Kone- ja tuotantotekniikka

HAMK Riihimäki, 13.3.2012

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HAMK Riihimäki  
Kone- ja tuotantotekniikka  
Mekaniikka

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<b>Tekijä</b>	Christer Loukas	<b>Vuosi</b> 2012
<b>Työn nimi</b>	Hissin ovien kustannuslaskentaprosessi ja työkalukehitys.	

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## TIIVISTELMÄ

Työn toimeksiantaja KONE halusi tutkia hissien ovien kustannuslaskentaprosessia erikoisovien näkökulmasta. Ovien kustannuslaskentaprosessin parantamisella tavoiteltiin prosessin luotettavampaa toimintaa ilman turhia työvaiheita, jotka kuormittavat jo valmiiksi hyvin kiireistä aikataulua. Kustannuslaskentaprosessin laadun parantamiseksi vaadittiin myös tuotekehitystä, jonka avulla pyrittiin parantamaan sekä helpottamaan ovien kustannuslaskentaa. Työn tavoitteena oli selvittää nykyisen prosessin kehityskohteet ja mahdollisuudet.

Tarvittavien aihealueiden tutkimisessa haastateltiin KONEen työntekijöitä eri työryhmistä kuten: tarjouslaskennasta, projektin hoidosta, materiaalin hallinnasta ja ovisuunnittelusta. Haastattelujen avulla selvitettiin, mitkä kohdat prosessista aiheuttavat virheitä ja hankaluuksia.

Prosessia kuormittavien tekijöiden selvityksen myötä syntyi tarve etsiä mahdollisia ratkaisuja helpottamaan suunnittelijoiden työtä. Opinnäytetyö painottuu suunnittelijan näkökulmaan, mutta myös muut prosessiin liittyvät tahot otettiin huomioon, jotta prosessin kokonaiskuva selkeytyy.

Tutkimustyön tuloksena syntyi monia ratkaisuehdotuksia kustannuslaskentaprosessin kehittämiseen sekä kolme laatudokumenttia, jotka ovat oppaita ovisuunnittelijoille siitä, kuinka ovikustannuslaskentaprosessi etenee.

**Avainsanat** Kustannuslaskentaprosessi, Kustannuslaskenta, Ovisuunnittelu

**Sivut** 29 s. + liitteet 17 s.

HAMK Riihimäki  
Degree Programme in Mechanical Engineering and production technology  
Mechanics

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<b>Author</b>	Christer Loukas	<b>Year</b> 2012
<b>Subject of Bachelor's thesis</b>	The door cost accounting process and tool development.	

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ABSTRACT

This thesis was commissioned by KONE who wanted to investigate the door cost accounting process from the perspective of special doors. The goal of the door cost accounting process development was to make the process function more reliable without the unnecessary operations which were already burdening the pushed schedule. Product development was also needed to get quality improvements which helped to ease and make the cost accounting process better. The object was to clarify the development targets and possibilities.

Different teams were interviewed to research this subject, for example members from the tendering team, material management, supply managers and door design engineers. The aim of the interviews was to locate the elements which were causing difficulties and troubles in the process.

There became a need to look for possible solutions to facilitate the work of the designers when the factors which burden the process became clear. This thesis has its weight on design engineers' point of view but all of the parties which were involved in the process were considered also so that an overall picture could be formed.

Many solution suggestions about the cost accounting process were formed while investigating the problems in the process, and also three quality documents which are guides for the door designers about how the door cost accounting process proceeds.

**Keywords** Cost calculation process, Cost calculation, Door design engineering

**Pages** 29 p. + appendices 17 p.

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Appendix 1 Cost calculation process in customized door engineering

Appendix 2 Cost calculation process development in customized door engineering

Appendix 3 Engineering process diagram

Appendix 4 1332606 – Landing door manufacturing document

Appendix 5 Question list for the interviewees

## 1 INTRODUCTION

KONE sells, manufactures, installs, maintains and modernizes elevator and escalator products while maintaining automatic doors. It is known worldwide for having the most innovative products and services and is one of the global leaders in the elevator and escalator industry. KONE also offers the most developed elevators and solutions for maintaining and modernizing them.

KONE was founded in 1910 and since then it has been a loyal partner for customers. KONE aims to provide the best user experience by developing and providing solutions which makes the people flow in buildings run smoothly, safely, nicely and without delays in the more and more urbanizing environment. KONEs sales were over 5 billion euros in the 2010 and the amount of employees were around 33 800.

The key customers for KONE are building contractors, building owners, facility managers and developers. Architects, authorities and consultants are also in a key role in the decision making process regarding elevators and escalators.

KONE has segmented the markets by the usage of the building. The main segments are residential buildings, hotels, offices, infrastructures and medical facilities. KONE also services special targets like leisure centres, training centres, industrial properties and ships.

KONE has globally hundreds of thousands of customers and most of them are dealing with the maintenance section. The Maintenance section's customers include everyone who has a contract – from those who own a single building to those who own whole hotel chains. KONE has over one thousand offices around the world, eight facilities and seven global research- and product development centres. The headquarters of KONE is located at Helsinki.

Special doors are designed and cost calculated by design engineers at the Deco-department in Hyvinkää. There are very many different kinds of solutions for doors to both marine- and dry land cases and thus there are also many difficulties when handling both engineering and cost calculation successfully as a part of the whole process from the customer's needs to the manufacturing of the elevator.

The target of the thesis is to investigate the cost accounting process of the special doors. As the current state of the process is a bit in the twilight zone it should be defined. At the same time the challenges and the potentials should be described. Weight on this thesis is at the point when the supply line receives the order of the elevator but still everything that is happening around that point is going to be described roughly so that an overview of the whole process is able to be formed. KONE wants as many solutions to make the cost accounting process the best as possible. (KONE website, 20.11.2011)

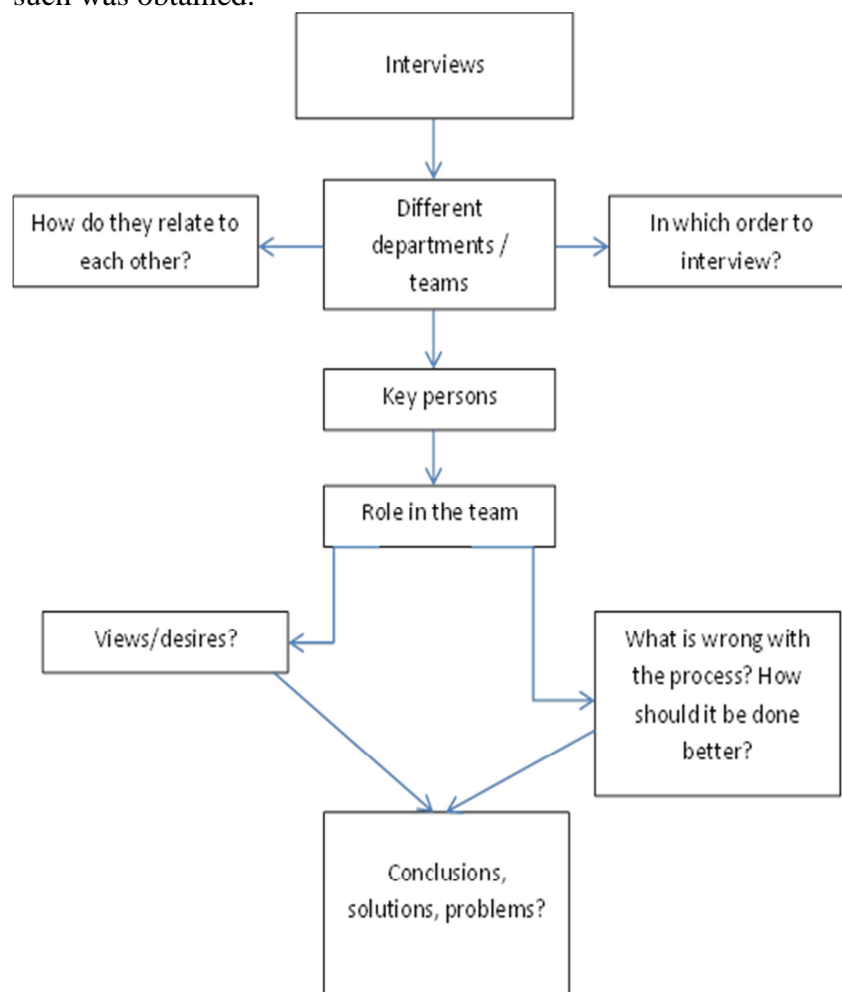
## 2 COMPLETING THE THESIS

The thesis was mostly accomplished by interviewing employees from different departments of KONE. There were meetings where only one person was interviewed and meetings where more than five people took part. KONE made a list that included key persons of different teams which were wished to be interviewed first to get a grid of the process. First it was just gathering some information about different teams and what they do, but in a short while the big picture was able to be formed and it was time to get more deeply into the objective of the thesis. There were also some organization charts and quality documents (KONE intranet, 2011 & KONE EDMS, 2011) which were a great reference to get started.

The margins of the thesis were set to be from a production point of view but for this to be mastered, it is mandatory to get an idea what is happening around it.

### 2.1 Starting the thesis

With this assignment it was very important to create a concept diagram about the interviews which was filled with new information whenever such was obtained.



Picture 1. Concept diagram.

The interviews focused on different departments which are somehow involved with the cost accounting process of the special doors. It is important to interview the members of different departments in some chosen order. In this case the order was selected so that those who are working in the early phase of the process were interviewed first. It is also good to keep in mind that the different departments relate to each other in some way.

Interviewees were mostly the key persons in their teams, for example team leaders with huge amounts of experience and knowledge of the process. This selection was made to get as much facts as possible. There were also newer employees interviewed to get more wideness to the answers and some different kind of approaches to the questions.

The main target of the interviews was to get as much information about that specific part of the process. Interviewees were requested to tell what is being done wrong at the moment. With this information it is possible to come up with a solution that will ease everybody's work. But it is also needed to remember that if one comes up with a solution it might affect another part of the process which is handled by another department or team. Interviewees received a question list well before the interview so that they could take a look at the questions in advance. The question list can be found from Appendix 5.

It is important to keep in mind that when coming up with new solutions for one department, that they do not negatively effect on other departments work or transfer the responsibilities.

## 2.2 Interviews

Interviews were held from June 2011 to December 2011. All of the confidential information has been removed from this thesis. It was shown that some of the answers were from the developmental point of view, which means that the answers were shaped so that the interviewees work would get easier. Some of the answers were more from the organizational point of view so that the possible development issues would assist more the benefits of the organization instead of the employee.

### 2.2.1 Tender team

The tender team is the team that does the cost accounting of the elevators. Interviews started there because they do the job before production. This was highly important when considering the creation of the big picture of the process. Information which was gathered from these interviews was mainly about the cost accounting process and the communication between the design engineer and the tender engineer.

These interviews revealed that there are some major communication problems between these two teams which needed to be clarified. Tender



engineers were also able to give information about the price lists which are used when calculating the costs. (Tender team, interview 7.6.2011.)

The tender team has their own rulebook called the Project tendering handbook, which includes information on how the work should be done and how the whole process proceeds. The Project tendering handbook had a big part in the beginning of the assignment as it involves a huge amount of information about the process. (Project Tendering Handbook V2.0, 2011)

### 2.2.2 Supply managers

Supply managers are the ones who lead the projects. Supply managers have a budget for a project which they try not to exceed. It was important to keep in mind when interviewing the supply managers that the ideas about what is done wrong in the process are from the point of view where the money is the most important factor.

Supply managers told how the door cost accounting process affects their work. From their point of view it is very important that the costs which door engineers calculate for the tender engineers are as precise and as right as possible. If a door engineer makes a mistake in the cost calculations, it might multiply, for example in the projects with hundreds of doors.

Communication problems between the tender team and design engineers were brought up by supply managers also. (Supply managers, interview 7.7.2011.)

### 2.2.3 Material management

Material management buys the material from different factories. Communication problems were brought up in this team also but between material management, design engineers and manufacturers.

The material management team was eager to know where the price lists are based on. They also wanted some clarification work to be done about the change management and communication problems related to that. Manufacturers should also use more communication skills to ease the process when the production orders are done (Material management team, interview 9.7.2011.).

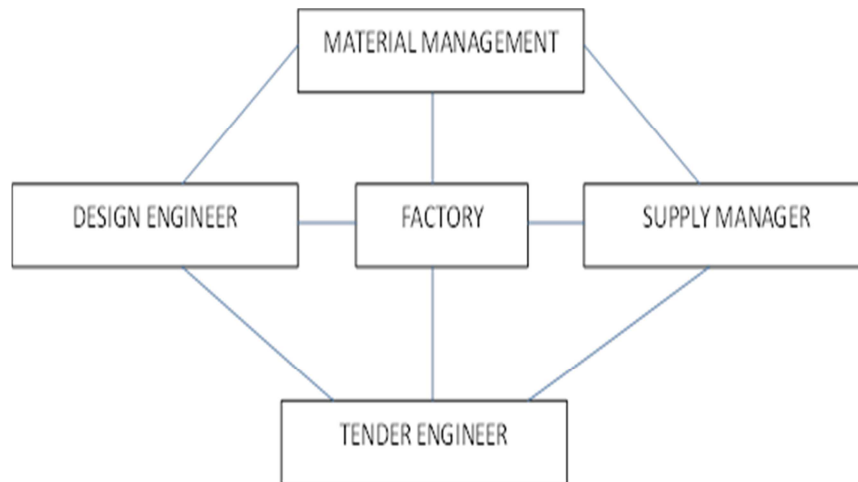
### 2.2.4 Design engineers

From a design engineers point of view it is most important to find ways to make their work run faster and easier. Design engineers wanted to know if it is possible to create an excel based program which helps them to do the cost accounting so that they would not need to use the printed price lists and to make the cost accounting more reliable by diminishing the chances of mistakes. It would also be very important to know what kind of information the material management team really needs from them when

inserting the costs to the common database. (Design engineers, interview 10.8.2011 & DECO presentation slideshow, 2009)

### 2.3 The big picture

After finding out the needs of the different teams involved in the whole production process a bunch of questions about the anomalies need to be created together with the the possible solutions for these. As the pieces of the process have been organized it almost seems like it is one big loop, if it is viewed from the distance.



Picture 2. Big picture.

As the picture shows, the design engineers work affects tender engineers and material management. Tender engineers work affects both supply managers and design engineers. Material managements work affects supply managers and design engineers. Supply managers work affects both tender engineers and somehow material management. It is also shown that every team is linked to the factory. (KONE organization chart, 2011)

It is clear that it is very challenging to find a solution which helps one of the teams without being a bother for the others as they are all linked somehow together. In this case the most effective way is to start to investigate the possible solutions one by one.

#### 2.3.1 Factory

As the manufacturer gives the price lists which design engineers, tender engineers, supply managers and material management use it would be very important to know how those are formed. Do the price lists include the raw materials price only or are the working hours included also? (Interviews, 2011)

### 2.4 Problem solving

There were many e-mail conversations opened between the teams. Some of the e-mails were intentionally made hazy so that it would open the discussion to the next level. After a few conversations between the teams it turned out that there are several things which every team wants to change. (Email conversation chains, 2011)

#### 2.4.1 Communication

Communication problems should not be an issue in any corporation. Almost every team wanted to implement or update a file which includes contact information for example, who to contact if one has a question about product development issues of doors etc. (Interviews, 2011)

It was shown that the communication problems generally need to be taken care of.

#### 2.4.2 Automation

Mostly design engineers and material management team wanted to automatize their work more. For example design engineers wanted to have a program which does the standard components pricing automatically and only leaves the custom solutions cost calculation to the engineer. The material management team wanted to have a solution that makes the change management more reliable. Without automation, the change management relies too much on the design engineer (Interviews, 2011).

#### 2.4.3 Design engineers

The current state of the door cost calculation process was needed to investigate. The thing is that no unnecessary work should be done. There are some quality documents which show the current state of the process (KONE EDMS, 2011). After studying the documents, it was necessary to start to investigate the process steps one by one and try to remove all of the unnecessary ones. There were a few points which looked like they might be removable but as a matter of fact they were not. Luckily there were a few things that could be changed in order to make the process a bit better.

The reference library, the door cost calculation excel file, repetition of errors and volume effect are in key position of this assignment.

### 2.5 Reaching the solutions

As the interviews had been completed it was time to go into the target of the assignment and start looking for possible solutions for different anomalies of the process.

It all started by listing the things that are not done the way they should be done. There were some key points, such as volume effect, the reference library, communication problems, repetition of errors, change management, production orders and price lists that need to be improved. A few of these were as a matter of fact target items of the assignment, for example volume effect, reference library and change management.

Another target of the assignment was to sort out the possibilities of the current process. After getting into the process it was seen that the process is easily automated and that is a huge possibility. Another possibility is the highly skilled employees, it was shown that the communication problems can be diminished and turned into an advantage.

### 2.6 Final solutions

It was known since the beginning that finding possibilities to improve a process which has been valid for years is very challenging. During the time the information was gathered it seemed like there were many things which can be made different when considered from one point of view. But the truth was something else, while the knowledge of the whole process increased it was harder and harder to find the perfect solutions.

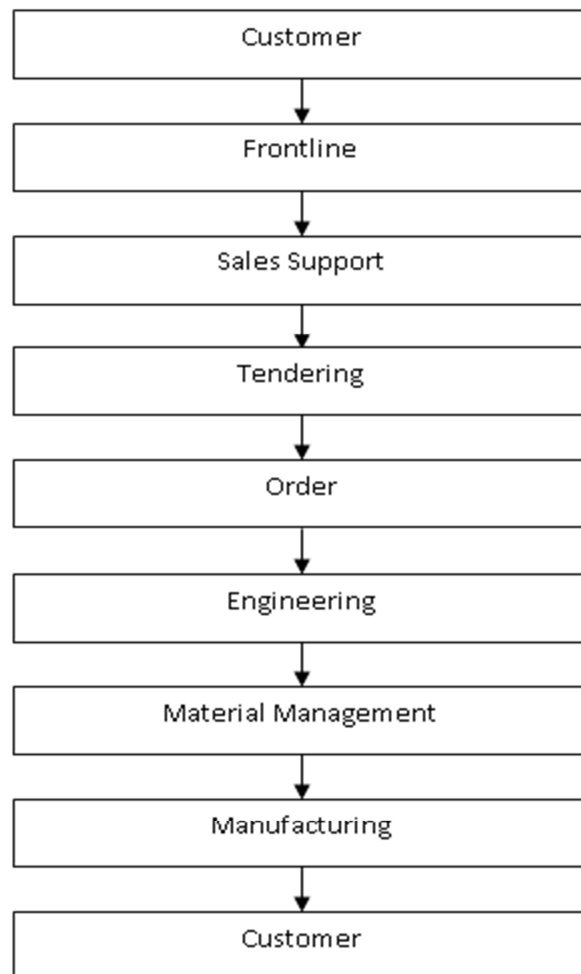
Fortunately there were some key points which needed improvements, some less and some more important. Almost the whole door cost calculation process became more time-efficient, the door cost calculation excel tool was described and change management was proposed to get automated.

### 3 COST ACCOUNTING PROCESS

The following headings will explain the whole process from offering the elevator to the customer, the manufacturing of it and the installation. Appendix 3 shows more exact information about the process.

#### 3.1 Process diagram

The following process diagram will give a rough explanation about how the process proceeds from the point when the customer is willing to buy an elevator to the point when the customer receives the elevator. (Appendix 3, 11.12.2011)



Picture 3. Process diagram

- Customer = Is willing to buy an elevator
- Frontline = Offering the elevator
- Sales Support = Helping the Frontline
- Tendering = Pricing the elevator
- Order = Order is received
- Engineering = All necessary engineering will be made
- Material Management = Buys the material from manufacturer
- Manufacturing = Manufacturing, packing, freight
- Customer = Receives the elevator

### 3.2 Race for the order

The whole process begins when the customer's building is reported to the elevator markets. The same areas local KONE sales company, called frontline, contacts the customer and offers KONE's elevators to the customer. The customer is now asked to fill in specific templates which include information about the elevators and elevator types they want to their building.

After this frontline sends the specifications to KONE sales support which forwards them to the right tender team to do the pricing of the elevator. (Tender team, interview 7.6.2011 & Project Tendering Handbook V2, 2011)

#### 3.2.1 Tendering the elevator

Usually at the tender phase the specifications are not in the final condition but they are precise enough for pricing engineers to create a competitive bid of the elevator.

A tender engineer sends a bid to the customer and after that KONE waits for an affirmative answer for the bid proposal. If the customer approves the bid, it means that KONE has won that specific project and an order is being created. Sometimes a customer may want to open a design order, which means that the customer buys the layout drawings of the elevators first, and after that the customer decides whether he or she wants to turn the design order to an order. (Tender team, interview 7.6.2011 & Project Tendering Handbook V2, 2011)

When the elevator is sold for some amount of money KONE agrees to deliver the elevator with that specific price. If the pricing is made incorrectly, for example the amount was way too less, the project will do minus which means that the pricing needs to be done very carefully and sometimes it is needed to be directed to the component designers.

Tender prices have nothing to do with entirely right costs as it is almost impossible to give an accurate cost at the point when the specifications are not in the final form.

#### 3.2.2 Problems in door pricing

If some problems occurs when accounting the costs for the doors, tender engineer contacts Deco-team which is responsible for all designing of the special doors. Tender engineer needs to provide precise specification of the special doors and materials for the designer so that the cost accounting for that door can be made as well as possible. After the door has been cost calculated by designer he or she will give the cost estimate for the tender engineer.

### 3.3 Receiving an order

After the order for the elevators is received KONE layout team starts to draw layout pictures for the project. Layout drawings shows all of the mandatory components that are needed when manufacturing the elevator, those are mostly about the hoisting function. Layouts includes shaft dimension checking which means that the dimensions are checked so that the car and other components fits to the elevator well. Layouts also confirm for example that the downwards oriented forces are not too much for the machinery to hoist.

After the layouts has been approved by the customer and the frontline KONE listing team starts to list the elevators which means that they create specific order forms for all of the component groups for the elevator. When the order forms are ready design engineers can explore those and start to do the engineering.

#### 3.3.1 Layout engineering

Layout drawings are made with program called AutoCad which is very commonly used in 2D-drawings. With KONE EngCalc program the layout engineer calculates the forces mentioned earlier. Layout pictures are very useful for all component engineering because those includes important information, such as building interface and the main dimensions.

#### 3.3.2 Listing engineering – creating an order form

Listing engineer needs to be very aware of every single component that needs to be put in the elevator. Listing engineer creates an order form which includes all of the information needed to do the precise engineering. Listing engineers main tool is SAP(ERP) system where the forms are created.

Doors will be listed with 2 separate categories: landing doors and car doors.

### 3.4 Door engineering

After the listings have been completed component designers starts to do their engineering which is called doing the manufacturing documents. Door engineers pick their own order forms from the SAP, which are shown in picture 4. They start to examine what the order form seals in and after everything is clear he starts to draw the needed pictures for the doors. Drawings are made by program called KVertex – one example of manufacturing drawing can be found from appendix 4. If the door is very special it takes much more time than almost standard door.

**SL Order Management**

Status DocFlow Cost CostDetail Bom & Bom Bom Bom Docs Bom Bom Bom Switch

Sales Document: 8225635 SHOPPING NIVELLES LIFT A07 Ref. Order: 4147760 /000210 SL Loc.: SL  
 Sold-to party: BEL-0002 KONE Belgium S.A. Ref SalOrg: GSL Network: 1976056  
 Sales area: 6SL 99 91 Global Supply Line, KONE SL Intercompany REF PO: 6063978 /  
 Sales office: 6SL2 Hvnk Cust service KONE Equip: 11360978 RefNetwork: 734530  
 Sales group: 601 KONE Internal  
 PO Number: 6063978 PO date: 07.07.2011 Header sta:  
 Request.dlv.dt: 28.02.12 DelivBlock: Bill.block: SalesDocTy: YSL0

Sales Doc.	Item	Description	Material	E6p	Prod.Ord.	Started	Finished	Purch.Orde	Stat.d.d
8225635	000010	PW33/10-19	KM_MONOSPACE_SP	009	In work	27.10.11			
8225635	000020	GUIDERAILS, MONOSPACE SP MX20 MX10/16	KM_MS_GUIDE_RAIL	02				Completed	10.10.11
8225635	000030	Ropes and grips	KM_ROPES_BU2	03				Completed	10.10.11
8225635	000035	CAR SLING, CF10USH/CF16USH/CF16UPM	KM_SO_07_91_015	04				Completed	14.10.11
8225635	000040	OSG PACKAGE, PACKAGES FOR OL35	KM_SO_04_11_025	04				Completed	14.10.11
8225635	000045	CWT FRAME, CWT3PS/CWT4PSM	KM_SO_08_04_020	04				Completed	14.10.11
8225635	000048	PIT LADDER, 10 STEP	KM718570602	04				Completed	14.10.11
8225635	000049	CWT FILLER BIT MIX	KM958230C01	05				Completed	14.10.11
8225635	000050	HOISTING MACHINERY, MX20	KM_MX20	01	Finished	04.10.11	07.10.11	Completed	12.10.11
8225635	000060	SHAFT MECHANICS, MONOSPACE SP (MX20)	KM_MS_SHAFT_MECH	03				Completed	10.10.11
8225635	000070	CAR, MCD	KM_MCD	06	Finished	07.10.11	06.10.11	Completed	12.10.11
8225635	000080	DOOR OPERATOR, AMDC2	KM_AMD_C_OPER	10				Completed	14.10.11
8225635	000090	RAILING, AMD LANDING DOOR	KM_AMD_L_RAILING	09				Completed	11.10.11
8225635	000095	TOPMOST COMBO BRACKET	FIC_MODULE_03	03				Completed	10.10.11
8225635	000098	SECOND TOPMOST COMBO BRACKET	FIC_MODULE_03	03				Completed	10.10.11
8225635	000100	AMD car door design 2	KM870001	09	Finished	20.09.11	28.09.11	Completed	11.10.11
8225635	000110	AMD landing door design 2	KM870000	09	Finished	20.09.11	28.09.11	Completed	11.10.11
8225635	000125	AMD landing door design 2	KM870000	09	Finished	20.09.11	28.09.11	Completed	11.10.11
8225635	000130	CAR OPERATING PANEL	KM860100	08				Completed	10.10.11
8225635	000135	CAR OPERATING PANEL	KM860100	08				Completed	10.10.11
8225635	000140	LANDING CALL STATION, KSL670/970	KM857830	08				Completed	10.10.11
8225635	000150	LANDING CALL STATION, KSL670/970	KM857830	08				Completed	10.10.11
8225635	000155	LANDING CALL STATION, KSL670/970	KM857830	08				Completed	10.10.11
8225635	000160	HALL LANTERN INDICATOR	KM856160	08				Completed	10.10.11
8225635	000170	LCE ELECTRIFICATION PACKAGE	KM750300C02	07	Finished	06.10.11	17.10.11	Completed	12.10.11

Picture 4. Order form list in SAP.

Next step for the designer is to modify bill of materials to the SAP system, it means that the items which listing engineer opened to the door manufacturing process is being filled with the correct drawing number. This means that when the items are released for manufacturing, the KONE door factory called TCU is able to get the right manufacturing documents to be manufactured. More about modifying Bill Of Materials to SAP in picture 5.



Result								
Lv	Item	Componentnumber		Qty	Un	ICat	AGrp	ObDp
		Description						
<input type="checkbox"/>	0	0000	KM870001					
		AMD car door design 2						
<input type="checkbox"/>	1	0001	KM870001_SHEET_DWG	2,000	PC	L	X	
		KM870001 sheets DWG numbers						
<input type="checkbox"/>	1	0002	KM870001_PANEL_DWG	2,000	PC	L	X	
		KM870001 panels DWG numbers						
<input type="checkbox"/>	1	0005		1,000	PC	T		
		SHEETS BODY PANEL						
<input type="checkbox"/>	1	0010	KM280995	4,000	PC	L		X
		SHEET, 1.2X1250X2300MM DX51D+Z100						
<input type="checkbox"/>	1	0100		1,000	PC	T		
		SHEETS COVER PANEL						
<input type="checkbox"/>	1	0225	KM281559	4,000	PC	L		X
		SHEET, 0.8X1250X2150MM FLEMISH LINEN						
<input type="checkbox"/>	1	0600		1,000	PC	T		
		REAR PLATES COVERING						
<input type="checkbox"/>	1	1000		1,000	PC	T		
		PANEL - LABYRINTS AND PROFILES						
<input type="checkbox"/>	1	1005	KM731439H11	8,000	PC	L		X
		Chute for Car door HH=2100						
<input type="checkbox"/>	1	1215	KM721923G11	4,000	PC	L		X
		SLAM LIST HH=2100						
<input type="checkbox"/>	1	1245	KM618440G11	8,000	PC	L		X

Picture 5. Modifying Bill Of Materials to SAP.

### 3.4.1 Door cost calculation

At this point it is highly recommended to take a look at appendix 1 (Cost calculation process in customized door engineering) which gives you the accurate information how the cost calculations are done nowadays.

Cost calculation is done every time when the engineering is completed. Cost calculation is not always needed when a change order is made. Engineer needs to check if any references are available, for example same project usually has same kind of doors and therefore the costs are comparable. Engineer needs to be very aware that the reference used is up to date because costs might be outdated since the manufacturing of the reference door.

After reference checking the engineer begins to calculate the door cost based on standard components. Standard components costs can be found from door cost lists which are provided by TCU. Costs are gathered one by one from those cost list excel files. After standard components of the door have been calculated engineer needs to sum the special solutions costs to the calculation. If the engineer is unable to calculate the approximate cost for the special components it has to be checked from the manufacturer, TCU.

The volume effect must be diagnosed. The cost might be much different when the quantity of the door varies. And yet again if the engineer is unable to calculate the volume effect it has to be checked from the manufacturer.

After successful cost accounting the calculations must be saved to a place where they are available for other engineers to use them as a reference in future calculations. (Door Engineering Quality Document, 2011)

### 3.4.2 TCU

TCU is KONE owned factory which manufactures doors. TCU is located in Czech, in a town called Ústí Nad Labem.

### 3.4.3 Cost accounting

“A type of accounting process that aims to capture a company's costs of production by assessing the input costs of each step of production as well as fixed costs such as depreciation of capital equipment. Cost accounting will first measure and record these costs individually, then compare input results to output or actual results to aid company management in measuring financial performance.” (Cost Accounting, Charles Horngren, 2008)

“While cost accounting is often used within a company to aid in decision making, financial accounting is what the outside investor community typically sees. Financial accounting is a different representation of costs and financial performance that includes a company's assets and liabilities. Cost accounting can be most beneficial as a tool for management in budgeting and in setting up cost control programs, which can improve net margins for the company in the future.” (Cost Accounting, Charles Horngren, 2008)

### 3.4.4 Material price variation

There are many causes for material price variance. Reason for variations might be inequality of markets, poor economic situation or even just the fact that raw material is more and more difficult to obtain.

“It may so happen that the unfavorable variance is due to a failure on the part of other department to perform its duties appropriately. For example, bad stock management by the stores department, inability of the sales/marketing department to predict demand accurately, etc, may necessitate purchase of materials at short notice resulting in incurring higher or additional freight and handling charges and sometimes even paying higher price for the materials.” (Cost Accounting, Charles Horngren, 2008)

### 3.5 Checking process

Checking phase is where possible design errors might be noticed. After finishing the drawings those are going to be crosschecked by another door engineer. If there are some errors which has impacts on manufacturing the designer needs to do the mandatory changes to the pictures and the crosschecking is done again if needed.

### 3.6 Status change

Status change is made in the SAP system, status change means that the engineer will give information to the material management team via SAP that the engineering is completed and the drawings may be passed to the manufacturer.

### 3.6.1 SAP system

SAP is a system which was developed in 1972 by five former IBM employees in Mannheim, Germany. It is stated to be the world's largest inter-enterprise software company. The name SAP stands for German words: Systeme, Anwendungen, Produkte – English translation could be “Systems Applications and Products”. (What is SAP? Tom Payne, Cecil Roets & David Schlanderer, July 2006)

Originally the idea of SAP was to provide corporations some base to interact with common database for a wide range of different kind of applications. Many known companies are using SAP nowadays, such as: IBM, Microsoft and KONE.

### 3.7 Insert data to SAP

At this phase the engineer needs to insert the costs to SAP system, it is very important so that the material management team is able to create an purchase order.

Inserting data to SAP is an complicated operation and more exact information about it is available at the appendix 1 (Cost calculation process in customized door engineering).

After inserting all the necessary data to SAP system cost calculation is over and done with.

#### 3.7.1 Confirming the engineering

After the engineering is completed and the proper costs have been inserted to SAP system engineer must confirm the activity that has been pointed to him. While confirming the activity the engineer is going to set off the used engineering hours for those doors. The engineering hours are going to be paid from the budget of the project where the doors were wanted.

### 3.8 Manufacturing the doors

Manufacturing process starts when the purchase order is made by the material management team.

### 3.8.1 Purchase order

When the material management has got the information that the engineering of the doors is ready they will start working on with purchase order. Purchase order means that the material management is going to send an order to the door manufacturer. They will give the information about the manufacturing drawings to the factory and they will also give the cost that the designer has calculated. At this point TCU agrees to manufacture the doors with that precise amount of money. (Material management team, interview 9.7.2011)

### 3.8.2 Manufacturing at TCU

When the purchase order is created and TCU has received it they will start to manufacture the doors when needed with their own methods. If TCU has huge workload they will manufacture it as soon as possible. TCU will take care of the freight and packing of the doors also. Freight is usually by air, by land and by sea depending on the destination country. Usually the terminal which is used is Hamburg.

### 3.8.3 Installation

After all of the elevator components have been sent to the destination site local KONE installation squad will take care of the proper installation of the elevator.

## 3.9 Process is now completed

The process is now completed and it is time to investigate how profitable the project was.

### 3.9.1 Profit calculation

Profit is the positive difference between incomes earned and expenses caused in a business. Profit is the money coming into the business minus money going out from the business

Incomes – Outcomes = Profit

(KONE internal training, 25.5.2011)

## 4 CHALLENGES AND OPPORTUNITIES IN THE PROCESS

This chapter takes a stand about the current processes pros and cons and possible ideas to refine the process so it would run more smoothly. Developing paragraphs has been limited to S-PLANS milestones 1A. to 2F. Change management in orders is going to be investigated while also considering cost accounting references and volume effects.

As door design engineers are now accounting the costs for the doors manually from the door cost list excel files there is going to be a suggestion for excel based tool which makes the process easier.

### 4.1 S-Plan

”The S-Plan is compiled for supporting KONE multinational Frontline-Supply line delivery process. It establishes a common language and provides the basis for planning and controlling the whole delivery process. It also clarifies the actions, schedules and responsibilities at each process milestones. The escalators and autowalks are defined in different delivery classes. The classification takes into account the technical complexity, material availability and the size of the escalator order.” (KONE website, 2011)

More information about the milestones can be found from Appendix 1, Appendix 2 and Appendix 3.

### 4.2 Communication problems

Communication problems are highly common in every single company with different kind of departments which are doing cooperation with each other.

#### 4.2.1 Tender Engineer – Design Engineer

There have been some communication problems between tender engineers and door design engineers. Sometimes it has been challenging for tender engineers to contact designers for support to calculate the cost for a special door. If tender engineer is in a struggle with deadlines he or she is usually not willing enough to contact design engineer because the contact process usually takes some time. This leads to a situation where tender engineers are not able to provide exact cost estimate for frontlines and to the customer. This is due to that tender engineer think that it is not that important to get an exact cost estimate – it is enough to be at the close range.

The situation still is that it would make KONE more competitive if all of the costs are exactly what they are in reality. Elevators profit is going to decrease if it is sold for lower amount of money that it would really cost. Tender engineers are used to yield to the situation where they price the components with the more expensive option.

Sometimes there is a difficulty to understand how tender engineer has managed to price a component at the tender phase when there are situations when even door design engineers needs to contact the manufacturer for support to price the door. (Supply managers, interview 7.7.2011)

### 4.2.2 TCU – Design Engineer

There are some problems at door manufacturing factory, TCU, as they have not been successful to provide the engineers with the information about costs which they give to the price lists. It is not known what the prices TCU gives, contains.

When TCU manufactures a door they have to buy the material from somewhere, it would be more than good to know if for example the freight from the producer to the TCU factory is included in the price lists. If the design engineer calculates the cost for the door he or she does only follow the price lists. If the freight is not included in the price lists the factory will lose its cover. Sometimes the door might be so challenging that it takes a lot of time to manufacture it – this is why there should be some kind of markup included in the price lists.

It would be important to have quality meetings with TCUs representatives and discuss the price lists over. Sometimes there have been quality meetings but only in those cases when the design engineer has calculated the costs downwards. Referring to earlier – TCU agrees to manufacture the door with the costs that the designer has calculated. (Design engineers, interview 10.8.2011)

### 4.2.3 Markup

Markup is a percentage added to the cost to get the retail selling price. (Investopedia, 11.12.2011)

“Certain securities are available for purchase by retail investors from dealers who sell the securities directly from their own accounts. The dealer's only compensation for the sale comes in the form of the markup, the difference between the price the security was purchased at and the price the dealer charges to the retail investor. The dealer assumes some risk by acting in this capacity, as the market price of the security in his or her inventory could drop before he/she is able to sell to investors.” (Investopedia, 11.12.2011)

### 4.2.4 Production order

When there have been some changes in the orders material management team should always do a production order. When the production order has been handled TCU should always delete and confirm these orders. Sometimes those are not deleted and that creates unnecessary pieces of work for material management team to investigate the floating production order yet again.

### 4.2.5 Effects on process

Communication problems do slow down the whole process as nothing seems to be clear for all parties. There should be clear rules for everyone to follow and that would create an ideal process which would run smoothly.

## 4.3 Incorrect cost calculation

Incorrect cost calculation may occur in both tender phase and in the phase when design engineer does the calculation. It is a complex occurrence which effects on the whole project and the profit which KONE should do. It has to be kept in mind that there is always chance for mistakes.

### 4.3.1 Repetition of errors

Repetition of the errors may be fatal for the project. As the project is already sold for some sum of money and the project has some kind of budget it would be important not to exceed it.

In a single project there might be over hundred doors. If the engineer calculates the cost for one door for example 1000€ but the real cost is 2000€ it would already make the project lose whole lot of money.

$$1000\text{€} \times 100\text{pieces} = 100\,000\text{€}$$

$$2000\text{€} \times 100\text{pieces} = 200\,000\text{€}$$

Please not that these costs are fictitious.

Now the project has already lost one hundred thousand euros just with wrong calculations of the door costs and it means that there is going to be much work on trying to fix it with material replacements which are used by the project engineers and supply managers who are coordinating the projects.



### 4.3.2 It could be possible that TCU would do the cost calculations

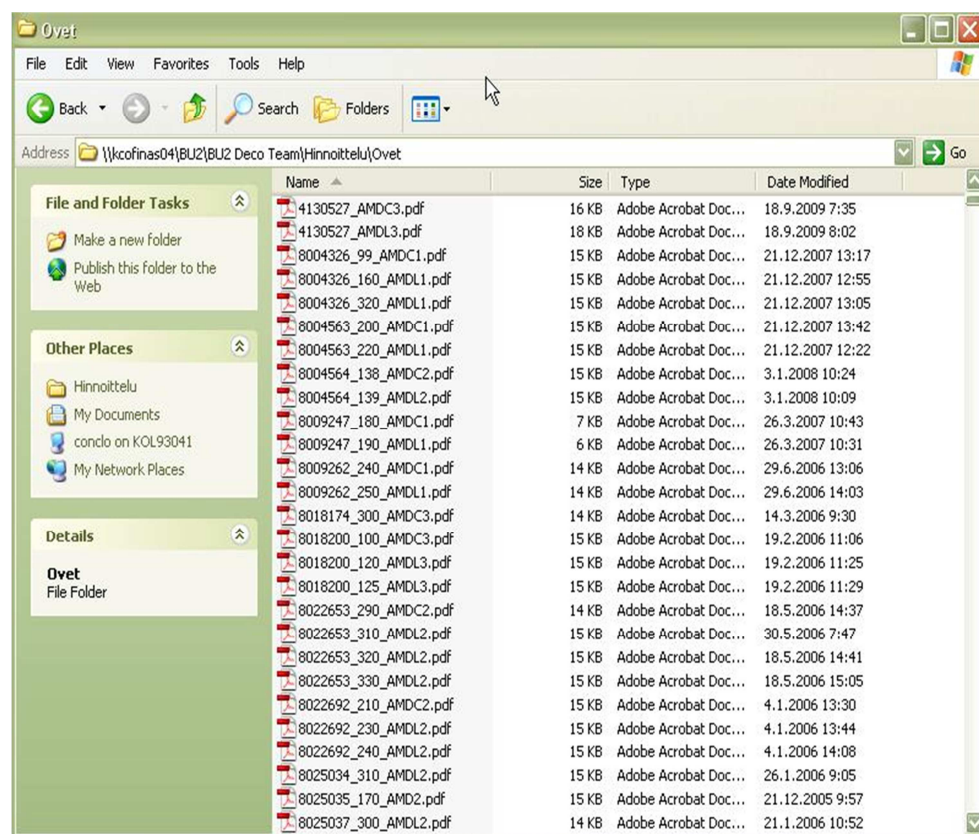
Elevator cars are already priced by the manufacturer – it would be possible with doors also. This would lead to the situation when the costs would always be just right but it wouldn't still eliminate the fact that the tender engineers are also in need of pricing help.

If TCU would agree to price the doors they would also be the main contact for tender engineers in special cases. Of course the ideal deal in this case would be that both design engineers and TCU would price the doors but the design engineers would be the contacts for tender engineers.

### 4.4 Reference library

Reference library in this situation means a network drive where designers upload all of the cost calculation files. At the network they can be used by all of the engineers as a reference for their calculations. Reference library could be a bit better organized to ease the work of the designer.

All of the files should be named as clear as possible so the right one would stick out when exploring the network drive and saved to the folders which are named by the year when the cost calculation was made. Under those folder should be folders which define the door type; for example KES800 (KONE developed door product). This would make the tracking of the references easier when the designer knows what he wants, for example 2011 calculated KES800 door.



Picture 6. Reference library.

It would also help if there were excel based list which is updated after every new calculation, for one row the designer could specify the specialty of the door – for example: golden frames (50mm) with the path to the folder where the calculation may be found. When new cost accounting is started the designer could come to that specific file and use the search function in excel.

CTRL + F = FIND => “golden frames” => found one document

This helps to avoid unnecessary job and it took only minute or two to find a reference. It would take only around 2 minutes always to update this excel but in the long run it would really speed up the process.

When jobs are done faster without possibility to mistakes the corporation saves time. When time is saved with this kind of things it makes possible to do more work. When you do more work you will at the same time do more profit. Customers would also benefit from this as the jobs would be ready faster – without delays.

If the reference library would work properly it would be possible to look up how much the door was worth in year 2010 compared to 2011 – and that would make possible to forecast how much it would approximately be in year 2014.

### 4.5 Volume effect

Volume effect has an effect on costs when there is more than one door. When the manufacturing of the door starts the materials are ordered to make the manufacturing possible. It is always cheaper to buy much material so the price per unit is going to be much less when there are many doors instead of one. The devices which create the components are always configured by the needs. So in that point of view it is also cheaper to do similar components than always configure the tools again because it takes some time.

#### 4.5.1 Volume effect included in reference library

Volume effect could be also followed if those could be included in the references. In the excel file which I mentioned earlier could be a row where the designer could enter the amount of the doors gone with that specific order. Usually when diagnosing the volume effect the knowledge is not passed forward to other engineers verbally so it would be good to mark it up to the files. This would also help the new designers to get a grid out of volume effects and how those affect on the costs for future calculations.

### 4.6 Change management

When the customer wants to change the component that was ordered a change order is being created. Usually the design of the component is going to change and redesigning is needed. Most of the times when the design changes the cost changes also so the cost accounting needs to be done again.

#### 4.6.1 Is now done

When a change request is made the items which were previously released for manufacturing are being dropped to the status where the order is being cancelled for unknown period of time. When all of the manufacturing pictures have been updated the status is going to be changed again to released which means that TCU can continue working on the doors.

The process has a gap in functioning automatically in this situation. Normally material management team gets information about the items being released for manufacturing but when in case of change request the designer needs to inform the material management team via email.

It is completely understandable that when you are used to rely on everything running automatically sometimes there might be a situation that one just does not remember to inform the material management. In these cases material management team needs to do unnecessary work yet again.

#### 4.6.2 Should be done like

This process should be automated in two different ways. The first one is to modify the explorer based page where designers need to fulfill status change request to function so that it would automatically send an email to material management team that there is going to be status change. After the engineering is completed the designer should come back to that exact site and confirm the open service request. At this point the webpage knows to send an email to the material management so the designer wouldn't have to do it.

Other possible variation of automation would be updating the SAP system so that it would understand when the case is change order and when the case is just a normal order. For both cases it would do the same actions and the material management team would always be up to date.

There is going to be new version of SAP so it would be possible to include this kind of solution to it. That would be easy and it would decrease the possibility of the errors.

12

**Item Number(s)**

**Material \***

**Process**  
-----  
**(Elevator level) \***

A  
 B  
 C

**New Status**

**Reason for status change \***

**What has changed**

**ENG FIX work centre**  
-----  
**(if needed)**

**Delivery time after change (MM HH:SS)**

**Additional information**

Sl... B I U [Icons]

Design Preview

Finish Cancel

Picture 7. Website where the change order is made

4.7 Door Cost calculator

Door Cost calculator is an excel based program which makes designers work much easier and more secure. With this program the door cost calculations could be more automated and the amount of errors would decrease as the designer wouldn't need to gather all of the prices by hands from the printed price lists.

4.7.1 How does it work

All of the standard component costs are gathered to the program. With different kind of macros the designer could choose the exact components from pick-down menus and the tool calculates the right costs based on the picks. For example if the door is 2200mm wide and its height is 2400, material is F, Asturias satin the tool could calculate the basic cost for this kind of solution.

All of the non standard – special components are still going to be calculated manually but by automating the calculation of standard costs the process could be made more reliable.

Another possible solution is to use the standard material prices from SAP systems specific .txt files which can be converted to excel. The program is developed to understand the code which SAP is using and it could calculate the cost of the standard solution straight from the order which listing engineers have created. The non standard elements should be calculated manually in this option too. In this case there are huge amount of difficulties to solve and the updating would also be challenging. Considering the fact that SAP system is also going to be updated so this solutions lifespan wouldn't be long enough compared to the time which is used developing it.

	A	B	C	D	E	F
1	Car Door Special Description	(All)	Car Door Special Descr...	Landing Door Special ...		
2	Landing Door Special Description	(All)				
3						
4	Material	Material Cost				
5	Asturias Satin (F)					
6	Murano Mirror (H)					
7	Zinc (Z)					
8	Speciality Cost					
9	Anti Scratch	--- €				
10	Grand Total					
11						
12						
13						

Picture 8. Possible layout for Door Cost Calculator.

<b>Door decoration</b>	Murano Mirror(H)	Zinc(Z)
<b>Car Door Special Description</b>		
<b>Landing Door Special Description</b>		

Picture 9. Another possible layout for Door Cost Calculator.

### 4.7.2 How does it help

The main purposes of the program are to make the cost calculations more reliable and to save time. It is much faster to have a tool to calculate the standard costs than to pick them one by one from the price lists. It is also much more reliable if we consider the situation when working day is almost over and you are still going to need to calculate costs for doors. It is stated that when you are tired the amount of mistakes might increase (National Institutes of Health survey, 28.8.2000). Appendix 2 shows more specific information about how this calculator is going to change the current process.

References are not needed anymore when calculating standard costs – they are only needed when calculating the special solutions costs. Designer doesn't have to create a template for calculations as the tool creates it. By implementing the tool to the process the checking phase will also move its place after the cost calculation is done so the costs will be in that point of view more reliable also.

### 4.7.3 How to update and maintenance

When the tool is developed so that the calculated cost doesn't include supply lines own markup the only update needed is when the price lists change. Price lists are updated yearly so every time it happens the tool must be updated so it includes all of the new prices.

The updating will create work but it is still way more profitable when considering the time that is won with it.

## 4.8 Optimum Process

Optimum process is not going to be built on fixing one giant anomaly but to correct few places where is a chance to do things wrong.

First of all the designers should know what is happening at TCU. Cost lists should be specified and it would be mandatory to know where those are based on. Designer should really know is the markup included in cost lists to be able to calculate the correct costs.

When the cost calculation process starts after the designing it would be a relief to be able to trust the past calculations. This means that the reference library should function like described earlier in chapter 3.4 and it should also be up-to-date.

All of the investigations of the volume effect should be also stored to the calculation files. Designer should always create a note to the calculation files about how much was the volume with this order. It would create a precious database which eases to forecast how much that kind of door would cost in the future.

Change management should be made to function so that every time there is a change order done and it is handled correctly and being released for manufacturing again the material management team would get the information about it automatically. It would lead us to a situation where we wouldn't be forced to rely that the designer always remembers to send an email to the material management team. Response times would decrease considerably when the notification is sent at that precise time and not after one hour or one working day. The responsibility would still be at the designers but in more easy and secured way.

Communication problems are not always responsibility of the company because those are usually based on the employees' ability to cooperate. All of the employees should be briefed about how the process works as a whole. Everyone should also have a contact list which defines who is responsible for what and who is in charge for certain part of the process. In short, everyone should know: "when I do this – it effects on that – and these should know about it".

## 5 CLOSING WORDS

The work was challenging in almost every way possible. At first it did not look like that but it really managed to surprise almost everyone. The interviews took quite a lot of time and studying the process was not an axiom either. I was kind of confused about the fact that almost every possible interviewee had their own vision about how the process should function, in fact I was expecting more homogeneous opinions. The thesis strained a bit and it was very time consuming, at first the thesis was about to be only from the production point of view, but then it was important to add other phases too so that it would not be difficult for a reader to understand the contents. The thesis was mainly completed by interviewing different parties, but there were also some quality documents which were also very helpful.

I am very grateful that I got this kind of opportunity to study the whole process of the elevators life-span. While I received more information about the project and the manners, my interaction skills rocketed when comparing them to the beginning of the thesis. At the same time I was able to create my own social network inside KONE and now I am very familiar with both, the whole process and the cost accounting process. These kind of things are very valuable when considering my future career.

I would like to say huge thanks to both Mr. Marko Viljanen and Mr. Sami Vepsänen from KONE for this great opportunity to study such an interesting case, and for supporting and guiding me with all of the problems that showed up. This assignment could not have been accomplished without the help of all of the interviewees, so I would like to thank them also. Last but not the least I would like to thank Mr. Tapani Termonen from HAMK Riihimäki for supporting me since the beginning to the end and for helping me with the theoretical side of the thesis. Once again, it was great to get such a demanding assignment.



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**SOF ENGINEERING DOCUMENT**

***Cost calculation process in customized door engineering***



**COST CALCULATION PROCESS IN CUSTOMIZED DOOR ENGINEERING**

TABLE OF CONTENTS

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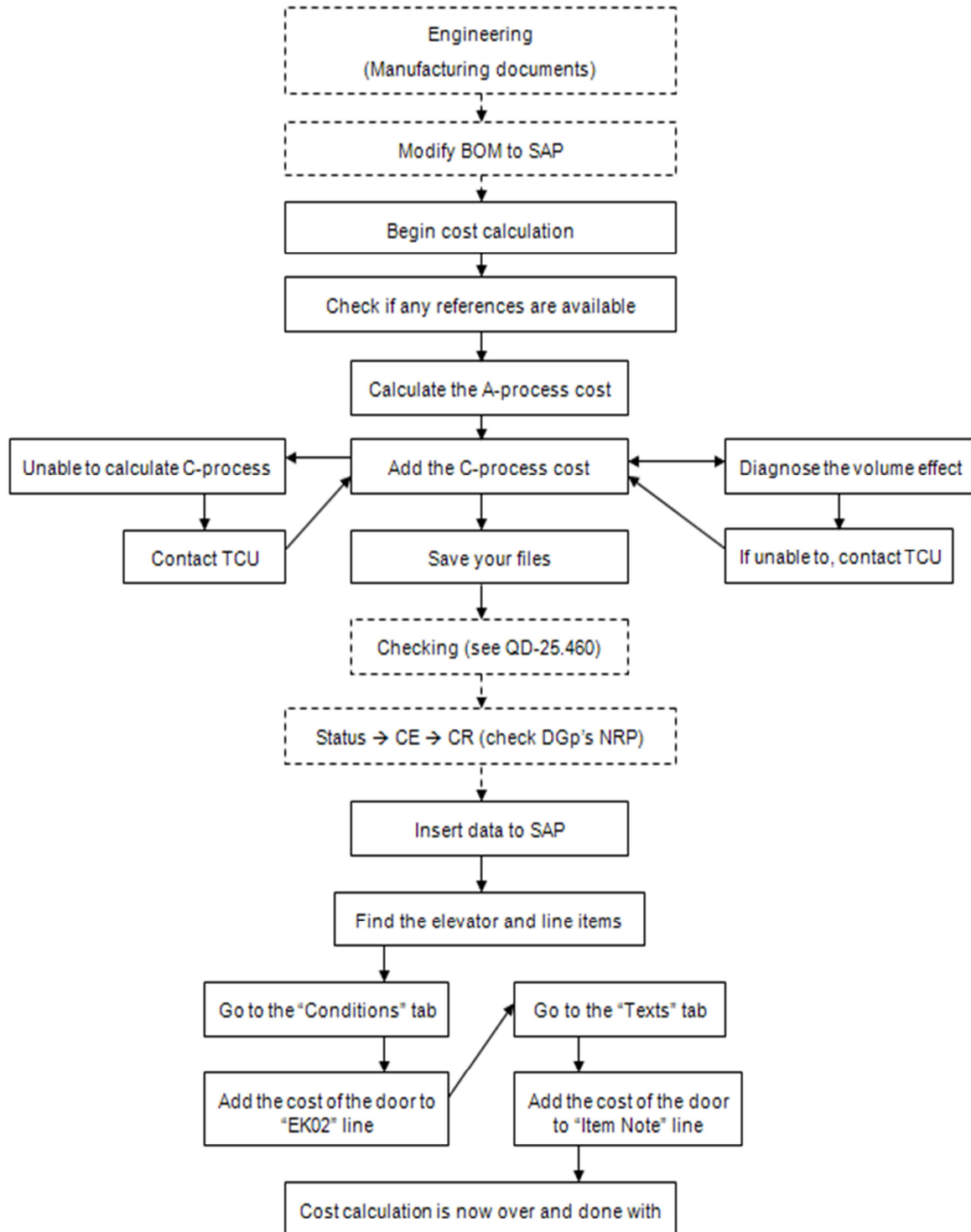
This document is made for KONE Supply Operations Finland (SOF). The Document collects main topics about cost calculation during the whole engineering process. It can be used to learn the process and it gives the exact information what is needed to be done while calculating the costs as well as harmonizing and improving everyday work. The content of this document is made for engineering point of view, but it can be used also for interest groups to learn the process as a whole and understand their own role in it.

**SOF ENGINEERING DOCUMENT**

**Cost calculation process in customized door engineering**



**1 COST CALCULATION PROCESS IN CUSTOMIZED DOOR ENGINEERING**



## **SOF ENGINEERING DOCUMENT**

### ***Cost calculation process in customized door engineering***



## **2 OPERATION INSTRUCTION**

### **Begin cost calculation**

- Cost calculation is done every time when the engineering is completed.
  - Create a new document.
  - Cost calculation is not always needed when a change order is made (Status change to CS).
    - See Chapter 3 at QD-25.006

### **Check if any references are available**

- Explore \\kcofinas04\bu2\BU2 Deco Team\Hinnottelu\Ovet for possible references, for example same project usually has same kind of doors and therefore the costs are comparable.
  - Engineer needs to be very aware that the reference used is up to date.
  - Engineer needs to be absolutely sure that the reference can be used.
    - Costs might be outdated since the manufacturing of the reference door.

### **Calculate the A-process cost**

- Used tools are Door Cost List excels (and 10tool).
  - This is done manually.
    - Gather costs from the list carefully one by one.

### **Add the C-process cost**

- Obtain the special matters in the design and calculate the costs for them
  - Sum the C-process cost to A-process cost and you have the complete cost.
- If you are not able to calculate the approximate cost for special door
  - Contact the TCU and ask for the estimated cost.
- Diagnose the volume effect.
  - The cost might be much different when the quantity of the doors varies.
    - If you are unable to calculate how much the volume effect influences the cost
      - Contact TCU and request guidance.

### **Save your files**

- Save all of the calculation files to \\kcofinas04\bu2\BU2 Deco Team\Hinnottelu\Ovet
  - Now the files you created might be a reference for future calculations.

### **Checking**

- Next move to "Checking process" (see QD-25.460)

### **Status → CE → CR**

- Next move to "Status and NRP" (see QD-25.006)

## **SOF ENGINEERING DOCUMENT**

### ***Cost calculation process in customized door engineering***



#### Insert data to SAP

- Find the elevator and the line items that you engineered.
  - Go to the "Conditions" tab
    - If EK02 line is available
      - Remove it and add it again with the correct cost
    - If EK02 line is not available
      - Add it and insert a correct cost
  - Go to the "Texts" tab
    - Go to the item note line and add ECU FC DDU TERMINAL price
      - Structure of the text added to item note line is as following:  
"Date, Engineers name, ECU FC DDU TERMINAL xxx€, Price according 8xxxxxx\_xxx\_AMDxx"
      - For example: "01.01.2011 Kari Konemies ECU FC DDU TERMINAL 999€ Price according 8123456\_012\_AMDC1"

#### Cost calculation is now over and done with

- Next move to "Confirming engineering activity (DOOR) to SAP" (see QD-25.006)

### **3 MODIFICATION AFTER ENGINEERING IS COMPLETED (STATUS TO CS)**

#### Following is made after the necessary modifications to the drawings are done.

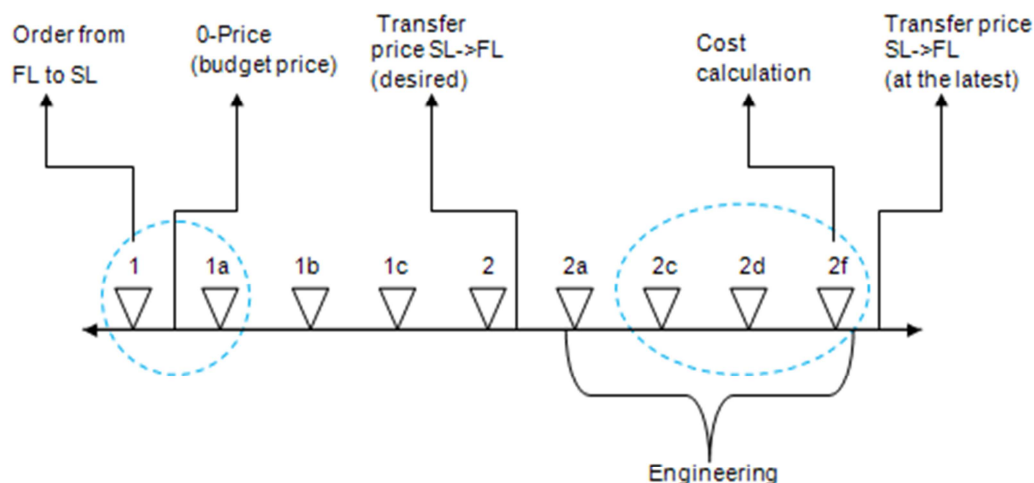
- If the design of the door has changed
    - Calculate the new cost for the door.
      - Go to the SAP and change status back from CS to CE or CR
    - Go to the "Conditions" tab
      - Delete old EK02 line and replace it with the new cost.
    - Go to the "Texts" Tab
      - Go to the item note line and add a revision information (do not delete the old data)
        - Structure of the text added to item note line is as following:  
"Date, Engineers name, ECU FC DDU TERMINAL xxx€, Price according 8xxxxxx\_xxx\_AMDxx.a.1"
        - For example, the item note line should now look like as following:  
01.01.2011 Kari Konemies ECU FC DDU TERMINAL 999€ Price according 8123456\_012\_AMDC1  
10.10.2011 Kari Konemies ECU FC DDU TERMINAL 1050€  
Price according 8123456\_012\_AMDC1.a.1
- Inform ESU MM about the modification, with a short description of changes.

**SOF ENGINEERING DOCUMENT**

**Cost calculation process in customized door engineering**



**4 COST CALCULATIONS EFFECT ON SPLAN**



1 = Make approval drawings 1a = SL submits approval drawings to FL 1b = Submit drawings to customer  
 1c = Receive approved drawings 2 = FL sends final specification to SL 2a = SL approves specifications  
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----- = Supply Line responsibility (SL)  
 Others = Frontline responsibility (FL)

**5 APPROVALS AND VERSION HISTORY**

Compiled by: HCE Christer Loukas  
 Checked by: HCE Sami Vepsänen  
 Approved by: HCE Marko Viljanen

Issue	Date	Description of Change	Ref CR	Compiled By Approved By
-	2011-09-17	First issue		HCE / C.Loukas HCE / M.Viljanen

References to other quality documents:  
 • QD-25.006  
 • QD-25.460

**SOF ENGINEERING DOCUMENT**

**Cost calculation process development in customized door engineering**



**COST CALCULATION PROCESS DEVELOPMENT IN  
CUSTOMIZED DOOR ENGINEERING**

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4	COST CALCULATIONS EFFECT ON SPLAN .....	5
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This document is made for KONE Supply Operations Finland (SOF). The Document collects main topics about cost calculation during the whole engineering process. It can be used to learn the process and it gives the exact information what is needed to be done while calculating the costs as well as harmonizing and improving everyday work. The content of this document is made for engineering point of view, but it can be used also for interest groups to learn the process as a whole and understand their own role in it.

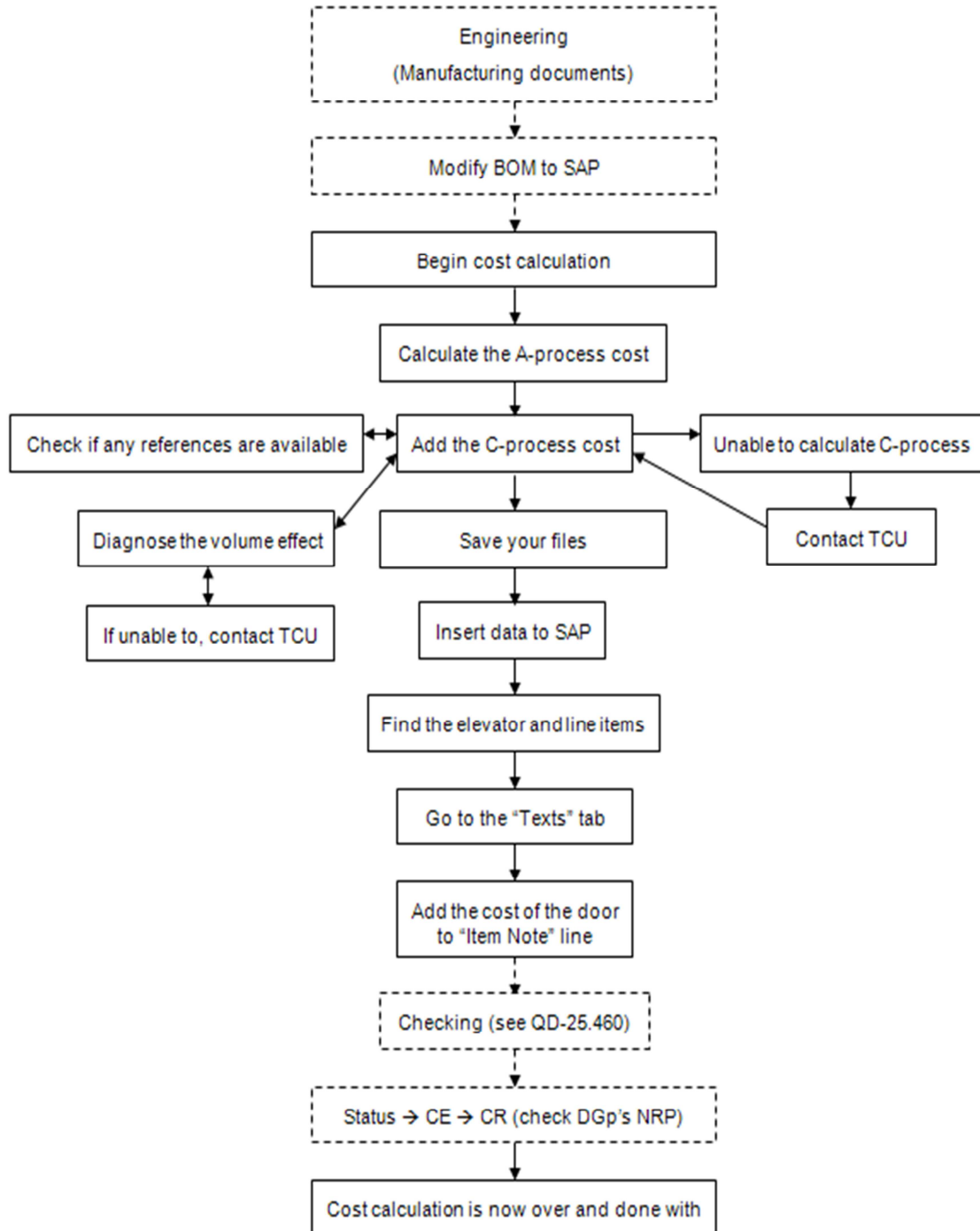


**SOF ENGINEERING DOCUMENT**

**Cost calculation process development in customized door engineering**



**1 DEVELOPED COST CALCULATION PROCESS IN CUSTOMIZED DOOR ENGINEERING**



**SOF ENGINEERING DOCUMENT****Cost calculation process development in customized door engineering****2 OPERATION INSTRUCTION****Begin cost calculation**

- Cost calculation is done every time when the engineering is completed.
  - Cost calculation is not always needed when a change order is made (Status change to CS).
    - See Chapter 3 at QD-25.006

**Calculate the A-process cost**

- *Used tool is Door Cost Calculator.*
  - *Door Cost Calculator gives you the correct cost automatically.*

**Add the C-process cost**

- Check if any references are available.
  - Explore \\kcofinas04\bu2\BU2 Deco Team\Hinnottelu\Ovet for possible references, for example same project usually has same kind of doors and therefore the costs are comparable.
  - Engineer needs to be very aware that the reference used is up to date.
  - Engineer needs to be absolutely sure that the reference can be used.
    - Costs might be outdated since the manufacturing of the reference door.
- Obtain the special matters in the design and calculate the costs for them
  - Sum the C-process cost to A-process cost and you have the complete cost.
- If you are not able to calculate the approximate cost for special door
  - Contact the TCU and ask for the estimated cost.
- Diagnose the volume effect.
  - The cost might be much different when the quantity of the doors varies.
    - If you are unable to calculate how much the volume effect influences the cost
      - Contact TCU and request guidance.

**Save your files**

- Save all of the calculation files to \\kcofinas04\bu2\BU2 Deco Team\Hinnottelu\Ovet
  - Now the files you created might be a reference for future calculations.

**Insert data to SAP**

- *Find the elevator and the line items that you designed.*
  - *Go to the "Texts" tab*
    - *Go to the item note line and add ECU FC DDU TERMINAL price*
      - *Structure of the text added to item note line is as following:*  
*"Date, Engineers name, ECU FC DDU TERMINAL xxx€, Price according 8xxxxxx\_xxx\_AMDxx"*

## **SOF ENGINEERING DOCUMENT**

### **Cost calculation process development in customized door engineering**



#### Checking

- Next move to "Checking process" (see QD-25.460)

#### Status → CE → CR

- Next move to "Status and NRP" (see QD-25.006)

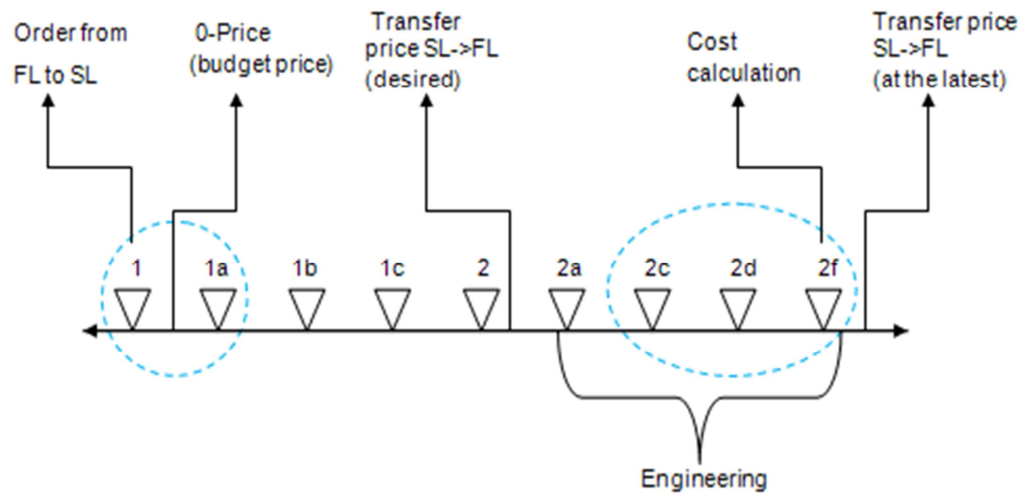
#### Cost calculation is now over and done with

- Next move to "Confirming engineering activity (DOOR) to SAP" (see QD-25.006)

### **3 MODIFICATION AFTER ENGINEERING IS COMPLETED (STATUS TO CS)**

#### Following is made after the necessary modifications to the drawings are done.

- If the design of the door has changed
  - Calculate the new cost for the door.
    - Go to the SAP and change status back from CS to CE or CR
  - Go to the "Texts" Tab
    - Go to the item note line and add a revision information (do not delete the old data)
      - Structure of the text added to item note line is as following:  
"Date, Engineers name, ECU FC DDU TERMINAL xxx€, Price according 8xxxxxx\_xxx\_AMDxx.a.1"
        - For example, the item note line should now look like as following:  
01.01.2011 Kari Konemies ECU FC DDU TERMINAL  
999€ Price according 8123456\_012\_AMDC1  
10.10.2011 Kari Konemies ECU FC DDU TERMINAL  
1050€ Price according 8123456\_012\_AMDC1.a.1
- Inform ESU MM about the modification, with a short description of changes.

**SOF ENGINEERING DOCUMENT****Cost calculation process development in customized door engineering****4 COST CALCULATIONS EFFECT ON SPLAN**

1 = Make approval drawings 1a = SL submits approval drawings to FL 1b = Submit drawings to customer  
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**5 PROCESS DEVELOPMENTS PROS & CONS****What has changed?**

- References are now needed only when investigating C-Process cost (earlier also needed when calculating the A-Process cost)
- Door Cost Calculator creates the template for the cost calculation (earlier engineer had to do it all by himself).
- The EK02 cost is no longer needed in SAP (now the engineer is only demanded to add the cost to the "item note" line).
- Checking and Status Change operations are now done after the completed cost calculation process.

**SOF ENGINEERING DOCUMENT****Cost calculation process development in customized door engineering****Pros**

- Investigation of the references is not needed when calculating the A-Process costs.
- Door Cost Calculator
  - The quantity of errors will vanish because the price lists aren't needed anymore while calculating the A-Process.
  - Cost calculation Process will be extremely faster and easier.
- Huge amount of time will be won when the EK02 cost is no longer needed in SAP.
  - This occurs clearly when there is a project with a lot of elevators.
- Checking process will now include the costs also
  - This reduces the amount of mistakes where "item note" cost is forgotten.
    - And this eases the work of ESU MM.

**Cons**

- Challenge
  - Who is responsible for updating the Door Cost Calculator
    - This will be clarified whilst the concept of the Door Cost Calculator is completed.

**6 APPROVALS AND VERSION HISTORY**

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Checked by:	HCE	Sami Vepsänen
Approved by:	HCE	Marko Viljanen

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**SOF ENGINEERING DOCUMENT**  
*Engineering process diagram*



**ENGINEERING PROCESS DIAGRAM**

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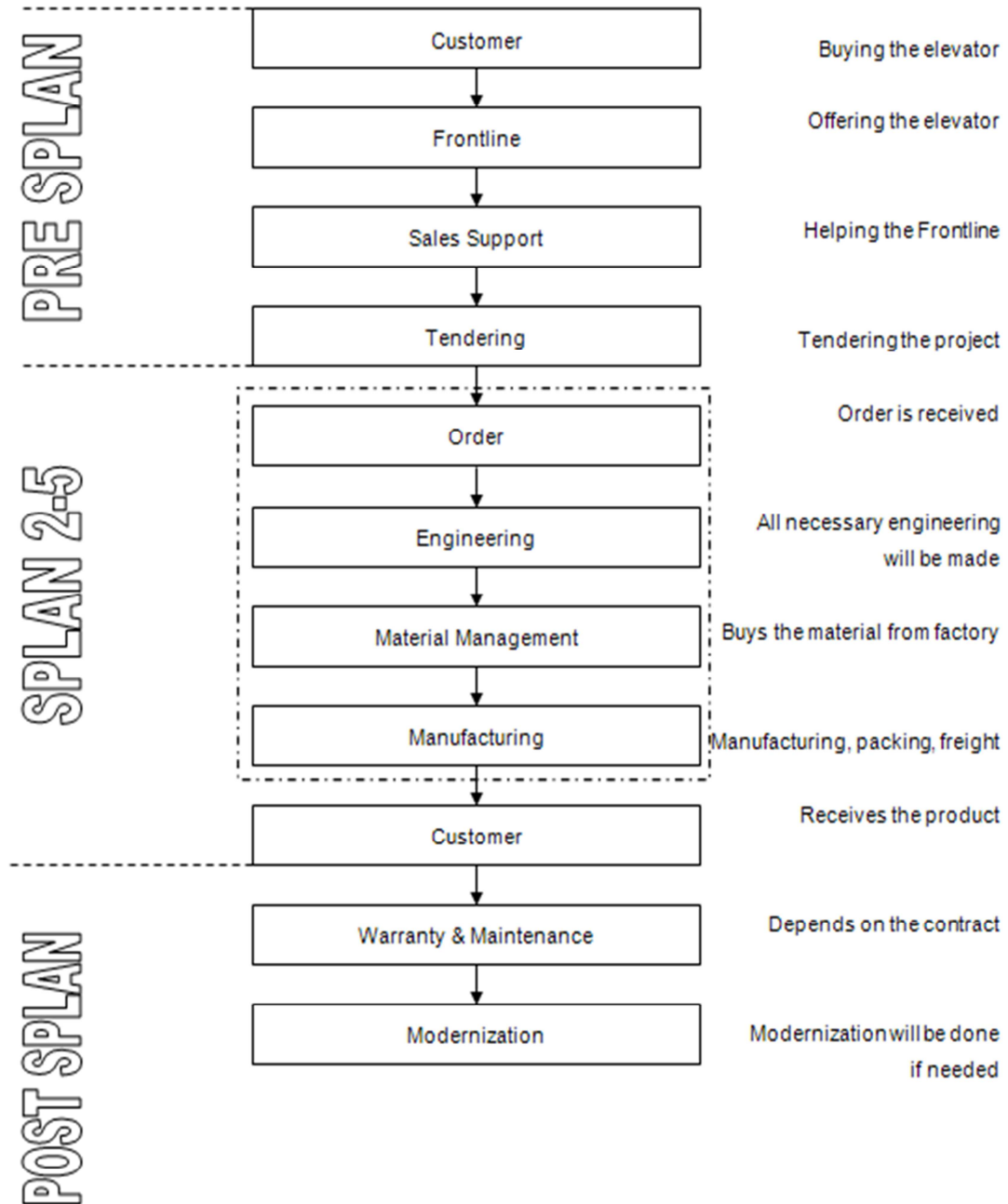
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2	PROCESS DIAGRAM IN ENGINEERING POINT OF VIEW.....	3
3	SPLAN.....	4
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**SOF ENGINEERING DOCUMENT**  
*Engineering process diagram*



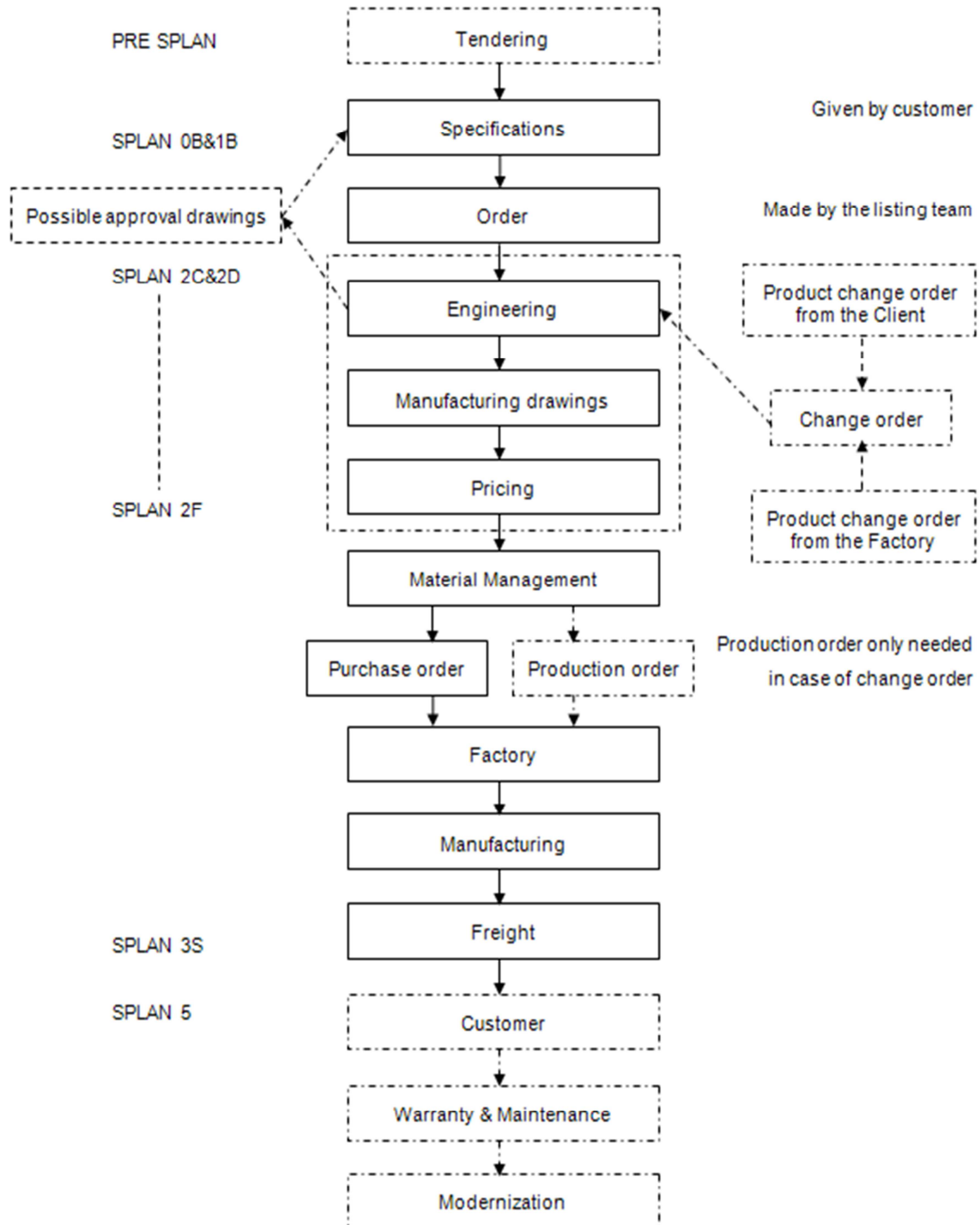
**1 ELEVATORS TIMELINE**



**SOF ENGINEERING DOCUMENT**  
**Engineering process diagram**



**2 PROCESS DIAGRAM IN ENGINEERING POINT OF VIEW**

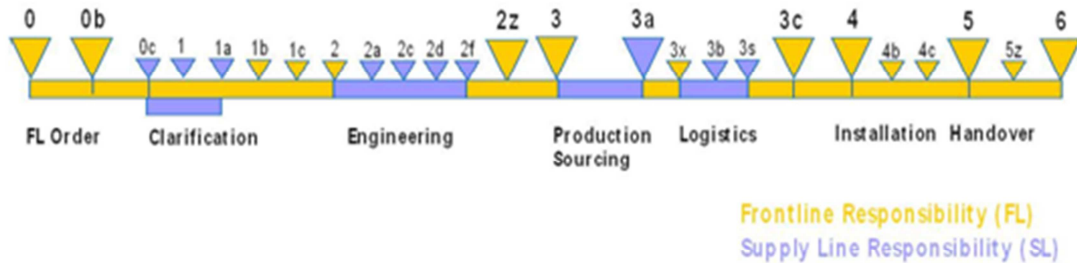




**SOF ENGINEERING DOCUMENT**  
**Engineering process diagram**



**3 SPLAN**



Main milestones	Project steps
0 Customer order received	0c SL receives purchase order and specification
0b Customer order booked	1 Make submittal drawings
2z All issues clarified	1a SL submits approval drawings to FL
3 Point of no return	1b Submit drawing to the customer for approval
3a Material ready at distribution centre	1c Receive approved drawings
3c Material complete on site	2 FL sends final specification to SL
4 Installation started	2a Technical specification approved by SL
5 Customer handover completed	2c Listing completed
6 Project closed	2d SL order confirmation
	2f Engineering completed
	3x Confirm delivery date and details
	3b Shipping date (actual)
	3s Material in the agreed location according to the delivery term
	4b Equipment installed
	4c Completion of installation
	5z Equipment ready to be put in to service

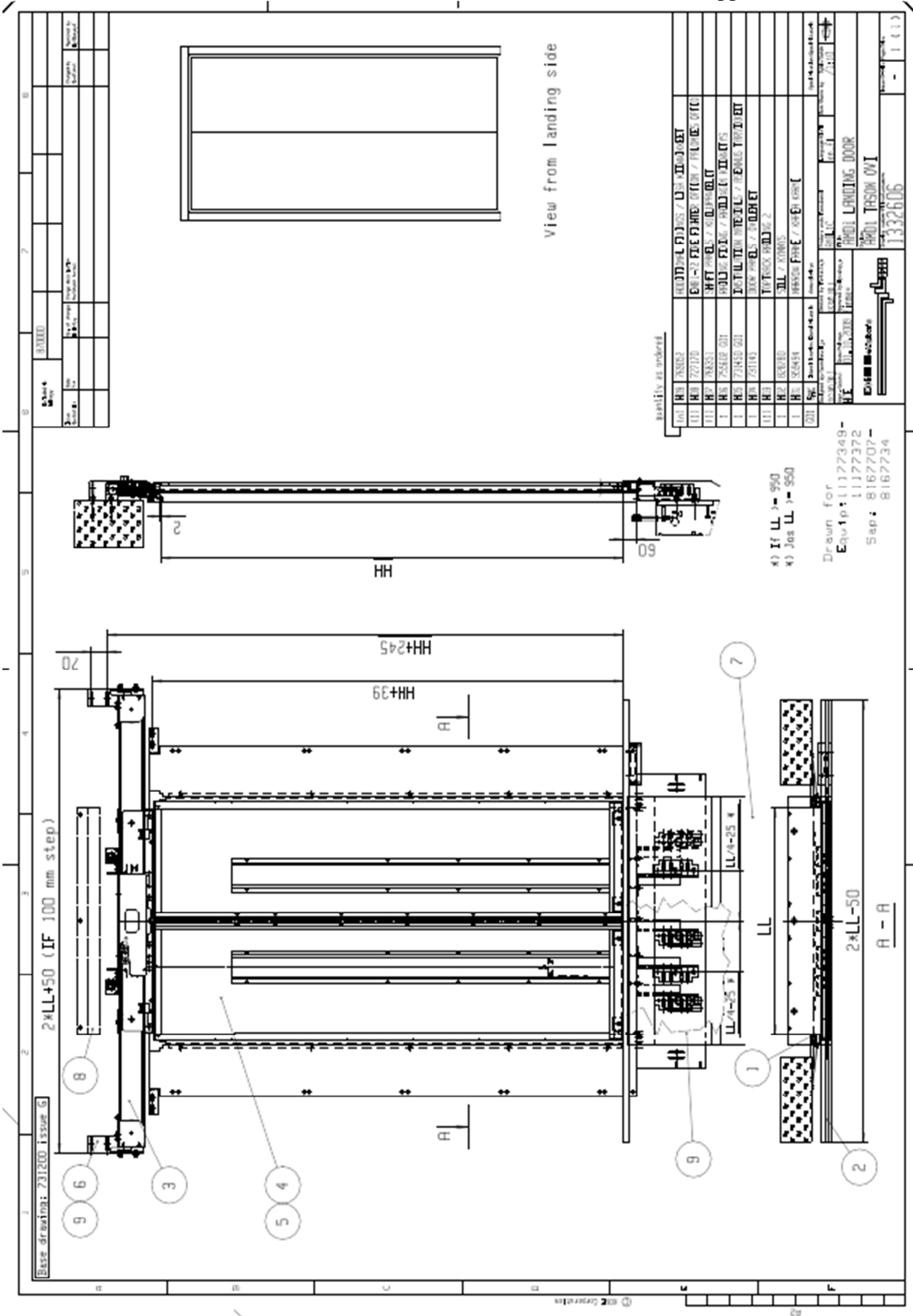
**NOTE**  
Some project steps are not applicable to all processes

**4 APPROVALS AND VERSION HISTORY**

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Question list for the interviewees:

Following questions were presented for all of the interviewees (there were much more questions too, but these were the ones that every team had to answer):

What does your team do?

Which teams are you most likely co-operating with?

Are there any anomalies between the teams you are co-operating with?

If yes, do those affect your work negatively?

If yes, would you have any solution how to fix those things?

Has there been a huge workload considering the last 6 months?

If yes, do you have any thoughts on your mind how to ease the situation?

If no, could it be possible that your team could do some of the works which other teams are doing at the moment?

Is there anything you would like to know about the work of the other teams, when considering Design Engineers, Material Management, Supply Managers or the Tender Team?

What do you think about the situation of the price lists at the moment?

What do you think about the TCU at the moment? What about when you compare the TCU to the other manufacturers?

If there's anything you would love to know about the process, please give me a list of questions so that I can start to investigate the situation and come back to you with a proper answer as fast as possible.