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International Project Management

Planning a Cost Reduction Event

With the aim to identify opportunities for decreasing assembly time

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DISSERTATION

International Project Management
CHALMERS UNIVERSITY OF TECHNOLOGY
NORTHUMBRIA UNIVERSITY
Gothenburg, Sweden 2007

Dissertation for the joint degree

MSc in International Project Management
Teknologie magisterexamen i International Project Management

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International Project Management (IPM)
BE332 Dissertation – Spring 2007
By: Sara Yngvesson

Acknowledgement

With this research project I finish my Master of Science degree in International Project Management (IPM). Hereby I would like to show my appreciation for those that have contributed to making this study possible.

First of all I would like to thank all the people that have taking part in the focus group and helped me to plan the event. Without You the planning would not have been as good as it has become. I would also like to show my gratitude to the people that were interviewed and showed me the way to get a better planning by sharing their experience and knowledge. Further, thanks to all the people at Volvo Cars Corporation, Ford of Europe and Jaguar Land Rover that has supported me in this work.

A special thanks to my supervisor Sven-Åke Erikson, which has helped me with the guidelines for this research project. But I would also like to thank you for being sympatric and supporting in making this study.

Finally I also would like to show my appreciation to my family and friends that have supported me in doing this dissertation.

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Abstract

The car industry is getting tougher and tougher with increasing actors on the market. The situation today is about surviving for the car manufacturing companies around the world. Volvo Cars Corporation (VCC) knows by study that their plants have to become more cost effective to be competitive toward other car companies in Europe. To be able to reach this different type of cost reduction activities has to be carried out. The former arranged cost reduction events at VCC have generated in a lot of cost saving ideas. But many of those ideas have not been good enough for implementation. Therefore it is required to identify new ways to find more qualitative cost reduction ideas.

The purpose with this dissertation is to plan a cost reduction event in form of a "Build Up Event" for Volvo Cars Manufacturing (VCM). The aim of the event is to identify qualitative opportunities to reduce the assembly time on the products of today, but also for coming products. The event should mainly focus on VCM needs to reach cost efficiency. This research study will be the planning phase for a real project taking place at VCM. To be able to accomplish the purpose with this dissertation a main question is identified:

- How to plan the Build Up Event to get qualitative opportunities to reduce added value assembly time?

To write this report different types of sources were used. The theoretical framework builds upon data from books, Internet, lectures given at Chalmers Lindholmen and Northumbria University, and the author's experience. This dissertation will be an empirical study. To collect primary data both a focus group and interviews face to face were taken place. To make this research a qualitative approach is chosen. The conclusions that are made in this research is mainly based on primary data, and complemented by secondary data. An inductive approach is used to develop the new method for planning a cost reduction event. After the planning preparations are made, with this research, the project is going to take place in reality. And if the outcome will be good this method of planning cost reduction events will be adopted as annual work. The validity of this study is high because of the competent and knowledgeable people that took part of making the planning.

The conclusions for this event are that the Build Up Event will take place between week 13 and 17 at pilot plant. During the event two cars will be build parallel according to the sequence in Trim & Final (C-shop). During the event workshops will take place that will follow a specific working method. To support the groups in the idea creation different tools and material are prepared.

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Terminology

BIC	Best In Class
CMT	Cost Management Team
CMT-M	Cost Management Team-Manufacturing
DFA	Design For Assembly
DFM	Design For Manufacturing
FA	Function Analysis
FACTS	Ford And Competitor Technology System
FAST	Function Analysis System Technique
FMC	Ford Motor Company
FoE	Ford of Europe
IE	Industrial Engineering
JLR	Jaguar & Land Rover
PID	Project Initiation Document
PII	Process & Inspection Instructions
PII no	Process & Inspection Instructions number
R&D	Research & Development
TF1	Time Force 1, Added Value Time
TF2	Time Force 2, Non Added Value Time
TVM	Team Value Management
TQM	Total Quality Management
VA	Value Analyse
VCC	Volvo Cars Corporation
VCM	Volvo Cars Manufacturing
VCME	Volvo Cars Manufacturing Engineering
VM	Value Management

1. Introduction

In this chapter the background of why this research is made will be described together with purpose, limitations and the expected outcome.

1.1 Background

The international market of today is by competitive nature. This is something that has led to short reduced price margins and that engineering companies constantly have to improve the product development process and reduce its cost (Sandpit, 2004).

For long term survival of a company a sustainable competitive advantage has to be maintained. Competitive advantage is normally made by developing new products and services that delight and satisfy the customers. But it can also be made by restructure and improving business process to get better quality and cost reduction by adding value. Customers off today demand that the product they are buying is (Brecker, 2001):

- Better
- Cheaper
- Faster

For the company to be able to manage this, the product has to have harmony between design and the process. The customer wants to have value for their money. The car industry is getting tougher and tougher with increasing actors on the market. The situation today is about surviving.

Volvo Cars Corporation (VCC) knows by study that their plants have to become more cost effective to be competitive toward other car companies in Europe. To manage this Volvo Cars Manufacturing (VCM) started a project called “Best In Class” (BIC) in 2006. The aim of the project is to improve efficiency significant by reducing cost. And the target for VCM is to become one of three leading car producer in Western Europe by year 2008. To be able to reach this goal different type of cost reduction activities has to be carried out. The activities have the mission to identify improvement opportunities for reducing the cost in the plants and implementing it at a great speed.

One cost reduction opportunity to reach the BIC target can be found in the added value assembly time. To identify ideas for reducing added value assembly time VCM has earlier arranged Benchmark, Line Walk, Teardown and Cut Up Cars activities. The former arranged activities (also called Events) have generated in a lot of cost saving ideas, both for product price, assemble time and process time. But many of those ideas have not been good enough in terms of quality, economy, time and technical solution for implementation. Therefore it is required to identify new ways to find more qualitative ideas to decrease the cost for building the product.

1.2. Purpose

The purpose with this dissertation is to plan a cost reduction event in form of a "Build Up Event" for Volvo Cars Manufacturing. The aim of the event is to identify qualitative opportunities to reduce the assembly time on the products of today, but also for coming products. The event will mainly focus on VCM needs to reach cost efficiency. The event should also consider poor solutions and quality problems, as well as finding ideas to reduce part price.

If the outcome from this Build Up Event will fulfil the expectations this way of planning cost reduction event at VCM could become the guide for planning coming events.

1.3. Delimitation

This research will take place at Volvo Cars Corporation in Gothenburg. The planning will mainly consider the needs for manufacturing to identify cost reduction ideas. Opportunities within reducing the part price are not the main focus to identify. But part price and assembly time is often linked together, and that is why it should be considered as well. Within manufacturing there are many different cost reduction opportunities that could be handled. This study though will only consider added value assembly time as cost reduction opportunity.

This paper will only handle this specific Build Up Event on a chosen Volvo car. The dissertation is also limited of the planning and the preparation of the actual build up. The result and outcome from the planned Build Up Event will not be considered in this paper. VCM has a budget for cost reduction and some of this money can be used for this event, but the money is limited and if money is needed a request have to be made. This research study will be the planning phase for a real project taking place at VCM. The author of this research is also the project manager of this project. The scope and limitations for the project, and therefore also the planning for it, is given from VCM management.

Besides VCM, Research and Development (R&D) and Team Value Management (TVM) will also take part of planning this event inform of participating in the Focus group (project group). Ford of Europe and Jaguar Land Rover will be informed about this event but they will not be considered during the planning phase. Other companies within the Ford family will not be invited or informed.

1.4. Research question

To be able to fulfil the purpose with this dissertation a main question is identified:

- How to plan the Build Up Event to get qualitative opportunities to reduce added value assembly time?

To answer the main question above, following question will assist:

- Which are the key performance indicators for this event?

1.5 Company description

The company Volvo was founded in year 1927 and the name Volvo is Latin and stand for "I'm rolling". Volvo Cars Corporation is today owned by Ford Motor Company, which influence on how the company is ruled. VCC produces premium cars and in 2005 about 450 000 cars were manufactured. The main manufacturing plants are placed in Torslanda, Sweden and in Gent, Belgium.

Because of the tough market and the hard competition between the different car companies around the world VCC has to become more cost efficient. The whole company is trying to decrease the resources and costs to develop and produce the products. This is something that has to be made without risking the value for the costumers. To manage this different type of cost saving targets are identified. These targets include both running production and coming products. The target for TF1 (Task Force 1), added value time, in running production is in percent on the total TF1. This considers all products for each year and the target is based on bottom line from an assembly instruction system called PII (Process Inspection Instruction). The time is measured in TMU and 28 TMU is approximate one second. For future product the target is similar to the running targets. To be able to reach these targets a lot of cost reduction activities have to be made. The Build Up Event that will be planed and prepared with this research is one of many cost reduction activities that has to be made to reach the targets.

VCC has today a Cost Management Team (CMT) that is lead by the organisation Research & Development (R&D). Within this team manufacturing, market, purchasing and design are represented. CMT is working active to close the cost reductions gaps to target mainly for running production. Normally it is also the CMT that arranges different type of cost reduction events. The author of this research is a part of the Cost management Team at VCC. Therefore CMT will still take part for the planning of the Build Up Event. Previous manufacturing hade a CMT-M (Cost Management Team - Manufacturing) but because of reorganisation at VCM it has been split up. VCC also has a support organisation within purchasing that is called Team Value Management (TVM). They work as a helping tool when it comes to doing cost reduction activities.

A decision was taken one year ago that TVM Ford of Europe (FoE) and VCC should arrange all cost reduction events together. And FoE will therefore also be informed about the planning and preparations for the Build Up Event. TVM FoE work a bit different from VCC in cost reduction and so far they do not consider manufacturing on their cost reduction events.

1.6 Expected result

Here are the expected results from this study:

- A new way of planning and leading cost reduction events has been developed.
- The planning and preparation work is made and the event can now start.
- The event will be well planned and organized so the result from it will be qualitative cost reduction ideas.

2. Literature Review

In this chapter data collected from different type of sources is presented.

2.1 Project

All projects are different and have unique goals and limitations, but there are also some elements that are common. Therefore a project process module can be good to follow (Cadle & Yeats, 2004):

- Pre-project work
- Start-up Initiation stage
- Development stage
- Completion stage
- Operational stage
- Post-project review

Not all of these elements of the model will be used in all projects. But it can be good to use as a template to check that all stages are considered.

2.1.1 Pre-project work

Before the project can start discussions between the customer and supplier to establish the objective and scope has to be made. Often the customer will have arranged a specification on their requirement. A decision also has to be taken if the project should run or not (Bringer, Hastings & Geddes, 2004).

2.1.2 Project start-up

The start-up is an important phase for the project. It is here the base for success or failure is build. Much of the work to come will reflect this stage. A normal problem is the pressure of getting the "real" work started. But at this point it is better to organise the structure making the framework, this will always be well spent time for the project. During this phase a lot of issues have to be addressed and the final details have to be settled. During the start-up it is recommended to ask the following questions (Cadle & Yeats, 2004):

- What is to be carried out?
- Why is it being done?
- Who is going to do it?
- How to accomplish?
- When to be done?

By answer this questions a clearer picture over the project will be exposed. It is important to secure the resources as early as possible. And this does not only include the individuals in the project group but also the equipments and accommodation.

Project Initiation Document (PID)
This document created by the project manager is a product of the start-up. And the project initiation document should be approved by the project sponsor. The format in this document differs between different organisations. Mnemonic OSCAR, is a format that is simple and effective for a PID. By following this format of PID will ensure that the important issues in the start-up are considered. (Cadle & Yeates)

Objective
There are two types of objectives that have to be defined; the business objective and the project objective. The business objective is what has justified the business case for making the project. The project objective on the other hand specifies what the result from the project should be. The project objective is often defined by the Triple Constrains; Time, Cost and Quality:

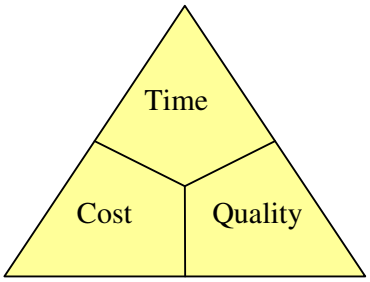

Figure 2.1.2, The triple constrains in project objectives (Bergman & Klefsjö, 2001)

It is the responsibility for the project manager to deliver the project objectives in time, cost and quality. But the manager can not take the responsibility to fulfil the total objectives for the business.

Scope
In the scope the project objectives are explained in detail in terms of what the project includes. The best way to identify the scope is by identifying the deliverables for this specific project. It is important to define what is in the scope but it is also vital to define what is not included in the scope.

Constraints
Constrains discuss more how the project is done rather than what is done on the project. Methods and standards to be used can therefore be included. But also legislations and organisation policies that have to be followed during the project can be mentioned. The constraints can also include the time plan for different type of resources, e.g. people and money.

Authority
The person with the authority is often a senior manager from the customer for this project. This is normally also the person that authorised the project in the first place. Some responsibilities that will follow with this are:

- To agree on the project initiation document
- To make the resources available to the project
- To support and promote the project to senior management in the customer organisation
- To accept the project on completion

Resources
Resources can be people, money, equipment and so on. To identity the resources the project first has to be defined. It is the project manager's responsibility to ensure that the amount of resources involved in the project is specified. The manager also has to inform the authority about this.

2.1.3 Development stage

It is in this stage that most of the suppliers work is made. Many of the activities are under a day-to-day control for the project manager. The development stage can be divided in to following stages, even though this will be distinguished between different projects (Cadle & Yeates, 2004):

- Requirements definition
- Design
- Implementation
- Integration and testing
- System testing

In this stage all of the requirements are specified in detail. This is done to control that all requirements are documented and do not conflict with each other or the business objective. The requirements should be documented so that they will be easy to follow up later on and see if there were accomplished. Customers and users have to be very active during this stage. The design and the requirements have to be met. After this different type of tests are made to see that the function meets the requirements.

2.1.4 Completion stage

The product has been completed and is handed over to the customer for them to make their last examination tests.

2.1.5 Operational stage

This stage begins when the produced product is up and running. This is not included in a normal project phase unless some support or guarantee is set between the customer and the supplier.

2.1.6 Post-project review

A while after the product is up and running a post-implementation review should be carried out. This will consider whether the business case for the project has been accomplished or not, was the expected result fulfilled. The aim to do this is to capture experience and be able to make some improvements to the next project. Issues to consider:

- Technical methods and standards used, how effective these proved to be
- Customer and supplier relationship issues
- Stakeholder management issues
- Team resource issues
- Project performance against plans, with a view to updating and improving that planning and estimating methods used.

2.2 Planning a project

'No plan survives the start of actual project' but if this is the case why do we have to plan it? (Cadle & Yeates, 2004)

Here are some reasons why we still should plan the project (Cadle & Yeates, 2004):

- A project is often very complex and consists of different elements. To manage this with success a careful plan has to be done in advance.
- The people in the group have to know their role, but also what to do and when to do it. This is shown in a plan.
- The customers wants to know what will be done to meet the requests
- If no plan exists, the project manager does not know in which direction to go.

This is why a plan is needed even though it will not survive the first contact with the enemy. The planning process is in big value for the result and it is an opportunity for the project manager to reflect on what has to be done and on how to do it. A good start of a project is to get a proper understanding of the requirements. In an ideal world all projects should start with a requirement specification. Planning is very important to get some quality out of it. A project plan constantly has to be considered and updated after upcoming circumstances. Today there exists a lot of different tools on the market for planning a project and a lot of them are computerized (Boddy, 2002)

Many projects fail to meet the objectives in terms of time, cost and quality. It is often hard to identify and estimate all elements that will influence these objectives. There are two basic ways to put in supporting actives into the planning (Cadle & Yeates):

1. Adding a task in the planning that is called quality review of a number of days to carry out extra activities on.
2. Adding a percentage on top of some or all activities to have some extra time to fix the things that are left.

2.2.1 Tolerances

A project have some objectives that has to be fulfilled, these are usually expressed in time cost and quality. In a project it is also important to know which of the objectives that are stretchable and to what limit. The project manager therefore has to know what tolerances exist in the project and how he is allowed to use them. This tolerance gives the project manager some flexibility to make needed adjustments within the project, but still keeping the control (Boddy, 2002)

2.2.2 Breaking down the work

When the objectives have been handled the actions to meet these objectives has to be considered. What is going to be accomplished and how is that going to be done? There are two functional methods to do this; the work breakdown structure and the product break structure (Cadle & Yeates, 2004)

Work breakdown structure

For a long time this type of structure has been widely used in many industries. Work breakdown structure is a more traditional approach. By using this approach the project is broken down to smaller and smaller boxes. This until there is individual tasks or work packages left that can be addressed to an individual in the group.

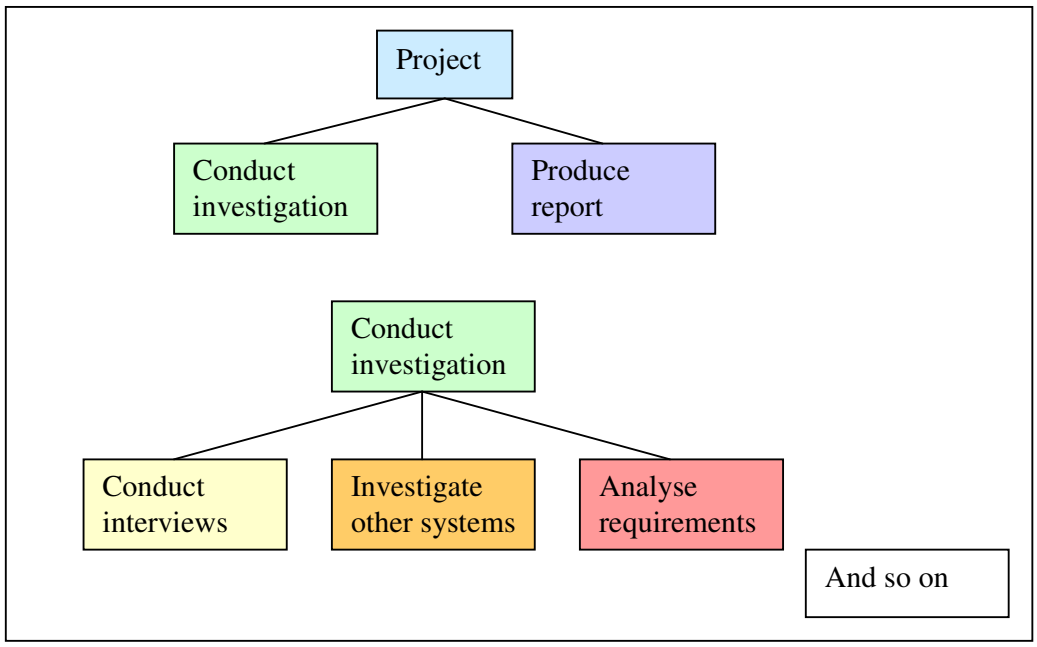

Figure 2.2.2a, Example from Cadle & Yeats (2004) on a work break down structure

Product breakdown structure
The product breakdown structure has during the recent years emerged. This structure is based on the use of the product. Here are some of the advantages of using a product breakdown structure:

- The focus will be on what to achieve, the product, rather then how to do it.
- Sometimes it feels easier to consider what has to be developed than to specify what has to be done.
- Easier to keep to the main subject and the risk of missing something is smaller.

The product breakdown functions as the work breakdown on how to break the product down to smaller products and boxes. This will be made until a reasonable product level is reached. An example of a reasonable product can be the minutes from the weekly meeting.

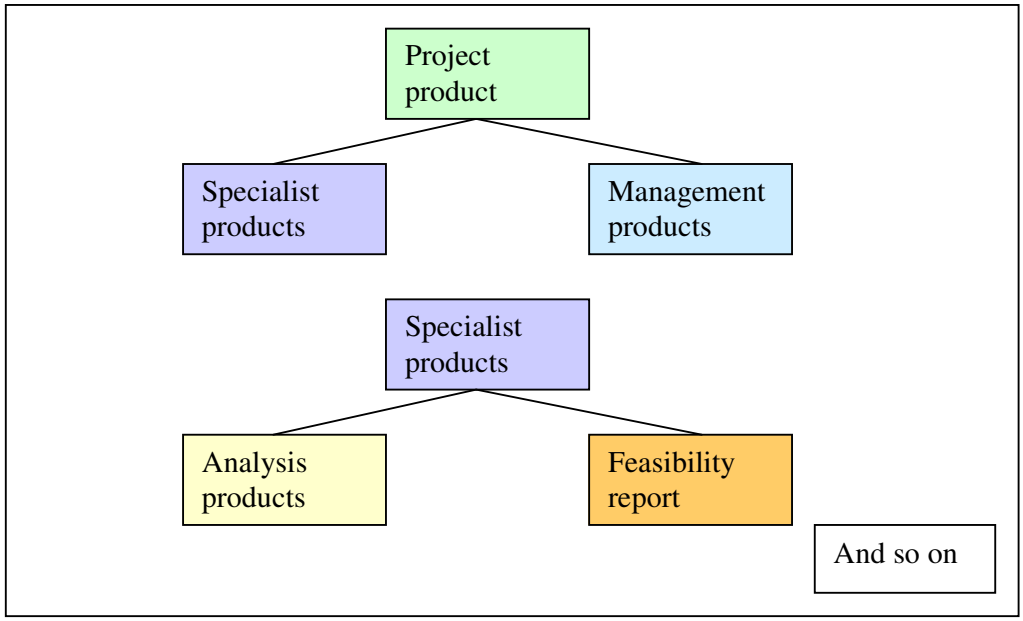

Figure 2.2.2b, Example from Cadle & Yeats (2004) on a product break down structure

2.2.3 Bar chart

Bar chart is a widely used planning tool, also called a Gantt chart. This type of chart shows a clear picture of the sequence of activities in the project. Some disadvantages with this is that it does not visualize dependencies. This is why they are not very suitable to use for managing process on a project. It is possible to show dependencies on a bar chart but the result is often messy and unclear. In general a bar chart shows two things (Brance, 2004)

- The sequence in which the work will be carried out
- The dates when to start and finish

2.2.4 Project milestones

The bar chart shows the sequence of activities that has to be made to complete the project. Completion of the project is therefore an important milestone for the project. Milestones can be useful control points were progress can be evaluated and plans be reworked if needed. The milestones can also be used to illustrate progress for the customers. Milestones should be selected very carefully and they are often equivalent to when elements / activity ends (Bringer, Hastings. & Geddes, 2004)

2.2.5 Reporting progress

When the project is up and running it is important to frequently report the project to stakeholders. This could for example be the project managers superior, the customer and the user. How often the reports should take place should be considered together with the stakeholders. At least it should be presented in the end of each project phase or together with when the milestones should be accomplished. This is an opportunity to present what is on track according to the schedule, but it is also important to present what is not going accordingly to the plan (Cadle & Yeats, 2004).

2.2.6 The group Leader

Leadership is the main key for having a successful group. One fourth of the company's probability comes from leadership. The leader (coach) emphasis is on internal actions, on getting people to want to do things, with getting their enthusiastic support. A leader is often surrounded with people that will follow his lead. This is something that could be called "a leader from the nature" and it is built on personal authority. The leader is totally depended on the people to get some result. To be a good leader you have to be creative and flexible in your way of handle things, "has to be able to sit on more then one chares at once" (Maltén, 2000). The effectiveness in the work is built on that the co-workers accept their leaders and his visions. The leader sees the co-workers as active and trusts them to take responsibility (Cadle & Yeates, 2004).

A successful leader or manager has to be able to see the overall picture, sharp, showing respect and being a team player. A leader should also be a good role model and gain respect from loyalty to the company. Another important thing is that the leader show strategies and objectives define guidelines and lead the staff into the same direction (Volvo intranet).

It is no easy way to identify a good leader but here are some skills that often are common (Rubenowitz, 1999):

- Positivism
- See the overall picture
- Social competence
- Intelligent
- Goal motivated

The group can achieve goals by working together and it is up to the leader to make this work. It is essential to see the goal ahead but also to have a map on how to get there together with the group. To make this the leader has to create loyalty and self-awareness and balance the group through the work by trying to take out the best of each individual. A leader also has to be flexible to adapt to changes that are made during the way but she/he also has to have the power the lead the group to the same direction.

2.2.7 Group dynamic

The group leader has always to balance the group depending on the different circumstances that comes up. How the group leader act highly influence the group dynamic. The group dynamic can also be influenced by other factors such as (Rubenowitz, 1999):

- Group participants
- Norms and standards
- Different personalities
- Environment
- Goal, needs and interests
- Organisation and work distribution
- Laws and roles

The most effective way to work with achieving the best possible result is by working together in teams. Teamwork gives the opportunity for the individuals to interact with each other and take advantage from knowledge and experience. The foundation for the teamwork is open communication, good relations and interaction to work toward the same goal and targets (Volvo intranet).

2.2.8 How to choose group members

It is important that the members in a group are not only chosen based on their competence but also by their ability to work in the group. Physical appearance like personality, gender and socioeconomic class may effect how an individual will interact with the group. Barker claims that it is better in general if the participants are strangers to each other. This is based on studies in group dynamic that shows that members may feel more inhibited of speaking if they know some of the participants in the group. However the opinion on this is mixed and most of the focused groups starts with a “get acquainted” session, this to learn to know each other better. It is good if the focus group begins with an introduction of the members. If the leader starts and offers personal information about him or her self will set the mood for a more intimate revelation. (Baker, T 1999)

2.3 Cost Reduction

Automization in the production industry has been a trend in the recent years to lower assembly cost. But the benefits are limited and the production becomes less flexible for new products and short production runs. The most effective form off assembly is often by manual. Therefore the production assembly process is not always the best solution in reducing cost. The product design as approximately 80% of the overall costs, and is therefore the key for reducing cost. This cost is often associated with large number of unnecessarily components. Another trend is that companies frequently outsource material and services that have no high importance for them. The suppliers are often able to achieve competitive advantages of scale, this by having lower labour and lower overhead costs (Brecker, 2001).

2.3.1 Brecker Product/process Improvements Methodology

Team-based activities are important to be able to make improvement in the process. These activities are performed with integrated techniques from (Brecker, 2001):

- Value Analysis (VA)
- Quality Function Deployment (QFD)
- Lean Thinking (Lean Manufacturing, Kaizen)
- Six Sigma (6σ)
- QS9000 (ISO 9000 – 2000 is similar)

To ensure a good result following four-phase Value and Lean based methodology should be followed (Brecker, 2001):

Phase 1: Key problem areas are identified and quantified.
Phase 2: Potential improvements are evaluated and prioritized.
Phase 3: Multi-functional teams improve key product / processes.
Phase 4: Improvements are implemented and monitored.

This four phase approach ensures that team work is focused on the right problems and that the improvement goals can be fulfilled. This method is also very flexible and can be used in different type of needs.

Phase 1: Key problem areas are identified and quantified
Qualitative data are collected to identify improvement opportunities and quantify possible improvements. Frequently an activity based costing approach is considered. The improvement goals should be aligned with the company's strategic business objectives.

Phase 2: Potential product / process improvement solutions are quantified.
Working teams from the product line use Value Analysis style workshops to develop and evaluate specific improvements that are needed to meet quality, productivity and cost targets. Lean thinking, Six Sigma and other concepts are at this stage considered.

Phase 3: Multifunctional teams improve key processes.
The multifunctional teams analyse the process and the product and plan an implementation plan for the evaluated potential improvements. Lean Thinking, Six Sigma, Kaizen, DFA, DFM and other tools could be useful in this phase for identifying improvement opportunities.

Phase 4; Improvements are implemented and monitored.
In this phase it is very important with strong support from the management, this to make significant and lasting improvements. The improvements should be continued followed up to secure that they still are working as planned.

It is essential for a company to satisfy their customer by giving them value in form of high quality and reliability. Customer satisfaction is a key element in TQM. When a product has been identified with quality problems or with cost saving potential there are two options, change the process or change the product design. To redesign a product is very expensive and it is therefore better to start looking at changing the process first. But when the process changes are too expensive or not possible a redesign should be considered. If the part is going to have a new design it is important that it gets a new "robust design". To make this creativity is needed to identify different type of solutions. Value Analysis brainstorming is a good technique to use to get different solutions and to see the best alternative. To get the part assemble efficient Design Fore Manufacturing (DFM), Design Fore Assembly (DFA), and Lean manufacturing methods could be used (Brecker, 2001).

2.3.2 Total Quality Management (TQM)

Total Quality Management is an improvement system for the overall business. It considers leadership, strategic planning and human resources but also the process improvements. The key values and concepts of the Malcome Baldrige Total Quality Awards are (Brecker, 2001):

- Customer driver quality
- Strong leadership
- Continues improvement
- Employee participation (teamwork)
- Fast response
- Design quality
- Management by fact (measures)
- Partnerships
- Measurable result

Brecks highly recommend that the work is done in trained teams. This will gain the best possible outcome from the activity. In the process for the team to solve a problem some different tools can be good to have like; check sheets, flow chart and Cause and effect diagram.

2.4 Value

Value is defined as the lowest cost of reliably providing the required functions at the desired time and place. The centre of economic activity is the value. The customer wants to get the best possible value for their money. Value Analysis is a well structured method to be able to identify the fundamentals of the value. It also quantifies the cost to provide this value for the customer. From the start VA was mainly used for cost reduction on a given set of functions. But today it is used to meet target cost for product and services. This is costs that are based on the price that the customer is willing to pay and what they think the product is worth. To succeed with a product it has to satisfy the customer's needs. Many products have failed on the market due to poor value (Brecker, 2001).

2.4.1 Value Analysis (VA)

The Value Analysis can be focused more on cost or on function. By multi functional teams using formalized processes within VA alternative material, manufacturing processes and design can be identified with improved value while reducing the cost. Within VA a "Job Plan" exists with the following structure (Brecker, 2001):

- Pre-Study
  - Collect customer data
  - Collect product and process data
  - Build product and process models
  - Form the multi-functional team
- Study
  - Information Phase- analyze data
  - Function Analysis Phase – Identify and cost functions
  - Creative phase – brainstorming ideas
  - Evaluation Phase - rank then develop ideas
  - Development Phase – quantify benefits and plan actions
  - Presentation – make oral report and prepare written reports
- Post-study
  - Complete changes
  - Implement changes
  - Monitor changes

Making structured function diagram and costing techniques gives information as a base to make good decisions. The process for Value Analyze is a way to measure, analyze, and improve the chosen area. During the brainstorming phase in VA ideas are created in a non critical and free flowing process. The ideas are then divided into different diagrams and refined.

2.4.2 Value Management

The concept of Value Management arose in the USA manufacturing industry during the Second World War. Lawrence Miles, an electrical engineer developed this method when his company could not manage to produce the amount of products that the market was required. He then realised that if they could not get the components to the product they still have to retain the function. The concept later on further developed and spread, and today it is used in a global scale (Ashworth & Hogg, 2000).

During the years the products have become more complex and remain of many different components therefore the Function Analysis (FA) technique has approach and evolved FAST (Function Analysis System Technique) that will be presented later on (SAMI, 2005).

Leading industrial companies such as Ford, Jaguar, Rolls Royce Aerospace and the Caradon group use Value Management to challenge traditional methods of working. This has resulted in benefits in terms of cost, performance and relationship building (IVM, 2004). The Value Management Philosophy is not a magic solution to achieve goals but it's a systematic why to eliminate unnecessary cost and still retain the function of the product. Value Management additionally offers some new opportunities for project managers to explore when dealing with cost/benefit issues (Cadle & Yeates, 2004).VM include identification of customer requirements, cost modelling, value analysis and value engineering workshops, value stream mapping, business process improvement and continuous process improvements. VM is a way to motivate people to develop there own and there groups skills with the aim of maximizing the overall performance of an organization. (IVM, 2004)

Value is the relationship between satisfaction on different needs and the resources used in doing it. When using fewer resources or greater satisfaction of needs the better the value gets. Different stakeholders have different views on what the value is for them. The aim of value management is to bring these differences together and make it possible for the organisation to accomplish the greatest progress toward it stated goal with using the minimum of resources.

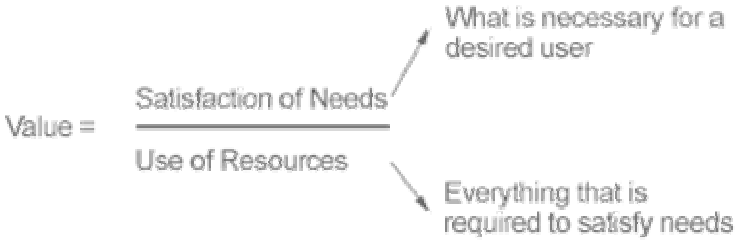

Figure 2.4.2. What value is (IVM, 2004)

It's important to keep in mind that the value can be improved by increasing satisfaction even though it cost resources in doing so. As long as the increase of satisfaction of needs is greater then the increase of used resources the total value will increase. Common measures on added value are:

- Capital cost reduction
- Program reduction
- Better information
- The smile on people's faces

"Value is in what things do, not what they are, or cost" (Hogg & Smith, 2005)

All operations and steps in production should add value on the product and therefore also for the customer. Non added operations must be eliminated, though this is nothing that the customer wants to pay for. The entire concept and philosophy Value Management is from of subsets as Value Planning, Value Engineering and Value Analysis. Value Management is primarily a workshop, or a series of workshops, where skilled workers and stakeholders/clients are participating to search for better value in terms of clients objectives. It is important to identify all the stakeholders at an early stage and bring them into the discussion (Cadle & Yeates, 2004).Otherwise the projects objectives will be incompletely defined. The workshops are often following a five phase process that includes (Hogg & Smith, 2005):

Information Phase
Details of the problem or project are presented to the participants like backgrounds, objectives and constraints. The aim of this phase is to get an understanding of the participants on this project and it will also work as a team building exercise. A Functional Analyse can take part as a workshop in this phase.

Creative Phase
The participants now understand the project and its functional requirements. A workshop team is invited to brainstorm and create ideas. In this phase as many ideas as possible are generated with no furthered discussion about there reliability.

Evaluation Phase
It is time to measure the quality on the ideas and to do so several of method could be used, such as championing. In the end a list with the selected ideas to further develop should exist.

Development Phase
Each idea is studied and evaluated to decide if it is a good solution or not. This stage is very time consuming and technical input is often needed.

Presentation Phase
Present the teams solutions to the clients. This is a critical phase were the clients have to except the solution otherwise it could result in that much work as to be redone.

Some benefits by using value management are (Hogg & Smith, 2005):

- Take better business decisions by providing decision makers a good foundation to base there decisions on.
- Improved product to all stakeholder, by understanding their real need
- Total understanding of the members on the organisations goal
- Improve communication and knowledge of the main success factors for the organization
- Work continuously with communication and development of multitask team work
- Decisions are supported by the stakeholders.

Something to look out for in projects is Poor Value. Some common factors for this are the lack of clarity and/or information about that the purpose for the project is. Time pressure, poor communication and coordination are other causes, as well as rivalry and politics problems. With the help of VM the risk of pour value in a project will be minimised. Factors that inhibiting a wider use of VM are e.g. that clients believe that it takes to much time to carry it out and that they think that VM already exist in the work of their organisation. The Value Management approach involves three root principles (IVM, 2004):

- A continuous awareness of value for the organisation, establishing measures or estimate of value, monitoring and controlling them
- A focus on the objectives and targets before seeking solutions
- A focus on function, providing the key to maximize innovative and practical outcomes

It's common to say that you practice Value Management as a part of the generation of cost reduction. The difference between reducing cost and cutting unnecessary costs is essential to the Value Management Approach. (Hogg & Smith, 2005)

2.4.3 Function Analysis and Function Analysis System Technique

The opinion on the Function Analysis in construction is mixed, some say that the benefits are well recognized and others disagree on this point. The principle of FA is quite simple and invites the question 'What does it do?' instead of 'What it is'. This generates to a search for something that perfume the function instead of attempting to find a substitute for previous solution. In describing the problem it is better to have the function we are trying to accomplish as abstract as possible. If the description consists of to much information the solution are limited and the mind are locked in a certain way of thinking. The function should be described with a verb and a noun. The verb defines the action that is required and the noun tells what it is acted upon. It is then possible to break down the process to components to easier the work, and to avoid misunderstanding. FA is then used on each component (SAMI, 2005)

Functional Analysis identifies the basic functions and the secondary functions on a product. The basic functions include anything that makes the product work or sells, and they are not replaceable. The secondary functions also called the supporting functions could be modified or eliminated to reduce the cost. By eliminate secondary functions that are not important for the customer the product cost will decrease without any reduction of the value in form of worth. But it is also important to remember that the basic function does not establish the value of the product on its own. One way of reducing cost but improve the value is by combine as many secondary function as possible.

The result from FA can then be used in Function Analysis System Technique (IVM 2004).

FAST help people with different technical backgrounds to communicate and solve the problems together. FAST is an evolution from FA by linking the functions together to describe a complex system. This method describes the item or the system that is under study and makes the team to think about the functions. The functions can then be broken down to sub-functions that can be put in to the structure. To build a FAST (a form of Value Tree) you start with the main function and then spread out to the right by asking the question, How? The chart also works from right to left by asking the question, Why? (Cadle & Yeates, 2004)

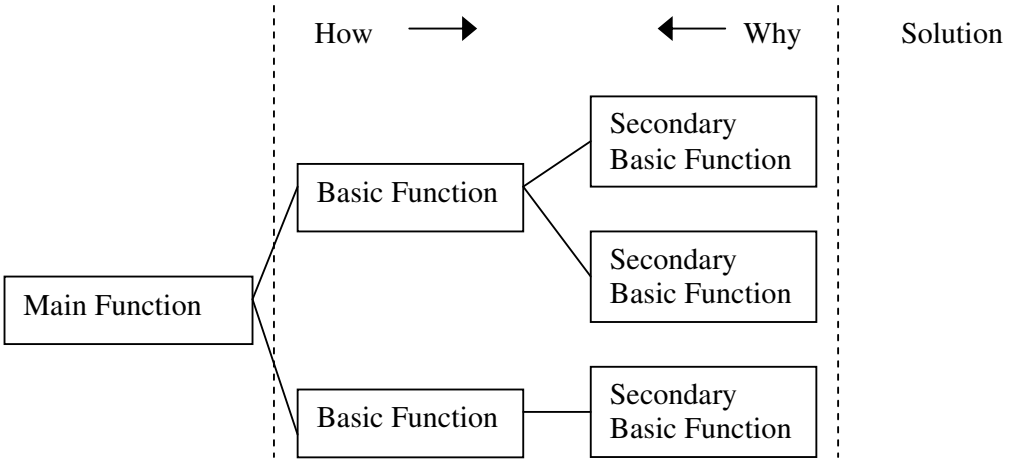

Figure2.4.3, Structure of FAST diagram

The functions can also be priorities by weighting them against each other, e.g. use total 100% to divide on the different functions, regarding to priorities. Here you have the possibility to see which functions that are more important and the others. The chart is used by teams to first agree on the functions and then on the priority between them. The functions that are classified as important are then broken down further to sub-functions. And these can also be weighted against each other in form of a priority (Hogg & Smith, 2005).

Another way of comparing the different functions is by putting them in some form of comparable matrix e.g. Value Analysis Matrix or QFD (Quality Function Deployment) (Crow, 2002). Function Analysis and Function Analysis System Technique are important analysis tools, and they lead to improve the products and lower there cost by (Crow, K 2002):

- Providing a method of communication within a product development team and achieving team consensus
- Facilitating flexibility in thinking and exploring multiple concepts
- Focusing on essential functions to fulfil product requirements
- Identifying high cost functions to explore improvements

2.5 Key Performance Indicators (KPI)

The key performance indicators function as help for an organization to define and measure progress toward the organisations goal. Key Performance Indicators are quantifiable measurements that reflect the critical success factors of an organization. They will differ depending on the organization. The KPIs selected must reflect the organization's goals, they must be the key to its success, and they must be measurable. Key Performance Indicators usually are long-term considerations. The purpose of PKIs is to establish quantifiable measurements of things that are important to its long term success. If the KPI is going to be for any help it is important to accurately define and measure it. For every key performance indicator it should be a target to measure. There are many things that are measurable but that does not say that they are the key to success. When selecting the KPI it is significant to limit them to those factors that are vital for the organisation and its goal. The key performance indicators are used as performance management tool, but also as a carrot for the project or organisation. Examples on commonly used KPI's (Cadle & Yeates, 2004):

- Time
- Cost
- Quality

2.6 Design For Manufacturability (DFM)

Design for manufacturability is the foundation for a lean production. The design on the product and the ability to produce it in the process has to be in harmony optimize (Brecker, 2001):

- Quality and reliability
- Material and equipment usage
- Process cycle time
- Production scheduling
- In process inventory

A tool to make a harmony between design and process is to use DFA when constructing the product.

2.7 Design For Assembly (DFA)

DFA aims to reduce the assembly cost by simplify the product. Appling DFA will often also have a spin off effect and decrease other costs as well, such as; improved quality and reliability. DFA may be defined as (Chan, Filippo A. & Salustri, 2005):

"A process for improving product design for easy and low cost assembly"

In final assembly all parts has to be fitted together and work together. If this not is possible the product will not be selling. The more parts to put together the larger are the opportunity for problems. To avoid quality problems the product should consists of as few parts as possible and as few process steps should be made as possible. DFA focus on eliminating number of parts on the basis that one part is better and cheaper than two. By making two parts into one the cost will decrease in indirect cost like maintaining, part no and purchasing. Further reduction of costs can be made by using the same components on a verity of products. This will also increase the reliability and serviceability on the product (Brecker, 2001).

DFA mainly consists of three questions that always should be considered when designing a product (Volvo intranet):

- Need to move relative other parts?
- Need other material?
- Need separate assembly?

3. Method

This paper is a dissertation at the International Project Management (IPM) program given at Chalmers Lindholmen in Gothenburg and Northumbria University in Newcastle. The methodology which is described in this chapter defines different types of methods that were potential to use for writing this research. It discusses and clarifies why the chosen method was preferred to use. The chapter also describes how this thesis work was made, step by step. Furthermore it considers how the data was optioned but also how the collected data was processed and handled in order to get valid and reliable information.

3.1 Research Methodology

When writing a research it is very important to consider different types of methods that can be used. The choice of method will direct effect the outcome from the research but also how reliable and valid it will be.

3.1.1 Primary and secondary data

Sources of information when writing a research can be collected in different ways. The data is divided into two categories: primary and secondary data. Primary data is identified by the immediate user. This type of data comes from interviews, questionnaires and observations. Normally the base for the research and the drown conclusions. Secondary data on the other hand is collected by someone else and the user, the researcher in this case. Typical secondary data is other researches work, reference books or articles. The value of this type of data depends on what type of research that is made. The secondary data may be a complement or a substitute to primary data (Eriksson & Wiederheim, 1997).

The conclusions that are made in this research is mainly based on primary data, and complemented by secondary data.

3.1.2 Quantitative and Qualitative studies

According to Christensen (2001) collecting of data is divided into quantitative and qualitative investigations. Quantitative gives knowledge about what people think and know. The data is gathered by questionnaire and/or interviews form a large number of people. Qualitative investigation gives a deeper knowledge about why people react like they do, and this is performed by group discussions and/or deeper interviews with a selection of people.

Quantitative Studies	Qualitative Studies
Theory can be used to explain or predict possible outcomes.	Theory arises from the analysis and interpretation of data
Theory can be used to generate hypotheses.	Theory can form a starting point, later to be modified after the analysis and interpretation of data.
Theory can be used to construct relationships between variables.	Theory may not necessarily be used explicitly - phenomenology.
Theory is concerned with the deduction of understanding	

Figure3.1.2 Differences between quantitative and qualitative studies.

The strength of a quantitative research is the high degree of generalizing and objectivity. The reliability of this type of research is high and if someone would repeat this type of study under the same conditions they would get more or less the same result. However mostly of the quantitative studies also includes some qualitative elements. Qualitative research is more subjective and offers a higher degree of flexibility. This type of research approach is often preferred when searching for a deeper understanding of a specific problem or when the collected data can not be quantified in any good way. This method can lead to lower reliability because of lack of clearly defined structure. But the flexibility and the possibility to go through a problem on a deeper level can be positive for the value of the research. (Lekvall & Wahlbin, 2001)

To make this research a qualitative approach is chosen. This because of the need to take the research down to a deeper level and to get out some central information, like what people think and know but also why. And this can be made by having more open and flexible discussions with a group of competent individuals. A qualitative method is according to the author necessary to get a better understanding on the issue and to be able to solve the research question.

3.1.3 Inductive or deductive

The process for research is normally considered to be either inductive or deductive. Inductive is when the researcher develops generalizations created on limited amount of data. Starting with observations and move toward hypotheses. On the other hand deductive is when hypotheses are derived from a generalized explanation. In practice it can be hard to separate these two procedures. It is common that the researcher prioritise a logical-rational model with a set of hypotheses. This is then function as guidance for the design on the study. This is made before the data gathering. The inductive process could be experienced as more difficult and messier than the deductive. The deductive starts with a hypothesis and then test it though observations,

which can be experienced as an easier way to tackle the study. The inductive process is more central to the development of new theories (Baker, 1999).

An inductive approach is used for this research to develop the new method for planning of cost reduction event. This is selected because it increases the possibility to identify new planning methods. When using a deductive approach it can be hard to think "outside the box" because of the frame that is given by starting with a hypothesis.

3.1.4 Interviews

Interviews are roughly grouped in three different categories (Hogg, & Smith, 2005):

- Unstructured
- Semi-structured
- Structured

Interviews can be made face to face or over the telephone. When practice the interviews by face to face a form of relationship is developed between this two individuals. The relationship is developed before and during the interview and will have a huge effect on the result. For group interviews techniques like focus group is good to use as a foundation method for developing a survey.

Unstructured
When using unstructured method you have a clear goal but no road on how to get there. This type of setup benefits soft or unquantifiable data, as ideas, opinion, correlations or suggestions to come up to the surface. It also gives the interviewed person and the person that makes the interview more freedom to continue talk about something that seems interesting. This type of interviews is normal to have in the starting phase of a project.

Semi-structured
Based on a prepared sheet of questions that is followed, but not necessary strict followed, during the interview. An idea can be to send out the questions to the persons that will be interview before so he/she can be prepared. The answers from the interview should be noted down a prepared form.

Structured
A questionnaire is prepared with small room for opinion or comments. Typical alternatives of answer are "Yes" or "No". This type of method will gain quantifiable and primarily hard data.

In-depth discussions/focus groups
This is an increasingly popular form of group interviewing technique. It is not expensive and it is an effective way to get out information from a group on a specific issue. (Baker, 1999) It is normally performed by arranging one or more meetings with a group of knowledgeable people to discuss the focused subject by asking questions. This is some methods that can be used (Hogg & Smith 2005):

- Group Discussions
- Snowball discussions
- Nominal group technique
- Brainstorming
- Buzz groups

Focus groups are not really a survey research method due to it do not give the same quantitative aggregate data that is given when asking a large number of people the same question. However focus groups also have some qualities when it comes to qualitative research. They are more free formed in its design and more natural and ordinary when the conversations take place. This type of method is useful when the researcher wants to collect background information on a subject. Focus group can be used to get a general impression of the group concerning a product, a film, how positive the clients are about services. These types of impressionistic reactions are hard to capture though questionnaires or face to face interviews. Another advantage with using focus groups is that they can dig deeper into the focused area. Discussions about impressions and focus on interests gain the creation of new and innovative ideas (Baker, 1999)

Stewart and Shamdasani summarize ten advantages with focus groups over individual interviews, both fore the researcher and for the respondents (Baker, 1999):

Researcher	**Respondents**
Scientific scrutiny: A rang of researchers can observe the group and record the discussion.	*Security:* Individuals may feel less exposed and more comfortable in expressing views that may be shared; they also need not defend or elaborate their ideas.
Serendipity: Focus groups may bring forth unexpected "out of the blue" ideas.	*Snowballing:* Comments from one person elicit comments from others.
Specialization: Since a number of people can be interviewed together, this reduced the cost of having highly specialized interviewer serve as the moderator.	*Synergism:* More ideas and information will flow out of this combined interview environment.
Speed: Interviewing groups of people reduces the time that would be required to interview these respondents individually.	*Spontaneity:* Since each person is not asked to answer a specific question, respondents may "jump in" with ideas and pick up on what interest them. They are not required to answer a question they have no interest in.
Structure: The moderator can control the order and time spent on various topics and return to topics.	

Figure 3.1.4 Advantages with focus groups (Baker, 1999)

The group members should be selected by the researcher and it should be about 6 to 12 members in total. The selected individuals have to have an interest or be knowledgeable about the subject that is focused. They may also be chosen because of a certain demographic groups or members of interest groups. The size of the group affects how the discussion flows. A smaller group may easy be dominated by one ore more persons. However a larger group may make it hard for all the participants to take an active part in the discussion. A group of eight is in general the optimal number on group participants. (Baker, 1999)

To collect the primary data and make a qualitative research a focus group were used. This was made because of the need of identify new ideas on how to arrange a cost reduction event. To complement the data gained from the focus group personal interviews were made face to face. The interviews were performed unstructured and semi-structured, depending on the different circumstances.

Different type of questions
Questions asked to the focusing group may be open-ended or closed-ended, primary which introduce the topics or secondary to follow up a topic. The questions could be either directed that require a response or neutral, with no demand on response. Different types of questions (Baker, 1999):

1. *Primary research questions;* Covers the main issues on which the group is focusing. This type of questions is generally prepared before the session is taken place.
2. *Leading questions;* Often begins with "Why" and are normally a restating of a participants own words.
3. *Testing questions;* Gives ideas that are more extreme but sill in tentative form, as if the person that asked were unclear about the position stated.
4. *Steering questions;* Is often used to get the group back to the main issue.
5. *Obtuse questions;* Encourage the participants to consider the different answers.
6. *Factual questions;* This type of questions can be a help to get out off diffuse and difficult situations.
7. *Feel questions;* Encourage the group members to express their feelings. This type off question is a little bit risky but can generate the most interesting answers.
8. *Anonymous questions;* help the group members to feel comfortable with each other and in the group.
9. *No question – keeping quiet;* By letting the group be silent at some times will encourage certain members to start speak.

During the focus group meeting different types of question were asked dependence on the situation. It is central for the leader to be keen and flexible to keep the meeting on track. When having the focus group meetings and the personal interviews this are the type of questions that were used among others:

- *Primary research questions, Leading questions, Steering questions, Factual questions, Feel questions and Anonymous questions*

3.1.5 Validity and reliability

In a research it is important to consider the reliability and validity of measures and procedures. The definition for reliability (wikipedia, 2006):

"The ability of a system or component to perform its required functions under stated conditions for a specified period of time."

In terms of research it means that the chosen method has to be documented so that another person could understand it and draw the same conclusions if repeating the same study. It is a way to measure if the method is reliable (Ruderstam, & Newton, 1992).

Validity concerns if the chosen method that is used really measures what it is intended to do. Validity can be divided into internal and external validity. Internal validity is about which degree the result is in accordance with the reality. The outcome and the result from the research have to be dependable. External validity refers to how the result can be applied to another situation. There is no definite way to decide if a method is valid or not (Lekvall, & Wahlbin, 2001).

The reliability of the result from this research is rather weak when it comes to that someone else should repeat the same study. Probable this study would end up in some different conclusion depending on diverse factors that influence the result. Factors that influence the result are:

- The individuals that have participated both in the interview and the focus group.
- The way the author flexible lead and steer the meetings.
- The authors experience within this subject

All individuals are different and that is way it is almost impossible to repeat the same study and draw the exact same conclusion. However under these circumstances some of the conclusions would probable be the same as in this research. The validity on the other hand for this research is very high. After the planning preparations are made, with this research, the project is going to take place in reality. If the outcome will be good this method of planning cost reduction events will be adopted as annual work. The validity is high because of the competent and knowledgeable people that took part of making the planning.

3.2 Recourses and participants

The persons that have participated to do this research are working in the industrial sector. Some have chosen to participate because of their own interest and have seen a benefit of going it. Other has been appointed from management because of their competence and / or knowledge.

A focus group that works as a project group was used to collect primary data. Following competences were appointed:

- Coordinator that is used to organize this type of activities.
- A person with good product knowledge from manufacturing.
- A specialist within Team Value Management (TVM)
- Cost reduction leader for Research and Development (R&D)
- Assembler that is well aware of the product

Beside this separate face to face interviews with people that have chosen to participate took place with the following competences:

- Method specialists for value management workshops
- Experienced leader for non added value workshops

3.3 Instruments

To plan this event different type of working tools has been used:

- Work breakdown structure
- Key Performance Indicators
- Milestones
- Project Proposal
- Bar chart
- Project Initiation Document
- Checklist

The project group had in total seven meetings. Three of the meeting sessions were held in two hours to take the discussion deeper and the rest were on one hour each. The first meeting was starting with a presentation of the individuals and followed by an introduction by the leader on purpose and the expected outcome from the event. After the presentation the participants were free to start an open discussion. The meeting started organized and moved toward unstructured. The rest of the meetings were more semi-structured were we started to sum up were we ended last time and what we should discus today. The project leader tried to be flexible and lead the group through these meetings but still always keep to the subject. Different types of questions were used to get good discussion within the group and still keep them on track:

- *Primary research questions, Leading questions, Steering questions, Factual questions, Feel questions and Anonymous questions*

To complement the data that was collected from the focus group personal interviews were made.

The first interview that took place in approximate two hours was with an experienced workshop leader from another company, but in the same concern. The interview was face to face and it was semi-structured. Some questions were prepared before the meeting. This opportunity were given though the authors profession. The second interview was with a method specialist within value managements workshops from VCC. This interview took place during one hour and the purpose was to see which method he would recommend for this event. The meeting was unstructured because the author did not want to affect the interviewed person to much. The specialist is well-known fore the author since working together before, therefore also the choice of structure on the interview. The specialist is also well-known on VCC for his previous achievements in reducing the cost both on product price and assembly time.

The method of recording the interviews and focus groups was by taking short keywords during the meetings. Direct afterwards the keywords were rewritten to more detailed notes. The notes were then sent by mail to the participants. This was made to get a clarification from the participants that they agreed upon that the notes where correct.

3.4 Research Procedure

To write these report different types of sources were used. The theoretical framework builds upon data from books, Internet, lectures given at Chalmers Lindholmen and Northumbria University, and the author's experience. The lectures were a part of the IPM master program. The books were found from research on the libraries and at home. Data from Internet was found through searching on different search servers on the net. Sources older than 1997 were not considered as potential data for writing this report.

This dissertation will be an empirical study. To collect primary data both a focus group and interviews face to face were taken place. Focus group is an excellent technique to use when it comes to collect the background data that was needed to get a good result to base the discussion and conclusions on. To be able to break the trend on how former cost reduction event had been planned and arranged. This type of needed data can be developed from group discussions. The focus group also worked as a project group were the author was the project leader. The group members were appointed from management according to the author's (also mentioned as project leader) given requirements:

- Coordinator that is used to organize this type of activities.
- A person with good product knowledge from manufacturing.
- A specialist within Team Value Management (TVM)
- Cost reduction leader for Research and Development (R&D)
- Assembler that is well aware of the product

The requirements for the group participants were based on the author's former experience with planning and arranging cost reduction events. The core of the project group was now six people including the project leader. Six participants in the core group were enough and at some meetings they also brought guests. The group member's all had different backgrounds, competences and knowledge. But there were some similarities as well as in interest and to work on the same company, Volvo Cars Corporation (VCC). To support and guide this project group, a steering group with voluntary stakeholders from VCC were created.

This research will be a part of a whole project taking place at VCC. This study will handle the following phases in the project:

- Pre-project work
- Start-up Initiation stage
- Development stage.

In the Pre-project phase a project plan for the Build Up project were created for VCC and a Project Management Plan for the school. During the Project start-up phase the project group were kicked off and a Project Initiation Document is created together with an updated schedule. In the development stage most of the work for the project group is taking place. To keep track on the work a checklist is created. The progress for the project's milestones is reported frequently to the steering group. This phase will end up with an invitation to the required participants.

3.4.1 Time Plan

To make this research project following time plan was followed:

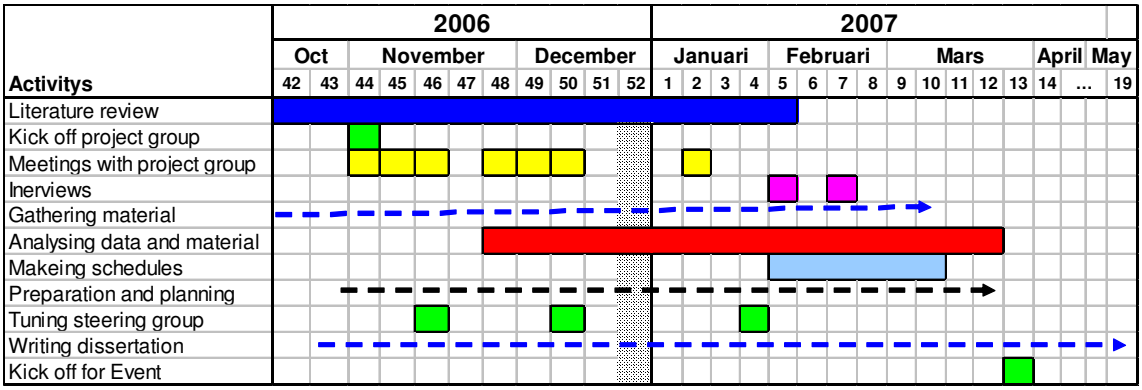

Figure 3.4.1. Time schedule for the research project.

The date for when the actual event would take place was given so the plan had to be made out from that. Ten percent time were added on top on all activities to have some extra time if needed.

4. Actual situation

The module that this Build Up Event will focus on is the first car on a new platform for VCC. This platform will later on also be the base for many products to come. And this makes this car especially interesting to identify cost saving opportunities on. For 2007 this specific car model is far from the TF1 target. And for 2008 there is not enough cost reduction opportunities identified to close either the TF1 target or the product price target. To decrease the gap to the cost reduction targets at VCC following events have been taken place already in 2007 (Volvo info):

Gap Closing - VCC
Linewalk in Gent - VCC
Linewalk and Teardown - JLR
Cut Up and time study –VCC
Teardown Event – FoE

To close the gap to the cost reduction goal for this year, next year and the year to come, following events are left to be implemented in 2007:

Build Up Event – VCC
Teardown, Linewalk, Supplier visit - FoE
Line Walk Torslanda - VCC

VCM will participate at the Events mentioned above with the aim to identify opportunities to close the cost reduction goal. VCM will also take an active part in the planning phase for the events to come.

4.1 Workshop for cost reduction VCC

Before a workshop can start it is essential that all relevant information is gathered. The preparation before is very important for the quality of the actual result later on. Workshops can be performed in different ways and the choice of working method should reflect what is desired to get out from it. At the latest cost reduction event that was driven by manufacturing following method was used (Volvo info):

Workshop phases	Time
1. Team knowledge of current/planned time consumption	10%
2. Team understanding of time drivers	20%
3. Knowledge used to generate ideas	20%
4. Idea evaluation	50%

Phase 1, Knowledge
Look at the system description to understand the function
Interface to other systems should be cleared out
Build sequence and time, PII description
Have pen and paper ready to note ideas
Avoid discussions at this stage other than clarifications.

Phase 2, Understanding
Go though step-by-step operations
For each operation with time define the cause of operation and time usage
Wrap-up of learning so far

Note: Make sure the participants note their ideas on paper but keep them from idea discussions at this stage

Phase 3, Use knowledge to generate ideas
The goal is to increase common team knowledge about time causes
Discuss why each time is consumed
Questions to ask:

- What has been noted?
- Other ideas how to attack the time consumption causes?
- Can some components be deleted?

List noted ideas, continue with "free ideas"
When no more spontaneous ideas; review operations in PII
Review components from an integration perspective:

- Need to move relative other parts?
- Need other material?
- Need separate assembly?

Phase 4, Idea evaluation
Go though all ideas and evaluate them according to time, cost and quality. Try to identify the actual saving but also cost increases and other factors that will be affected.

4.2 Team Value Management at VCC

Team Value Management (TVM) is a support function under purchasing. TVM is leading match pair teams that consist of both R&D and purchasing. The aim of these teams is to make R&D and purchasing to communicate and to help each other to reduce the costs. Besides this they also support other areas in different type of activities. Fore a while ago they made a lean activity in the paint shop with good result. The TVM process is as following (Volvo Intranet):

1. Gather and analyze balanced commodity data.
2. The team to agree upon and to get approval for proposed target.
3. Create a roadmap with gap closure actions to reach target,
4. Implement and follow-up according to the roadmap with first priority: short lead time and/or large cost reduction
5. Utilize data to get verify target on future vehicles
6. Follow up and verify if best in business has been achieved

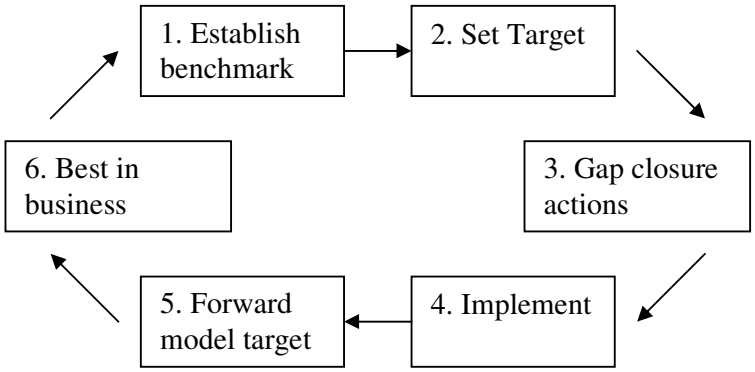

Figure 4.2a TVM Process flow (Volvo Intranet)

TVM at VCC works cross functional with many different areas and this is a picture of their approach.

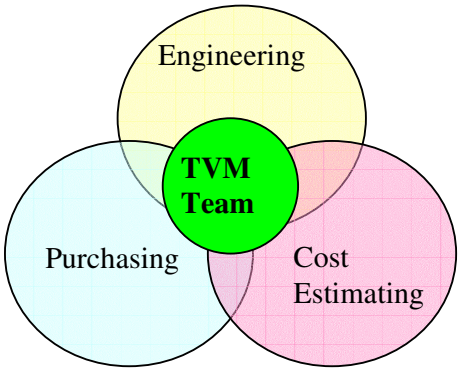

Figure 4.2b TVM Cross finctional approach (Volvo Intranet)

Besides engineering, purchasing and cost estimating that are the main areas TVM also work with (Volvo Intranet):

- Quality
- Logistic
- Project Teams
- Suppliers
- Implementation
- Manufacturing
- Benchmarking

Team Value management is a strategy for managing value to be best in business. TVM defines value on the product and therefore also for the costumer as following:

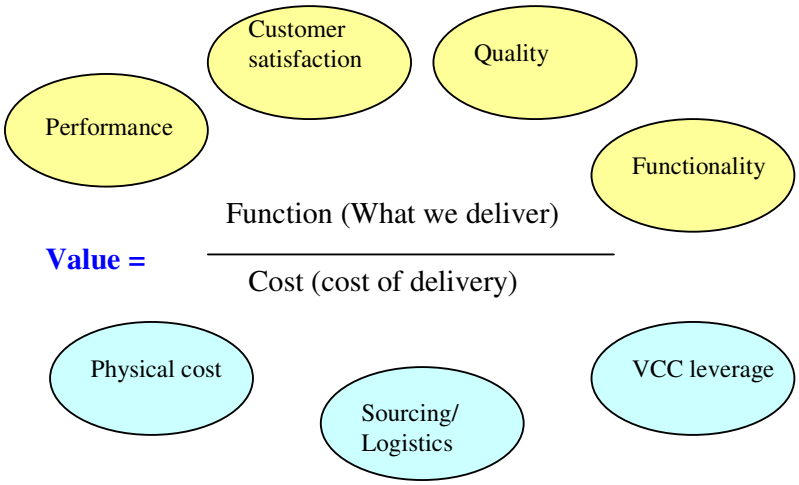

Figure 4.2c TVM strategy for managing value (Volvo Intranet)

4.3 Authors experience

The author started early in the age of 14 to lead and coach other people. And during the years she has manage to get several of leader educations that can become handy in making this research.

The author for this research project is working for a consulting firm in Gothenburg. For the two last years she has been consulting within cost reduction at VCM. In these two years at VCM she has highly contributed to the development of a new way of working with TF1 cost reduction for manufacturing. With this the author also has had the opportunity to take an active part both in cost reduction event within VCC. With this the author has great experience in planning and leading cost reduction events. Recently she also advances to become a project leader for cost reduction events at VCM

5. Result

In this chapter the results from this research project is presented.

5.1 Compile of the interviews

Two interviews were made to compensate the information that already was gathered. The outcome form these interviews will here be summed up.

5.1.1 Interview with experienced leader for non added value workshops

Time: 2007-01-31
Place: Jaguar Land Rover, Halewood, England

The interviewed person is working as a cost reduction coordinator at Jaguar Land Rover in a department called Industrial Engineering. Earlier she worked on another large car company in Europe that have been very successful in decreasing their assembly time, and that was way she got the job at JLR.

JLR are manly focusing in decreasing the non added value time to decrease the total assembly time. The plant is divided into workgroups that are responsible for making their part of the line as slim and lean as possible. The working group consists of 1 group leader and seven operators. They are trying to decrease the assembly time by:

1. Tape the operation
2. Standardise best practice
3. Clock it
4. And then analyse it and see if more improvements maybe done.

There are both advantages and disadvantages with this way of working. The team spirit is increasing and the team feels a great responsibility of their lines. This also generates good product quality and makes the persons feel important and needed. The teams care about each other and the whole plant is like a big family. But with this way of working you are not able to see the whole picture. Possibilities with moving operations to be able to balance the process more efficient decrease a lot. To try to work better together over the working groups JLR know wants to start up weekly structured teams. These meetings allows cross functional discussions to be started.

At the car company where the interviewed person worked before they were working totally different with reducing the assembly time. They were working regular in cross functional groups to continually find cost reduction opportunities. The focus was on non added value. When an opportunity was identified a Kaizen group were created to have a two day activity to look deeper into the opportunity. This group were lead by a person from Industrial Engineering. Other participants in the group could be production supervisor, operators, and logistics and so on. Recommendations for methods and tools for these activities were given from the head office.

When working with reducing the cost, in this case non added value time, you more or less always follow a specific flow. First you have to identify a cost saving opportunity. This can be made from many different ways like counting steps, looking at cycle time and so on. When the opportunity is identified it is time to deep dive into the issue and collects al relevant information for this specific issue. The information is then analysed to get better understanding about the issue. To then identify ideas to eliminate or decrease the issue different methods can be used. When the best cost saving idea has been selected it is productions responsibility to implement it and to follow it up. When doing this type of time reduction activities it is very important that it is a cross functional team that is making it together.

5.1.2 Interview with method specialists for value management workshops

Time: 2007-01-13
Place: VCC, Gothenburg, Sweden

The interviewed person is today working in the organisation TVM, but has a background from working in VCM as well. At VCM he worked with cost reduction and all that it includes. The background from VCM cost reduction and now working at TVM makes this person very interesting for this research project.

He thinks that idea generation is made by force people to start thinking. Encourage them to start to talk and share their thoughts with each other. He also states that every group should a "Duracell Rabbit", that goes on and on. It should be someone who is able to provoke the group, ask a lot of questions and spread energy.

The workshop method should be as following:

- Step 1 - Component/System Analysis
- Step 2 - Idea Generation
- Step 3 - Classification/Prioritisation
- Step 4 - Development of Action Plans
- Step 5 - Implementation

The roles of brainstorming are were important to remember:

- One "stupid" idea together with an even more "stupid" one might develop in to a genius idea
- Think BIG and NEW
- There is no such things as limitations & restriction
- Go for quantity not quality
- Encourage and support each other
- Negative criticism is strictly forbidden (No, Done it before etc etc)

5.2 Compile of the focus group

The focusing group also called the project group has highly influenced the planning of the event. The main scope was set from the pre-project phase but the content in it has the group together developed. The group were more or less deciding the KPI and the milestones together with the project leader. The best timing for this event was also decided in this group. By breaking down the work that had to be done to plan this event a checklist (To Do list) were created. In this checklist all the participants had something that they were responsible for doing. What the tools resulted in will be described in the analyse chapter.

5.3 Sum up evaluations from former cost reduction events

After the earlier arranged cost reduction events all the participants have filled an evaluation form. These evaluations are summarized beneath.

5.3.1 Positive

- Making new connections
- Cross functional groups
- Planning and preparation
- Kick off
- Separate place for the teams to sit down and evaluate ideas
- Interesting to see other products
- Team Leader
- Preparation mail before the event
- Coffee and cookies

5.3.2 Negative

- No prices for the components
- To long sessions
- To big scope
- Missing a compendium or something with information
- 4-5 persons in each group would been enough
- Not enough time for evaluation and developing of ideas
- Not able to disassemble the competitor cars
- Missing of right competences in the group
- Unstructured group leader

5.3.3 Improvement opportunities

- Would like to meet the team before the event started
- Welcome material with essential information
- Make each session smaller and have more breaks
- Focus on a specific area
- Prepare the parts with price information
- Try to have smaller groups
- Put more time for develop and evaluating ideas
- Have cars that can be disassembled
- Secure right competence and group leader

6. Analyse

Analyse of information will follow in this chapter.

6.1 Project Proposal

The first thing to do to plan this Build Up Event was to make a project proposal included the total event both planning and realisation. The proposal had to be approved by VCM management before any further work could be made. This project proposal is found in appendix 1 and it includes the following information:

- Background
- Purpose
- Limitations
- Methods
- Resources and participants
- Time schedule
- Budget

6.2 Project plan for the Build Up Event

This research project is the planning phase of a whole project and here is the overall project plan for the entire project.

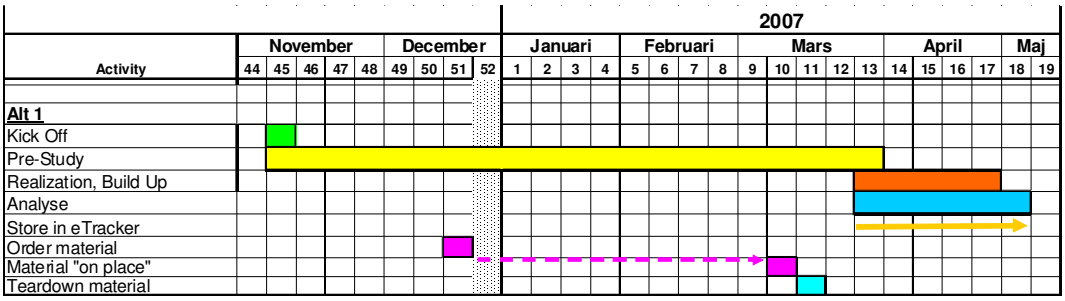

Figure 6.2, Bar chart for the whole project

Time:

- Kick off 07w13
- Build up 5 weeks
- Analyse 6 weeks
- Material on place 10 weeks
- Teardown material 2-3 days

6.3 KPI for making the Build Up Event a success

The main KPI for almost every project is Time, Cost and Quality. The time for this Build Up Event is limited to time schedule that are made, see 6.2. The cost is also limited and all money that is needed have to be requested for. The quality on the output is very important for this event and it is influenced by many different elements. Therefore the Key Performing Indicators are identified to secure the quality:

- A great Group leader
- Group composition
- Workshop method
- Place and timing
- Schedule
- Workshop Material

Title: A great group leader
Defined: When having a workshop with a group of people the leader for the group is the key to success. The leader has to lead and balance the group through the workshop. Besides this the leader also has to function as a facilitator during the idea creation phase. The leader has to motivate and inspire the group to be creative so new cost saving ideas can be identified.
Measured: A measure on this is what the group will perform under the Build Up Event.
Target: The target for this should be five ideas for each workshop that could be faceable.

Title: Group composition
Defined: The group leader is the key to success but without the group it is impossible to succeed. The group composition for this event should be a cross functional group with individuals from different units. This because of that the different areas has different responsibilities. This unit areas have to work together to make the ideas to become feasible.
Measured: This could be measured by number off people from the different areas.
Target: One person from each of these areas: group leader VCM-Core, R&D-KU/SU, Time specialist and one special competence.

Title: Workshop method
Defined: When having a workshop the aim for it has to be clear but also the way of how to get there. To get out new qualitative ideas a method has to be developed that will support this.
Measured: Can be measured after the events by the quality on the ideas created. But also by how far they ideas have been taken in the implementation process.
Target: Each area should have identified ten qualitative ideas during the total event. At least two of these ideas must be started up for future investigation.

Title: Place and timing
Defined: The place to have the event on and the timing for it is essential if people can participate or not. The place has to be practical and suitable for the event but also be strategically for the participants. The people have to be able to get there but when they are at place as few interrupts and disturbances have to take place as possible. The timing is important to be able to get the right people on place in time. If they are busy with something more important during this time they will not participate on this event.
Measured:

- Were the right people able to participate or were they busy with something else?
- Did the people show up as they said on place, and when participated were they able to stay focused without any disturbances?

Target: To get all the desired people at place. Minimize all potential sources to interruption and disturbances during the workshops.

Title: Schedule
Defined: It is significant to have a well worked out and clear schedule. That also should be easy to read and to understand for the participants. This is also an essential factor to get people to be on place at the right time and at the right place.
Measured: Did they people show up at the right time and place or did some misunderstandings appear.
Target: Everyone should understand the schedule with no misunderstandings.

Title: Workshop Material
Defined: To make the workshops the groups needs some material that they can look on and be inspired of. To sit in a room without any material will limit the ideas to a specific level and they will not be able to be further developed.
Measured: Make an evaluation with the participants on the workshop after the event and ask if the material was satisfying or how it could be better.
Target: All the participants should be satisfied with the material on place.

6.4 Project milestones

The milestones for this project are equivalent to the KPI:

- Group leader
- Group composition
- Workshop method
- Place and timing
- Schedule
- Workshop Material

The progress on the milestones is presented to the steering group.

6.5 Project Initiation Document

The project start-up phase starts by answer the following questions:

- What is to be carried out?
- Why is it being done?
- Who is going to do it?
- How is it to be accomplished?
- When is to be done?

By answering these questions the project initiation document could be created. This document is presented in appendix 3 and includes the following information:

- Objective
- Scope
- Constrains
- Authority
- Resources

6.6 Checklist for planning

To keep track on what has to be done, to when and by whom a checklist (To Do List) were made. This was made to complement the planning schedule that is Shawn in chapter 3.4.1. To make the checklist a work breakdown structure were used, and a part of this is shown in appendix 7. An extract from the checklist is shows in appendix 8. Following information is included in the checklist:

- What to do?
- Who is responsible
- When to be ready
- Remarks / Comments
- OK

6.7 Schedule

Two different schedules were created one build schedule and one workshop schedule. The build schedule shows which parts and systems that will be built every minute during the five weeks the Build Up Event take place. A part from the build schedule is shown in appendix 4, and a bar chart for it is shown in appendix 5.The workshop schedule shows when the workshops will take place and which component that will be handled under the workshop. A piece from the workshop schedule is shown in appendix 6. Four workshop schedules were made one for each area, interior, exterior, electrical and chassis.

6.8 Workshop method

Different types of workshop methods and the benefits of using them are described below.

6.8.1 Brecker Product/Process Improvement Methodology

To ensure good result following four-phase Value and Lean based methodology should be followed.

Phase 1: Key problem areas are identified and quantified.
Phase 2: Potential improvements are evaluated and prioritized.
Phase 3: Multi-functional teams improve key product / processes.
Phase 4: Improvements are implemented and monitored.

This approach ensures that the team is focusing on the right issue.

6.8.2 Value Management

Value management is primary a workshop were skilled individuals participate to search for better value. The workshops are normally following a five phase process known as the 'job plan' that includes:

1. Information phase
2. Creative phase
3. Evaluation phase
4. Development phase
5. Presentation phase

Some benefits with this approach:

- Makes better decisions by having a good foundation to base the decisions on.
- Improved product by understanding the value

6.8.3 Workshop method at VCME latest cost reduction even

On Track Management, were hired to help with the planning and the workshop method. Following method was used:

Workshop phases	Time
1. Team knowledge of current/planned time consumption	10%
2. Team understanding of time drivers	20%
3. Knowledge used to generate ideas	20%
4. Idea evaluation	50%

6.8.4 Workshop method from value management specialist at VCC

The workshop method should be as following:

- Step 1 - Component/System Analysis
- Step 2 - Idea Generation
- Step 3 - Classification/Prioritisation
- Step 4 - Development of Action Plans
- Step 5 - Implementation

6.8.5 Workshop method from experienced workshop leader at JLR

When arranging workshops the working method is more or less the same independent on the issue to be studied.

1. First an cost saving opportunity is identified
2. Collect information and data
3. The collected data is then analyzed to get a better understanding
4. Idea generation within the group
5. Evaluation of the ideas in the group
6. Implementation and follow up

6.9 Invitation

To invite the right people an invitation were send out to management to cascade it in the organisation. The invitation can be found in appendix 2 and following information is included:

- Purpose
- Working method
- Target group for the event
- Timing
- Participants responsibility
- Cascading
- Participants

When name on the participants were in a second invitation with more detailed information were send out with following information:

- Purpose
- Woking method
- Formal time for Kick off
- Exact location

7. Discussion

A work breakdown structure was used to get a better overview of what had to be done for planning the project. This was a good way to make all the actions visible in the project group. This could have been made in other ways but this was the one that were preferred in the group. A checklist was created and used to address the issues to a responsible person. The list was also used to track when the issue should be solved out. Key Performance Indicators were identified from the work breakdown but also the sum up from evaluations in chapter 5.3. KPI is normally used for long-term consideration for success. But for this research it was a good way to identify the most important success factors. KPI is also easy to later on follow up and see if the targets were fulfilled and if not analyse what went wrong. This makes it possible to improve the failed indicator to next project. The Key Performance Indicators will now be discussed.

7.1 Place and Timing

The project plan for the whole project has been changed along the way. The first preliminary plan that was made was aiming to have the event before Christmas 2006. The short time for planning the event would highly affect the outcome and the event was therefore rescheduled to spring 2007. When making the plan for this type of events there are some important factors that have to be considered. The required resources have to be availably during the build up period. The time to get the workshop material on place influences when the event can start. The actual time for building the car will influence the duration of the event. The project group gathered the necessary information to clear out these issues. By looking at a build schedules for coming projects it was easy to identify when the required resources would be free. The most vital object that was needed for this event was the car that should be built during the event. The time to get this on place was eight weeks so this was considered in the planning. To evaluate the time for actual building the car while people also wants to feel and analyse the parts/systems at the same time is harder. In the plant it takes about a day to build a car. When the ‘slow builds’ are made on new products in pilot plant it takes about two weeks and they count 10 minutes for each operation. To make this ‘slow slow build up’ 20 minutes per operation should be enough. A build sequence list for the car was created from the PII system. Then all operations were given 20 minutes each to be built on. The total time for building the car, eight hours a day, ended up in five weeks and this was the base for the event time.

To find a suitable place to have the event on is also important but the timing was the essential part to start with. The place has to be on a specific distance from the office. It can not be to fare away from the office then it takes too long time for the participants to get to the place in time. If the place is to close to the office it is harder for the participants to focus on the task at the event. In this case it is easier for the participants to just come and go, and this is something that should be avoided. Experience from farmer arranged events shows that the events that took place abroad were the most productive. These because the participants have leaved their regular work at home and are now able to focus 100% on the task for the event. In general people are also motivated by changing the environment. For this event there was no

possibility to have it abroad because of the limited amount of money. Otherwise it would be the best suggestion. Besides this the place also has to fit to other requirements south as; a car is going to be build, the participants have to have some place to sit and the surrounding should not disturb the work. Two options were identified one was a separate building outside the area for the factory and one was pilot plant that is located in the same building as the office. Pilot plant was selected due to that it was the best place to build the car according to how it is built in production. The disadvantages that will follow with this decision are:

- Problem to secure the participants to be at place during the whole time
- Harder to get the people focusing on the event
- Disturbances in the surrounding
- Are not able to sit beside the cars

To minimize the risks for these issues to occur following actions is taken:

- Be very clear in the invitation that the participant has to be at place for 100% when their parts/systems are handled.
- When the participants are at place they have to focus on the given task and nothing else. This should be stated in the invitation but also be brought up on the Kick off.
- There will be other activities in pilot plant at the same time as the Build Up Event. To see and hear as little as possible from this the building will take place in a separate corner of the plant.
- To arrange somewhere to sit for the participants three meeting rooms were booked in the close area.

7.2 Workshop Material

To make this event and help the participants to create ideas some material is needed. This event was specified from the beginning to include a specific Volvo car. This car was ordered from the plant and it took eight weeks to get it to Pilot Plant. The project group agreed on having a high specified car to get as much parts on it is possible. Another important selection was to have the body in white and the interior in light colour as well, this to be able to see cable harness in the car and to easier see how to assembly. It is on this car that the cost reduction opportunities should be identified. To help the participants with these different types of material can be used. To benchmark it is possible to rent competitor cars, but then you are not allowed to disassembly anything. This limits the use of the car very much. Another opportunity is to rent teardown material from a company in Europe. By doing this you have the opportunity to compare your parts toward competitors, but you do not have the possibility to see how it is assembled in the car or how it is placed. When renting parts you are not able to choose which parts you are interested in, you have to rent a whole car. Beside this it is always possible to by a competitor car, if money is not a problem.

Ford has a benchmarking tool that is called FACTS, which stands for: Ford And Competitor Technology System. FACTS is a computer based system that is availably on the Volvo Intranet. In this system picture and information on competitor cars are availably. When having FACTS it is not needed to rent part from another company, FACTS should be enough. To buy a new car out on the market was out off question for this event, due to limited amount of money to the project. To rent a car is not that expensive but it is not efficient either. By contacts a new Ford car became availably for this event. This car was given for free and the only thing that had to be arranged was the transports. On this car we were able to disassembly as much as we wanted. The interesting with this car was also that it is built on the same platform as the Volvo car. This made it possible to direct compare if Ford had managed to make a smarter and faster solution in the assembly than Volvo.

To build the Volvo car we have the assembly descriptions from the PII system. This should be feasibly to the participants during the workshops. The best way to do this is by having them on the wall with help from a computer and a beamer beside the car. To build the ford car we needed to have access to Fords "PII system" that is called Gspas. Some time and effort were needed to learn and handle the system. The Gspas system should also be shown on the wall during the workshops to be able to see how the Ford part is going to be assembled.

To build up the cars two persons are needed during the event. Potential persons for this are the manufacturing engineer that is responsible for the part, operators from production or mechanics from pilot plant. The event will take place in pilot plant and it is therefore suitable to have the mechanics to build the car. More advantages with having the mechanics is that they have a better knowledge on the complete product and they are used to work in pilot plant.

The groups also need to have a place to sit down and discuss the ideas. Unfortunately it is not allowed to have tables and chairs in pilot plant so meeting rooms in the area had to be used to this.

7.3 Schedule

Beside the project plan, schedules for the building had to be made as well. A raff schedule for the actual building was made to get an overview of how long time it will take to put the parts together, see appendix 5. The time for each operation was estimated to take 20 minutes each to be built. The estimation was made together with an experienced person for arranging ‘slow builds’ in the project group. The car should be build according to the normal sequence in the plant so all part get in the car at the right place at the right time.

All the components on the car can not be handled during this event. Some parts and systems that are more interesting to look on have to be selected. The project group selected competences to make this selection. A sequence list, see appendix 4, was sent over to these persons and they were selecting which components and systems that should be considered during this Event. They also put up how much time they needed for each components. From this information the build schedule were reworked

and the time on the operations were updated. The operations that were chosen to be handled had extra time and the operations not chosen were only having the time it would take for the mechanic to put it on place. A macro was then used on the build schedule to put in; starting time on the day, breaks, lunch and when the day ended. This made the list to a complete schedule for the five weeks of building.

The best way to create ideas is by doing it together in a group. Therefore a group schedule inform of a workshop schedule were created. One workshop schedule were created for each area; Interior, Exterior, Chassis and Electrical. The operations that were selected to be considered in the build schedule were blocked together to different workshops. An example of this schedule is shown in appendix 6. In total 52 different workshops are planned to have during five weeks time. The workshop schedule is the only plan that the participants need to have. Depending on which area the person works with this specific workshop schedule will be send. So it is only one schedule for the participants to concentrate on. The event leader, that will be the project leader, on the other hand has to be in control of all schedules the entire time. Some periods will be very hectic with up to three workshops running at the same time. While other periods will be very still with no workshops at all and it is just to put the parts on place in the car. To manage to have control over all the workshops a schedule were made specific for the event leader. This schedule is almost the same as the build schedule but the workshops is also included in it.

7.4 Workshop method

All the data that is collected regarding workshop methods is more or less recommending the same method. What is different between the methods are the number of phases, the names on them and the context in them depending on what they are used to. But in the whole they look more or less the same. Each workshop method has to be adapted to the aim with the workshop but the frame work could be the same independent on subject. The general framework for a workshop method is:

- First the problem/opportunity (subject for workshop) has to be identified.
- Required information has to be collected and analysed
- Creative phase, generation of ideas.
- Evaluation of created ideas
- Presentation/implementation

The workshop method for the Build Up Event will follow this framework to identify qualitative cost reduction ideas. The context in these phases will be discussed below.

7.4.1 Identifying the opportunity

This phase will not be included in the workshop. The opportunities on parts and systems have already been identified by.

7.4.2 Collect essential data and analyse

Important data for this event is the PII and Gspas assembly descriptions. Every workshop should start by first going through which part/system that should be handled at this workshop. What the function for the part is and how it is assembled in the car. The part is then first assembled in the Volvo car and then the similar part is assembled in the Ford car.

7.4.3 Creative phase, generating of ideas

The workshop groups now has a good base of knowledge to start creating ideas on. Following questions should be considered in the group, function as a checklist for the group leader:

- Were there any differences in the assembly description (PII) and how the part was assembled?
- Are all the assembly operations in the description adding value on the product?
- Is integration between parts possible (DFA)?
    - Need to move relative other parts?
    - Need other material?
    - Need separate assembly?
- Is the Ford part faster or smarter to assembly?
- Do we want to see other solutions (FACTS)?
- Do we need help to identify an idea or the best idea (FAST)?

In this phase the roles of brainstorming are important to remember:

- One “stupid” idea together with an even more “stupid” one might develop in to a genius idea
- Think BIG and NEW
- There is no such things as limitations & restriction
- Go for quantity not quality
- Encourage and support each other
- Negative criticism is strictly forbidden

All ideas in this phase should be written down by the individuals on a separate paper.

7.4.4 Evaluation of created ideas

All the ideas are now collected by the group leader and sum up in the idea sheet, appendix 7. The ideas are gone through and discussed together in the group and the idea sheet is filled in with required information. After this the ideas are evaluated together in the group according to time, cost and quality and an action plan is developed. The ideas are also gone through in the terms of Value.

7.4.5 Presentation/implementation

The ideas are now evaluated and an action plan exists for the ideas that were chosen to go for implementation. These ideas will at this phase be reported out and further investigation will be done by responsible area to go for implementation.

7.5 Group composition

The most effective way to work to create ideas is by working together in a group. To create ideas a good group dynamic has to be present within the team. It is the group leader's responsibility to try to balance the team. Beside the group leader the group participants and the environment can also influence the dynamic. The group members will be chosen from their profession and competence. The personality will not be able to be considered.
Because of the circumstances the group leader has to balance the group as good as possible and try to get a good group dynamic. To get the right competences in the group following resources were requested and invited to the Build Up Event:

- Group Leaders from TVM
- VCME Core
- R&D System responsible
- Time Specialist (IE)
- Cost reduction
- Special Competence TVM/operators/Resident/Commodity etc.

7.6 A Great Leader

Leadership is the key to having a successful group and to get a good result. A leader is someone who leads the people and the people will follow. To be able to lead a group the leader has to be flexible and creative. It is not possible to really say what a great leader is but there are some skills that often are common according to Ruben:

- Positivism
- See the overall picture
- Social competence
- Intelligence
- Goal motivated

It is hard to find a leader that has this skills and it is even harder to get the person to lead this event. For this event it is important that the leader is motivated and inspires the group also to be motivated. The group leaders for this event will be selected on their profession. It is not possible to select a specific person but it is always possible to ask the question. Different areas were identified to be support with potential leaders for this event; TVM, CMT, IE and VCME group managers. The leaders with in TVM would be the most suitable for the work with their experience of leading TVM activities. They are very familiar with leading workshops and are used to work with reducing cost. If the TVM leaders not are available the second choice should be Industrial Engineering. They work with cost reduction and they have participated

before at this type of workshops. It would be a good experience for them also to lead one. The leader is the most important person for making this event and it is therefore very important that the event get great leaders.

The question for being workshop leaders was first asked to TVM. Unfortunately they had lack off resources during this time and were not able to take the responsibility. IE was in the same situation and CMT was excluded due to the risk off to much focus on product price. The VCME group managers were next on the list but they were not able to take the role because of time consumptions for their normal work. System specialists were offered instead. This was not an optimal solution, but after raised the questions several off times to the steering group there were no other options.

To prepare the system specialists for their role as a group leader an introduction were given from the project leader. TVM also arrange an education on how to lead a workshop.

8. Conclusion

The Build Up Event will take place between week 13 and 17 at pilot plant. During the event a specific Volvo car will be build according to the sequence in Trim & Final (C-shop). Parallel with the Volvo car a Ford car will also be build. The car is built in benchmarking purpose and it is also build according to Volvo car sequence. To build up the cars two mechanics is hired from Pilot Plant. The best ideas are created in teams and therefore cost reduction workshops will be arranged during the building. The workshops will be lead by system specialists and the participants will come from:

- VCME Core
- R&D System responsible
- Time Specialist (IE)
- Cost reduction
- Special Competence TVM/operators/Resident/Commodity

To support the groups in the idea creation following material and tools are given:

- FACTS
- PII
- Gspas
- Checklist
    - Questions
    - DFA
    - FAST

Qualitative cost reduction ideas will be generated when the workshop is following this working method:

1. Understand the function of the part and analyse information
2. Creative phase, generation of ideas.
3. Evaluation of created ideas
4. Presentation of ideas

8.1 Future investigation and follow up

After the event has been performed a post-project review should be made by the project leader to see if the expected result were fulfilled. The review can be helpful for planning of next cost reduction event. Following issues should be considered in the review:

- Technical methods and standards used, how effective these proved to be
- Customer and supplier relationship issues
- Stakeholder management issues
- Team resource issues
- Project performance against plans, with a view to updating and improving that planning and estimating methods used.

Besides this it is also important to follow up the Key Performance Indicators for this project and see if the targets were achieved or not. If the targets were not fulfilled the reason for failure should be identified, this to avoid these issues to the next event.

If the outcome from this event is as expected it should be considered to use this way of planning as annual work for cost reduction events in the future.

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Appendix

Appendix 1; Project proposal

Build Up Event

Background

We know by study that VCC plants have to become more cost effective to be competitive toward other competitors in Europe. To be able to reduce the cost for the plants, investments and work has to be done in many different areas. And the assembly time is one of the areas that have to be improved.

Former arranged Line Walk's has generated in a lot of cost saving ideas, both for product price and assemble time. But many of those ideas have not been good enough for implementation. Line Walk can still be valid as input to generate cost saving ideas for new products, but we need to find new ways to find qualitative ideas as well. From a CMT-M (Cost Management Team – Manufacturing) point of view we think that a Build Up event could be an efficient way to find great ideas.

Purpose

The purpose with this activity is to generate ideas to secure manufacturing input both for short term and long term cost saving. The outcome from this exercise could also be seen as the optimal way to assemble the parts, a walk from today's solution to Best Practice with present knowledge. This event will mainly focus on VCM needs to reach BIC (Best in Class) in cost efficiency. But will also consider bad solutions and quality problems, as well as finding ideas to reduce part price.

Limitations

The Build Up event will be performed on a chosen high specified car, and will only consider 'Trim & Final' assembly (C-shop). A benchmark on component level will take place during the event with help from the Ford benchmark database FACTS (Ford And Competitor Technology System). It will also be considered to by or borrow components from competitive cars. All components may not be considered in this study due to the time limitation in the realization of this activity. Some parts may also be excluded due to high assemble complexity or that the parts are pre-assembled at supplier.

Methods

To support and guide this project a steering group with stakeholders should be chosen. And to start up the pre-study a project group has to be appointed. It is then up to the project group to decide which parts that should be evaluated during this event. The project will together setup the time schedule within the project time frame. The project group will also decide how to perform the Build Up event to get the best possible result out off it. In the pre-study it is also important that the group collects all relevant information and data that could be useful for this Build Up.

The project group has to identify the best suitable resources to participate in the realization of the Build Up. The choice of recourses highly influences the results. Therefore it is very important that this event get management attention and that identified resources will be available. To get a dynamic and effective working group it is preferable to have about 4-7 recourses in each group. It will also be up to the project group to create a checklist that will be used during the build up. This checklist will function as a help tool and is needed to make sure that all necessary output is covered.

During the realization phase as many ideas as possible should be started up for investigation. The generated ideas will be stored in the Ford database eTracker under the project "Cost Reduction VCC".

Recourses and participants

In the project group this competences is highly needed:

- Project leader
- Assembly specialist with high competence in the process flows.
- Knowledge about the product and its complexity.
- An experienced resource in planning this type of activities e.g. Black Belt.
- A coordinator for handling of material, tools and instructions
- One recourse that is competent in FACTS with its benchmark opportunities.

Time schedule

Kick off 06w43
Pre-study 10 – 14 weeks
Realization of activity 6 – 10 weeks
Analysing and refine the material 6 – 8 weeks
Store in eTracker project "Cost Reduction VCC" 2 week

Budget

TBD

Appendix 2; Invitation to the Build Up Event

Invitation to Build Up S80 Event

Volvo Cars Manufacturing Engineering (VCME) herby invites you to a Cost Reduction Event at Pilot Plant in Torslanda. The event is led by VCME and supported by R&D and TVM.

Purpose

The main purpose is to identify new qualitative cost reduction ideas for S80, but also for other vehicles on the EUCD platform. Comparison between assembly methods of the S80 and Mondeo will take place during the event.

Working method

The participants are divided into working groups according to their MSS and PSS area. Each group will have a leader that will guide them though the workshops and the event. The task for the group is to identify cost reduction ideas and to evaluate and refine the ideas together as a team. The event will end up with a report out section to senior management. The result from this event will then be subject for continued work in order to reach VCC cost reduction targets. To support the groups in this work following arrangements are made:

- S80 will be build according to C-shop sequence
- Mondeo will be build parallel and reflect the assembly on S80
- Display of PPA and GSPAS descriptions
- If possible display of V70

Target group for the event

VCM – Industrial Engineering, Core, Commodity and Resident
R&D - PSS responsible / SU / KU
Cost Reduction Team leaders and members
TVM / TCM
Purchasing

Visitors from FoE / JLR organizations

Timing

The event will take place between week 13 and 17, in Pilot Plant (PVÖ) Torslanda.
Detailed schedule for workshops on each area and build schedule is found as an attachment in the mail.

Participant responsibility

To get maximum efficiency out of this event each participant must contribute for the entire workshop were his/her parts is handled. It is also very important to be creative and focused on the task during this time.

Cascading
In order to invite right persons we ask you to cascade this invitation according to above target groups.

Participants
We need to have names on participants and time fore when they will participate latest Tuesday week 12. Please respond to:
Sara Yngvesson, email address; XXX

Best regards

Sara Yngvesson
Project Leader, Cost Reduction Event
81031 Industrial Engineering
Volvo Cars Corporation

Appendix 3, Project initiation Document

Project Initiation Document for Build Up Event

By: Sara Yngvesson, dep.81031

Objective

The purpose with this activity is to generate ideas to secure manufacturing input both for short term and long term cost saving. The outcome from this exercise could also be seen as the optimal way to assemble the parts, a walk from today's solution to Best Practice with present knowledge.

Expected result

- Identified new qualitative ideas to reduce the assembly time on today's product but also for coming models
- Get a better understanding about the differences as well as the similarities of the assembly time/-method between a Mondeo and a S80.
- Find ideas to reduce the product cost on short and long term.
- Cross functional exchange for improved understanding between Product & Process within VCC and towards FORD.
- If positive result keep this type of activity as annual work

Scope

This event will mainly focus on VCM needs to reach BIC (Best in Class) in cost efficiency. But will also consider bad solutions and quality problems, as well as finding ideas to reduce part price. The Build Up event will be performed on a chosen high specified car. A benchmark on component level will take place during the event with help from the Ford benchmark database FACTS (Ford And Competitor Technology System). It will also be considered to by or borrow components from competitive cars. All components may not be considered in this study due to the time limitation in the realization of this activity. Some parts may also be excluded due to high assemble complexity or that the parts are pre-assembled at supplier.

Constrains

To support and guide this project a steering group with stakeholders is chosen. It is up to the project group to decide which parts that should be evaluated during this event. The project group decides how to perform the Build Up event to get the best possible result out off it. In the planning it is also important that the group collects all relevant information and data that could be useful for this Build Up.

The project group has to identify the best suitable resources to participate in the realization of the Build Up. The choice of recourses highly influences the results. Therefore it is very important that this event get management attention and that identified resources will be available. To get a dynamic and effective working group it is preferable to have about 4-7 recourses in each group. It will also be up to the project group to create a checklist that will be used during the build up. This checklist will function as a help tool and is needed to make sure that all necessary output is covered.

During the build up workshop sessions for the selected systems / components will take place.

Authority
The person with the authority over this event is the manager for Volvo Cars Manufacturing Engineering. He is the responsible that authorised this project and he is the one that are responsible to make resources availably, and promote the project to senior management.

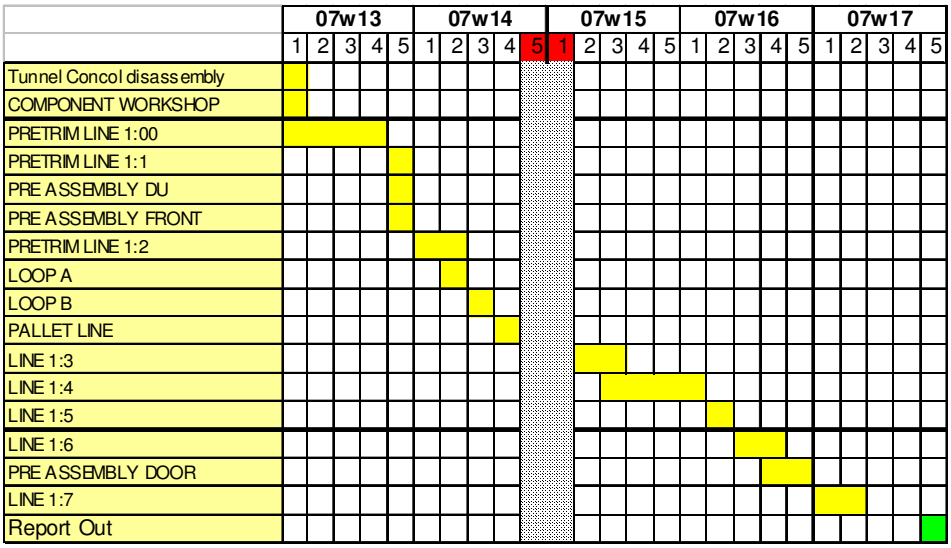
Resources
At each workshop session during the build up following recourses should be at place:

- Group Leaders from TVM/IE/CMT/VCME/Group managers
- VCME Core one person from each system area
- R&D System responsible
- Time Specialist (IE)
- Cost reduction
- Special Competence TVM/operators/Resident/Commodity etc.

Appendix 4; a piece from the build schedule

LINE 1:41		0	2007-04-12 08:00
CONNECT HOSE TO PUMP CONTEINER.	730	15	2007-04-12 08:00
CH ENGINEBAY ASSEMBLY TO WATER CONT	420	10	2007-04-12 08:15
CONN. COCKPIT TO PJB	420	10	2007-04-12 08:25
COCKPIT CONNECTION TO A-PILLAR	420	10	2007-04-12 08:35
STEERING SHAFT, STEERING GEAR, ASSE	610	20	2007-04-12 08:45
SPRINGNUT TO REAR HEATSHIELD ON FLO	620	20	2007-04-12 09:05
Break		10	2007-04-12 09:25
PLASTIC NUT WHEEL ARCH LINER FRONT	740	20	2007-04-12 09:35
AIR DUCT REAR LOWER B-PILLAR ASSEMB	540	20	2007-04-12 09:55
ANCHORAGE CUSHION REAR SEAT ASSEMBL	530	20	2007-04-12 10:15
REAR CARPET ASSEMBLY	520	20	2007-04-12 10:35
ABSORBER UNDER REAR SEAT ASSY	520	20	2007-04-12 10:55
CONNECTION ENGINEDRESS / ENGINEBAY	430	5	2007-04-12 11:15
CONN. COCKPIT TO TUNNEL	420	5	2007-04-12 11:20
CONN. SRS	420	5	2007-04-12 11:25
GEAR CABLE TO GEAR LEVER CARRIER AU	620	20	2007-04-12 11:30
Lunch		60	2007-04-12 11:50
FLOOR CARPET FRONT LEFT ASSEMBLY	520	20	2007-04-12 12:50
A-PILLAR LOWER ASSEMBLY	520	20	2007-04-12 13:10
AIR DUCT REAR FLOOR ASSEMBLY	540	20	2007-04-12 13:30
AIR OUTLET REAR FLOOR ASSEMBLY	540	20	2007-04-12 13:50
AIR DUCT FRONT B-PILLAR ASSEMBLY	540	20	2007-04-12 14:10
FLOOR CARPET REAR LIFT INTO BODY	520	15	2007-04-12 14:30
TUNNEL MODULE TO BODY ASSY	540	20	2007-04-12 14:45
Break		15	2007-04-12 15:05
STEERING WHEEL, COCK-PIT, ASSEMBLY	530	20	2007-04-12 15:20
AIRBAG DRIVER SIDE	530	20	2007-04-12 15:40
FLOOR HARNESS CONN. TO TUNNEL	420	15	2007-04-12 16:00
FLOOR CARPET FRONT RIGHT ASSEMBLY	520	20	2007-04-12 16:15
CABLE ROUTING KV-ANTENNA	420	10	2007-04-12 16:35
EMBLEM TYPE TRUNK-LID 4D, ASS.	740	5	2007-04-12 16:45
EMBLEM VAR TRUNK-LID 4D, ASS	740	5	2007-04-12 16:50
DISASSAMBLING SUPPORT TRUNKLID.	740	15	2007-04-12 16:55
End of day			
Night			
Next day			
TAIL LAMP Y286	730	20	2007-04-13 08:00
RELEASE HANDLE BONNET LOCK ASSEMBLY	720	20	2007-04-13 08:20
TIGHTEN OF HOODLOOCK.	720	20	2007-04-13 08:40
BONNET LOCK ASSEMBLY	720	20	2007-04-13 09:00
LINE 1:42		0	2007-04-13 09:20
STEERING ROD, BALL JOINT TO STEERIN	610	20	2007-04-13 09:20
BRACKET BUMPER REAR ASSEMBLE	730	20	2007-04-13 09:40
Break		10	2007-04-13 10:00
AUDIO MODULE, ASSEMBLY	430	15	2007-04-13 10:10
CONNECTING PIPE AIR FILTER TO AIR G	620	20	2007-04-13 10:25
ROCKER MOULDING.	740	20	2007-04-13 10:45
SECURE CABLE HARNESS UNDER REAR CAR	520	10	2007-04-13 11:05
BATTERY ASSEMBLY WITH LIFT	420	15	2007-04-13 11:15
SUPPORTCHANNEL HOOD LOCK WIRE FINAL	720	20	2007-04-13 11:30
BATTERY+ FROM EJB	420	15	2007-04-13 11:50
Lunch		55	2007-04-13 12:05

Appendix 5; Bar chart for building the car



Appendix 6; a piece from the workshop schedule for exterior

W14

Monday 2/4		**10:00-12:00**	**RETRIM LINE 1:2**		
720	240		FRONT INNER PLACE TO CAR	C8240-4002	
720	240		ASSY HOODLOCK TO SUPPORTCH	C8210-4004	
720	240		TIGHTEN FRONT INNER	C8240-4003	WS8
		15:00-16:15	**RETRIM LINE 1:2**		
730	260		AIRSEAL LOWER	C8910-4002	
710	190		GLOVE COMPARTMENT LOCK, ASSEMBL	C8340-4016	
740	210		REAR DRAINHOUSE TO SOUNDPLUGG A	C8360-4006	

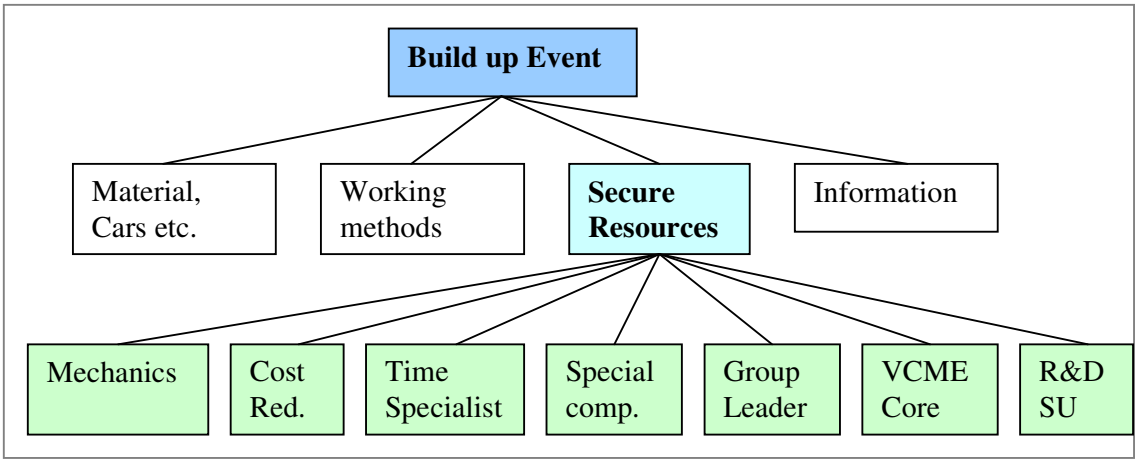
W15

Wednesd 11/4		**12:00-17:00**	**Line 1:4**		
720	230		ANTI THEFT COVER	C8320-4007	
710	190		STRIKER TRUNKLID ASSEMBLY	C8340-4007	
720	190		OUTER HANDLE TRUNKLID ASSEMBLY	C8340-4008	
730	180		WINDSCREEN WIPER UNIT, ASSEMBLY	C3631-4001	WS9
720	190		PLASTIC COVER TO TRUNKLID LOCK, AS	C8340-4011	
740	250		A-PILLAR MOULDING Y286	C8415-4001	
710	190		ASSEMLY LOCK CYLINDER BOOT LID.	C8340-4017	
Friday 13/4		**08:00-12:00**	**LINE 1:41 o 1:42**		
730	170		TAIL LAMP Y286	C3530-4001	
720	240		RELEASE HANDLE BONNET LOCK ASSEM	C8210-4003	
720	240		TIGHTEN OF HOODLOOCK.	C8210-4013	
720	240		BONNET LOCK ASSEMBLY	C8210-4016	WS10
730	260		BRACKET BUMPER REAR ASSY	C8610-4003	
740	250		ROCKER MOULDING	C8631-4001	
720	240		SUPPORTCHANNEL HOOD LOCK WIRE FI	C8210-4014	

Appendix 7; Idea sum up sheet

Part No	Idea description	TMU /car	Partprice SEK/car	Investment (SEK)	Weight effect (g/car)	Time aspect (S/M/L)	Status (N/InP/ Imp/R)	Effected Car	Action	Responsible	Remark

Appendix 8, Work breakdown structure



Appendix 9, Checklist for the planning

What To Do!	Responsible	Ready week	Remarks/Comments	OK/ week
Send invitation	Sara	07w10	Will go out to participants+ some other	
Present scope to steering group	Sara	06w50 d5		**OK**
Meeting 3 steering group	Sara	07w03		
Place	Sara			
Book PVÖ C-shop	Sara	06w50		**OK**
Meeting room	B	07w02	Tomas kollar på PVÖ plats	
2 Projector + screen	P	07w02		
Check Internet	Sara	07w02		**OK**
PC	Sara	07w02	Have also one in PVÖ	**OK**
Chairs + Tables	Sara	07w02		
Report out equipments	Sara	07w10		
Present material	Sara	07w10		
Meeting room	B	07w10		