WORKING IN PROJECTS

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Preface

The purpose of this document is to be a short introduction to working in projects, intended to be used in an introductory course for the Masters programme Communication Engineering at Chalmers University of Technology. Focus is on the human aspects of working in projects.

The author has a long experience of product development in the Telecom Industry, as project manager, product development line manager, business development manager and as product manager.

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1.1 Introduction

Performing a product development has become synonymous with running a development project. E.g., virtually every product development is organized and managed as a project. This practice started in the decades following the Second World War as a way to organize very large development projects within the defence and space industries.

By definition a project is the way to perform a task so big that it requires several persons to perform it. A project always exists for a limited time, the duration of the project.

Every company has a line organization. There are several good reasons for using a parallel organizational structure for performing large tasks, a project structure. Some reasons:

- A project involves several different departments of the company
- A project may even involve partner companies or sub-suppliers
- There may be several projects going on at the same time
- A project is limited in time
- A project will have a specific budget
- Projects may be very different, and each project can be organized accordingly
- Projects is a good way to accommodate change

Such development projects can be very different, depending on conditions like:

- Size of the project, particularly in terms of persons involved
- The number of departments, of companies, involved
- Complexity of the product to be developed
- If it is a break-through innovation to be developed or a minor evolution of an existing product
- The competition in the market
- If it is a customer specific project or a internally sponsored project

1.2 Line Organization

The line organization of a company is the hierarchical structure with the Chief Executive Officer at the top. It moves down line by line and is therefore called a line organization. This structure defines how the power of authority is delegated level by level. A company comprising all functions involved in developing, producing and selling products may have an organization structure like figure 1. This may also be the structure of a business unit in a large enterprise comprising several product areas.

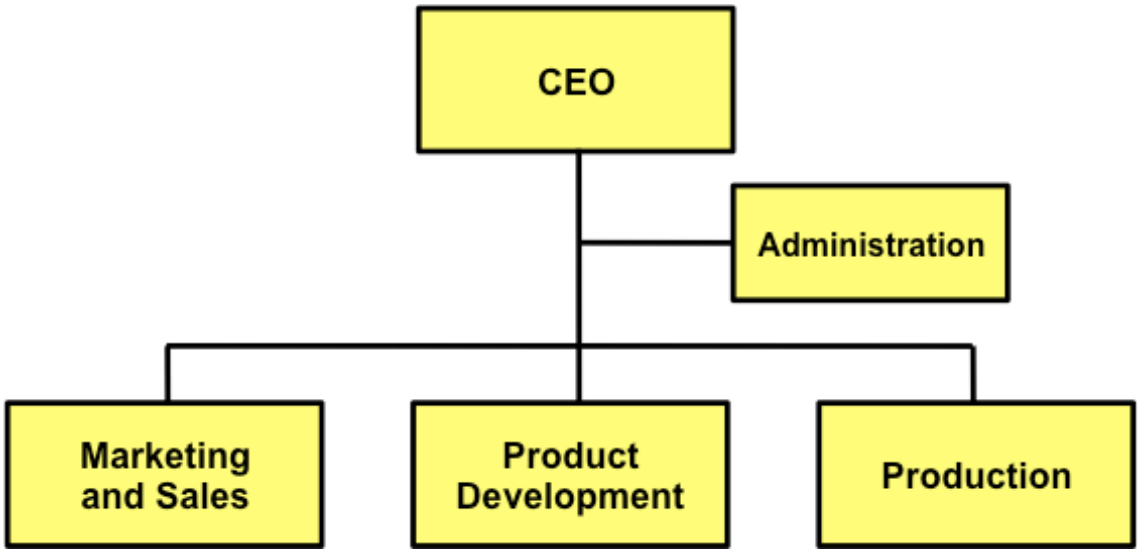

Fig. 1. Company Line Organization

The authority to decide what product(s) to develop usually belongs to the market department, or top management. Internally, the manager, or the line unit with such decision power is today often regarded as sponsor of such product development projects. The sponsor takes decisions regarding projects and allocates budget for a project. It has become customary to handle this role with a product management unit within a market department.

The development department usually has a functionally divided organization, and may in case of a telecom oriented company comprise some or all of the following units:

- Systems design
- Digital hardware design
- Software design
- Radio design
- Signal processing design
- Mechanical design
- Integration and testing
- Project office

The development department may also include support functions for

- Quality control
- Configuration management

In recent years Product Management has become common as an additional function between Marketing and Sales and Product Management. The main purpose is to interpret market demands and provide product specifications to Product development.

It has become very common to subcontract production. In such a case the subcontractor needs to be involved in a development project. A subcontract is when a second company is involved with responsibility for a part of a project.

1.3 Project Organization

A project will need some kind of organization structure. It can be very simple for a small project and may be quite complex, including several hierarchical layers, in case of a large project. The most logical structure is to divide the project into sub-projects with one such sub-project for each logical sub-unit or functional part of the product. Often a company takes the easy way to create a sub-project for each involved part of the line-organization (system design, analogue and digital Hardware, Software etc.) involved in the project, and an additional sub-project for production preparations. Some of these sub-projects may need to be divided further, depending on the size of the project. The support functions (quality control, configuration management etc.) are often included as one or several staff functions in the project organization structure.

If the development task of a project is a complex system it is customary to divide the project on top level with separate sub-projects for each major part (or product) of the system, and then to divide each sub-project with a functional structure.

1.4 Project Phases

The following way to divide a project into phases has become very common, and is used by many companies, with slight difference in terminology and in the details:

1. What-study phase
2. How-study phase
3. Execution phase
4. Wrap-up phase

This structure is used within Ericsson and in same or similar fashion in many other companies. The Ericsson model, called PROPS, is presented in Fig. 2 It is also integrated in several commercial development tools, like the Rational Unified Process.

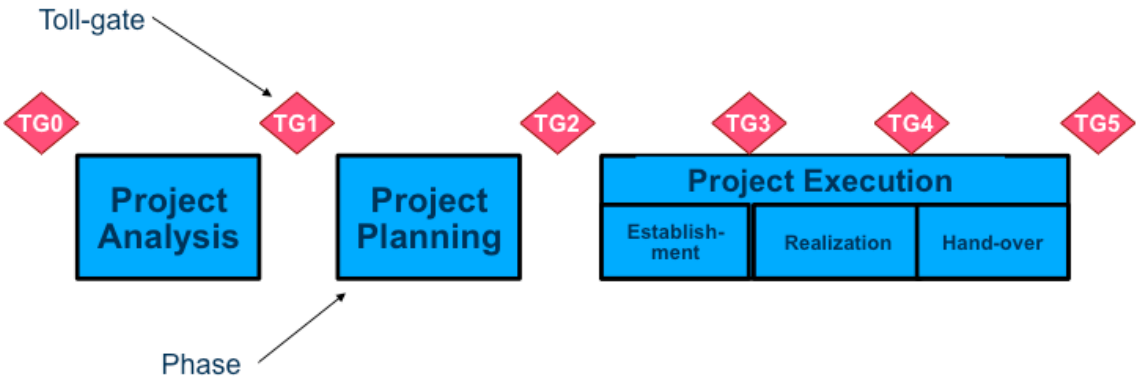

Fig. 2. The Ericsson PROPS Process, based on Phases and Toll-Gates

The execution phase is the main part of the project where the bulk of the actual design work is performed. The division into phases makes it possible to define check-points at the transition from one phase to the next, where the project sponsor evaluates the result from the preceding phase and decides if and how the work shall proceed.

1.4.1 What-study Phase

The purpose of the What-study is to identify a market need and convert it into a rudimentary definition of a product, preferably with an outcome of the study in terms of relevant targets regarding time-to-market, production cost, key technical properties etc. This study must be performed with large contributions from product management or other part of the market department. Or the market department must initiate the study with clear objectives to the development department. It is common to make a sketch of how the product can be technically implemented. Based on these results, preliminary estimates of development cost and production cost are made, as input to the check-point before the How-study phase. At the check-point it may be decided to start the How-study. Or it may be concluded from the What-study that it is not a good idea to develop a product according to the initial idea. In case of a customer specific development, the customer will make a definition of the product to be developed, as part of a Request for Proposal. In such a case there is no need for the What-study.

Important output for making a decision on how to continue are:
- Brief sketch of the product and how to implement it
- Course estimates of development cost, development time and production cost
- Estimate of the market potential

1.4.2 How-study Phase

The How-study is a preparation for the Execution. The result of the study shall be a good-enough plan for how to perform the development. The two key results in terms of documents are a plan for the technical implementation (Product Description), and a plan for how to organize and perform the work (Project Plan). The break-down of the work will have to be based on the break-down of the product.

A popular way of starting the process of getting from Requirements to Product Description is to make a product architecture. This is in short to identify all necessary components, including functional components, both hardware and software, that will be needed to make the product. Describing it as an architecture allows to show how different parts interact and relate to each-other. This is also a good way to initiate the work break-down. It is necessary to involve all affected parts of the organization in the architecture work. Since the architecture is often made up through a workshop early in the How-study it is likely to be necessary to refine or modify the architecture later in the project.

Based on the work break-down the planning will also include providing a time schedule and a cost estimate for the development, and also an estimate of the production cost. Another factor of importance to evaluate at the check-point between How-study and Execution is to make sure that the company can provide the necessary resources for the project execution. This check-point is the most crucial decision for a project. It includes allocation of budget for the rest of the project. When the sponsor is facing this decision it often causes hesitation and request for changes of the How-study result before the go-

ahead for execution can be reached.

Important output for making a decision on how to continue are:
- Requirement specification covering all fundamental requirements
- Implementation proposal
- Reliable estimates of development cost, development time and production cost
- The line organization´s view on how to manage the execution
- Update of the market potential

1.4.3 Execution Phase

The traditional way to organize the Execution phase was to perform the work in strict sequential order. E.g. first systems design with the task to split up the product into parts and define requirements on each part. Then separate development of each part, followed by integration when all parts are available (often called the big bang approach). The integration will reveal mistakes and limitations that must be corrected, and when this is done the formal testing according to the initial requirement specification will follow, probably revealing more needs for corrections and modifications. In case of a strict sequential work it is not until after successful testing that the production department will receive the result of the development and start preparing for production. The production preparation work is often called industrialization, and it includes necessary changes to make the product properly producible.

The above approach has two obvious drawbacks:
1. It will take a long time
2. Needs for changes may be revealed very late

In recent decades many initiatives have been taken to find more time efficient (and consequently cost efficient) approaches. Terms like concurrent engineering, integration driven development, production oriented development etc. have been introduced. They all have one thing in common: Work is performed in parallel as much as possible.

The basic phased approach for a project actually makes a fundamental contribution to a more time efficient execution, and this is how:
- Both the What-study and the How-study have as most important purpose to make sure that there are realistic conditions in place for the next phase
- Both study phases, and in particular the How-study, establish a common view among key members of the project team about the task of the project and how to achieve it

Important aspects on how to work efficiently in a project are how people in the project interact with each other. More about this later.

The primary goal of the Execution phase is to complete the product development, e.g. to get the product into production, or in case of a customer specific development to perform the delivery to the customer.

Criteria for deciding to close the execution phase are:
- All requirements fulfilled (based on testing result)
- Product is ready for production

1.4.4 Wrap-up Phase

When the goal of the Execution phase is achieved there are always a number of minor tasks left to do that are best treated in a separate Wrap-up phase, like:
- Finalising and filing documents
- Monitor production for a period of time (a few months) to make sure the product is producible in volume
- Monitor early operation by the customer to make sure the performance and quality is good enough
- Hand over responsibility for maintenance support of the product to the line organization
- Evaluate the experience gained in the project and make recommendations for future projects
- Close down the project organization and hand over personnel

Common criteria for closing down the project are:
- The product is producible in volume (feedback from production)
- The product is performing well in operation (early feedback from customers)
- The line organization is prepared to take over the responsibility for maintenance

1.5 Agile methods

The growing Software part of all kinds of products has had a large impact on the evolution of development processes during the last 10+ years. Today Hardware and Software development is completely separated for many types of products. Often a standard Hardware product can be used as platform and only the Software development is product specific.

There are some main reasons for the characteristics of the Software oriented methods:

- It is always easy to implement a step-wise approach for Software development
- A software product is never fully developed. Functions can be added and added in upgrades
- Malfunctions identified after delivery can be corrected as part of upgrades

The commonly used term for the new development processes is Agile methods. The most well-known specific process is Scrum. The execution work is split up into so called Sprints of 2-3 weeks in length. At the start of each sprint a plan for the work during the sprint is established within the development team. The sprint shall include testing of the complete product at this stage, but not necessarily a sufficiently thorough testing for delivery. At the end of the Sprint a backlog of parts that were not achieved during the Sprint is established and used as input to the planning process for the next Sprint.

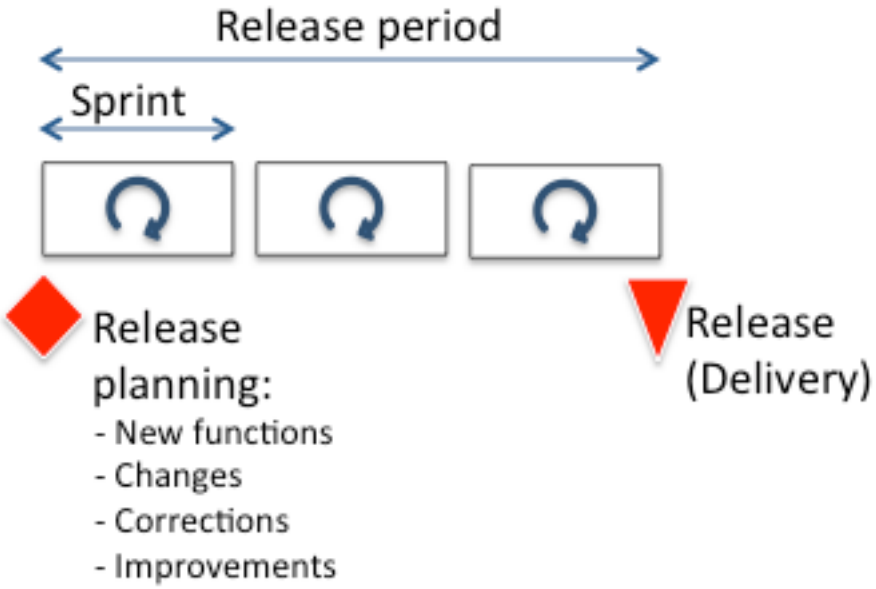

Fig. 3. Execution according to Scrum

Scrum is ideal for development of products under constant upgrades, and for development where a complete requirement specification is not possible to establish before the execution starts. Drawbacks are that it can be difficult to make proper forecasts of delivery time and cost.

The most often mentioned advantage is that it is comparatively easy to respond to new functional demands on the product during the execution phase.

1.6 Development Processes and Tools

For the different parts of development work, like systems design, radio design etc. it soon becomes obvious within a company that it is preferable if the work is performed in an established and predicted way, e.g. a documented process shall be used. This will provide guidelines and check-lists to the engineers in the company. In particular it will improve the introduction of new persons in the work.

Another important reason for establishing a process is to ensure that the work is performed in a way that meets quality requirements. Therefore a key part of a process is to include checkpoints in the work to ensure that the achieved result at each checkpoint is OK. A common type of procedure is to perform reviews where the result at hand is evaluated by other persons, preferably experienced designers. Mistakes and misjudgements by individuals will in this way be identified and corrected as early as possible. In this way it becomes the responsibility of the organization, and not the individual, to avoid mistakes. In a case where a mistake despite the checkpoints has been revealed later than expected in the process, this is regarded as a process error, and should initiate an improvement of the process.

For some development processes, in particular for Software design, commercial tools exist that include and imply the use of a certain process. This is beneficial, in particular

for small companies that can reduce the cost for establishing an internal development process. It is however always necessary to adapt available processes and tools to a specific development task. It is customary to design a development process to fit the largest and most complex development task that can be imagined. With the consequence that most of the development projects will be burdened with a too complex process, unless the organization can manage to adapt the process to each project.

Using formal processes and commercial tools helps a lot in organizing development work, but every organization must create their own adaptation in order to get all details in place. And constantly add its experience from performed projects. Some is relevant to put into documents, and will constitute the local process (formal process plus adaptations). Some is the unwritten practice of how to act, and that is the culture of the organization.

1.7 Project Planning, and the Documents

One fundamental input document for a product development is always a requirement specification. It may come from the customer or from an internal source like product management. Such a specification is usually a condensed top level requirement specification. It is hopefully sufficient to understand the function and performance expectation of the complete product. Before individual designers can do their job more has to be added. Some necessary additions:

- Make sure that all necessary functions, including those for installation, commissioning, maintenance etc. are included
- Identify and add requirements for producability
- Based on the implementation selected, make a break-down of requirements to sub-units, and particularly important, specify the interfaces between sub-units
- Consider requirements for testability, during all phases of development
- Go through present experience of similar products and add relevant requirements based on such experience, for gaining a competitive advantage

All such additions of requirements must be evaluated from cost and complexity viewpoint.

Based on the complete set of requirements, a test plan shall be established. It shall identify the different steps in the development process and define what shall be tested at each step. Based on the test plan detailed test procedures can then be prepared for each test step.

A project plan is a document that defines how the work is organized, how it is monitored and controlled within the company, and milestones for the project. A time schedule for the project is normally a separate document. In order to decide on a suitable organization for a project it is usually advisable to make a technical break-down of the product. This break-down is important for the planning of the project in terms of suitable organization, time schedule, resources (number of persons) and work-effort (man-hours). A project plan should also define the roles and responsibilities in the team.

The most common form of a time schedule is the Gantt chart. In order to create a Gantt chart you need to break down the work into separate tasks. In the chart there is one row for each task. To the left there is a column listing the tasks. To the right there is a time-line for each task indicating the start and finish of a task. This simple form of chart gives a very good overview of a project in terms of tasks, and the time dimension of the project. It is easy to see what tasks will determine the total duration of the project, and that may require re-planning in order to meet a delivery time requirement. During the execution of the project the most important way to follow up the progress is to compare the actual result with the planned result in the time schedule.

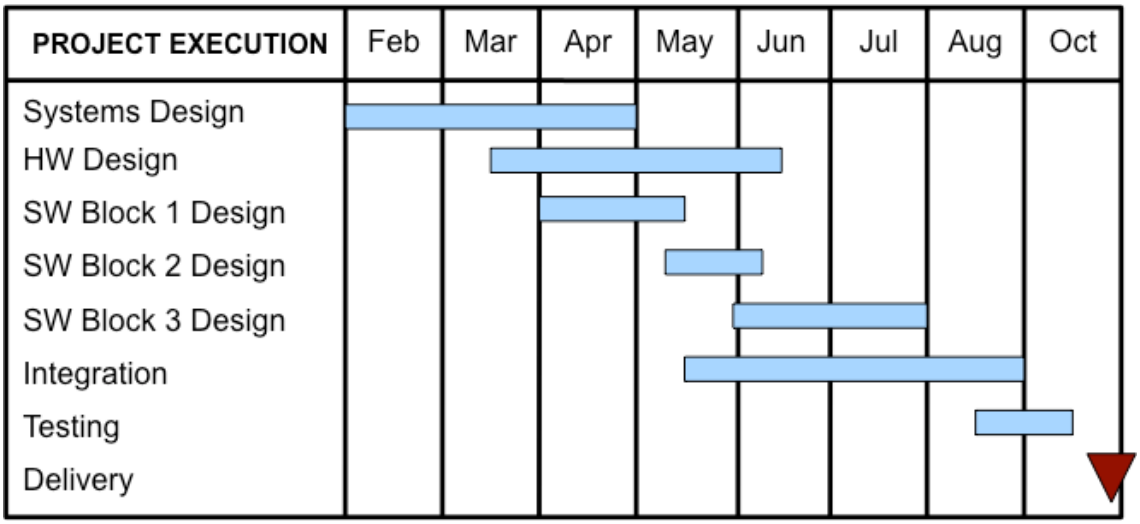

Fig. 4. Example of Gantt Chart

1.8 Risk Management

In recent years risk management has become a common tool for successful project management. The basic idea is to identify possible risks that can occur in the project, e.g. things that may deviate from the plan. Examples are:
- Technical solutions that may turn out not to meet requirements
- Tasks that may require more time than estimated
- Disturbances due to resource conflicts with other projects

Make a list of the most obvious risks. Estimate the probability of each item and the magnitude of damage it may do to the project. Make a risk list based on the combination of probability and damage impact. Based on the list, identify actions to counteract the top-most items in the list. For example, if a technical solution is regarded a top risk, consider risk reduction by implementing and testing this part as early as possible in the project, or if a technical solution is particularly critical to a project, consider to develop more than one solution in parallel, and compare the solutions.

Risk judgements have a short validity, and if risk management is used in a project, it is important to revise the risk list rather often. A good advice is to focus on near-term risks and make limited efforts on long-term risks.

2 How to Work in Projects

2.1 Fundamentals about Cooperation

It is obvious from the above that a basic reason for organizing work as projects is to create a foundation for the cooperation of people, and of different organizations, in order to jointly perform a task. It is also obvious that there is a need for different kinds of competence to carry out a product development task. It is well understood that it takes a certain competence and ability to manage a project, and even a sub-project. For optimum performance in a project team this is not enough. Everyone involved must contribute to the interaction in the project. It is not sufficient to do ones own bit and leave the cooperation part to the management. And furthermore, a good cooperation will add tremendously to the individuals work experience and satisfaction.

Every group of persons working together for a period, like among the closest colleagues in the line organization, will establish common values. Not necessarily openly discussed and agreed, but rather by unspoken agreement. A crucial part of the common values is how the group views its surrounding groups of people. If these common values differ from group to group and particularly if the way one group perceives its neighbouring groups is negative or critical, these conditions will be an obstacle for projects involving persons from different groups. If on the other hands the common values are shared within a large organization and the sentiment to other groups are positive this will be a strong asset in performing well in projects. It will be fun and rewarding to work in projects in such an organization.

Having a common and well established development process within a company is one major part of the common ground that is necessary for efficient project work. But it is not enough. The common values is another necessary part.

2.2 How to establish Common Values

Let us assume that you will be involved in a project that will involve persons or organizations that are not part of a well established common value culture. A quite common situation. If the project management is aware of this, it will take action in the start-up of the project to create a culture based on common values within the project. The key to do it is quite simple: To create a joint understanding among all involved of the common goal, how this will be achieved, and a conviction that goals and plans are realistic.

To initially set the goals for the project is a task for the project management and the project sponsor. When it comes to make the plans and identify how to reach the goals, this is a task that should preferably involve as many as possible of the project members. Presumably there is a project management group comprising the project manager and the sub-project leaders. This is the key group for establish the common values. The sub-project teams must however also be involved in the discussion, and give feedback to the project management group for review. An appropriate final step is, if possible, to gather the whole project team and for the project manager to present the result. This process

will take some time, and can therefore be questioned as a distraction from the real work. Usually this is time well spent, particularly if the project team will encounter surprises and difficulties later on.

2.3 The Priority Dilemma, Time, Cost or Quality

All project planning is a matter of balancing time requirements, keeping the cost within budget and of securing sufficient quality. This is particularly so when a project is facing unexpected problems. What is most important? Is it time, cost or quality? Guidance should be found in the common values. All may seem equally important, but such a view is to no help in priority decisions, small or big, in the everyday work.

Depending on what is made first priority, will have consequences that must be handled. With time as first priority you will have to be prepared to handle quality problems in initial production or in operation, or increased cost. With cost as first priority you will most likely sooner or later have to take away features from the requirement specification, and with quality as first priority the delivery time will be a constantly changing target and not a very firm goal. Still, if it is properly evaluated and communicated in the project what is important, each project member can make decisions in his daily work, and when a major re-planning has to be done it can be achieved quickly and it will be understood and respected within the project.

2.4 Creativity Maximum during the How-study

The appropriate way to perform the How study is to select and involve key-persons from each part of the organization that will be needed to perform the execution later on. This means that for any project How-study team, the participant constellation is more or less different from other previous projects. And particularly, the study team does not comprise the every day working mates. The impact of assembling a new group of people is quite surprising. In such a group you are likely to become more perceptive to new thoughts than you usually are. This is reinforced by the fact that your team-mates are coming from other parts of a company and have different competence and experience than yourself. In such an environment you are likely to open up to new ideas and you are more inclined to generate new ideas yourself.

Due to this, the How-study concept is a very efficient way to foster creativity and to find new technical solutions, and new ways of working. The fact that the How-study team comprises a broad range of different competences gives unique opportunities for influencing each other. E.g. production people can advice if a technical solution is suitable for production or not.

Important for this process is to use interdisciplinary workshops for different matters like requirements, product architecture, time schedule. This helps to create a common view among the key personnel of the project.

The How-study will create relations to persons in other parts of the project organization that will be valuable during the execution phase. Since, once the Execution phase is

started there will be so much focus on achieving your own bit that the open atmosphere of the How study gets lost.

2.5 Internal Interfaces, from Finish to Start

Regardless of what your own task is in a project, you will have an interface to one or several others that provide input to your work, and the result of your work will become an output delivered to others. It will be of a major importance to your contribution to the project that you identify your interfaces, and have a good working relation with them. It has become a common practice to plan a project backwards, and this also applies to the involved individuals. On the overall level the planning starts from the expected end result of the Execution phase and moves backwards. For each identified work package it is established what must be provided, and when, from the preceding stage. If all is done in one sequence the time schedule will most likely be too long, and ways of working in parallel must be considered. This usually means that work must be done in increments, and internal deliveries be done accordingly. A good practice to achieve this is to use the concept of integration driven development. The idea is that the integration of bits and pieces to make up the whole product shall start as early as possible. There is usually a logical way of making an integration, starting with the most basic parts. However, the development time for different parts will not always support the most logical order of integration. The end result will always be some kind of compromise. And during the execution, there will always be unexpected problems that will lead to re-planning of the integration order.

When the project plan is established and you can see where your task fits in you will probably find one or several cases of inputs to you, and one or several cases of outputs from you. It is probably very logical to you to be concerned with how to achieve what is expected of you, e.g. the output side. However, in terms of interaction within the project, it is the input side that is most important to be concerned about. If you have a design task your input may be specifications, and your output may be a piece of Hardware or Software to provide to the product integration.

You should clarify to yourself what it is that you are expecting as input, and you should discuss this with the person or persons that will provide it to you. In doing so a number of good things will happen:

- Both will get the same view of what is to be delivered
- You can stress what is most important to you, and what is less important
- You can propose a delivery order, in case all can not be provided in time
- You will have established a personal relation as early as possible

In the same way you can expect to be approached by the ones who are expecting you to deliver to them. Allow the same thing to happen here. It is completely natural that if someone is actively asking you for a certain thing you will regard this as important and act accordingly. What is not asked for will consequently be regarded as less important. Provided that everyone cares about their needs and makes them clear to counterparts you can expect to get an optimum situation in the project. Because everything is not as important, at least not at the same time, allowing this knowledge to influence the

planning is a good thing.

2.6 The Inevitable Delays

No matter how well a project is planned there will occur problems of different kinds, and what they have in common is that they will lead to delays compared to the initial plan. How such situations are handled in a project very much dependent on the culture of human interaction. The issue of concern is how delays are reported and how they are responded to. The ideal situation is obvious: As soon as you realise that the task you are working on can not be accomplished as planned you should report this to others concerned, e.g. your sub-project leader, those expecting a delivery from you and probably also your line manager. The response that you would like is of course to get support with your task in order to minimise the delay, and also support to re-plan the impact to other parts of the project. In a supportive culture this is exactly what happens.

But imagine that you are a hard-working sub-project leader and one more of your team members approach you with the bad news of a problem with a delay as consequence. Will you be able to appreciate that you have been informed, or will you voice irritation and blame him (or her) for causing you more headache? Please consider what will happen next time the same person gets a problem. Will you be told then? Not so likely if you responded with a bad temper last time.

When problems are identified and properly reported within the project as early as possible you will have the best possible chance to minimise the consequences. There are several ways, like:

- Support from a more experienced designer to minimise the delay
- Consider a more incremental delivery to the receiver, for minimised impact
- Reconsider the requirements, in order to minimise the extra work

It is in situations like this, when you are the source of a delay, that you will benefit from an already established relation with the counterparts that will receive the result of your task. If you have a good relation and already understand each other's situation it is likely that you together can find a good solution with minimum impact on the project plan.

In a less supportive culture you are likely to keep the information about a delay to yourself as long as possible, knowing and hoping that someone else will be identified as the culprit of a delay before you. Then you will reveal your, hopefully smaller delay, to the project. This desire to have someone else blamed instead is so strong in cultures where common values are not established, that in a project comprising more than one company it is almost inevitable that this type of behaviour will occur. That is why it is so important to foster a culture of appreciating when you get informed about a problem, and that others in the project respond with support and not with criticism.

2.7 The Almost Finished Syndrome

During the project execution there is a need to assess if the project is time wise on track

or not. Much effort has been spent on inventing scientific models for this purpose. They all have in common that the input to the model has some degree of assumptions. So in the end the project status will always be based on the gut feeling of those involved.

Everyone has a tendency to give as positive report of his or her own performance as possible, and also to be as optimistic as possible of the ability to complete the task. That is why the most common answer to the question of project status is “almost finished”.

What really works is to break down the complete task into appropriate pieces and then tick off when each piece is really finished (delivered to the receiving instance). And then to trust the gut feeling of the project management group for estimating the remaining part of the project, to judge if the project can be completed on time or not. When this is not possible, despite all efforts, the project will have to face the inevitable, to renegotiate the project goal with the company management, and maybe also with the customer. More about this later.

2.8 Why so many Meetings?

In projects, meetings are important. Most agree to that. Many also agree that meetings tend to become too many, and take too much time. Sharing of information, coordinating the work and making joint agreements are all needs that are best achieved through meetings. For the sake of efficiency some advice can be given:

- Try to reduce types of meetings, and consider how often they are needed
- Prepare meetings well and keep them short
- Allocate a time slot for the meeting, and keep it
- Attend meetings you are called to, or report absence beforehand.

Every meeting shall have someone to prepare and run the meeting, regardless if you like to call that person a chairman or not. The responsibility includes setting up an agenda and making sure presentations are well prepared. The most important responsibility is however to lead the meeting, make sure that the expected results are achieved, and that the meeting is closed within the allocated time.

When a project is facing problems, the ability to cope with them can be noticed in how the team the interacts during meetings. If the project has initially discussed and agreed on goals and common values, this will pay off in times of trouble. Then it will be comparatively quick and easy to agree on how to tackle the problems. Otherwise the result may at worst be endless discussions in every type of meeting.

2.9 The Importance of Bandwidth

When communicating with teammates in a project you have different options, meeting face-to-face, making a phone call or sending an email. Meeting face-to-face may not be possible, talking on the phone requires that the other person can take your call, while writing an email can be done at the time of your choice. But please consider the purpose of communication when you decide how to.

If you have to discuss a difficult matter, maybe to convey a message that will cause a disappointment to the other person, or you need to make an agreement, then it is of importance that you can clearly notice the response of the other person. Then you must at least be able to hear the voice of the other person, preferably also look into the face. If you really want attention to something, it may be worth the effort to go and visit the person whose attention you are seeking.

For a simple message to someone you know well, the way to convey a message is of much less importance, and you can do whatever is most convenient. But when it is crucial to avoid a misunderstanding you must be able to sense the reaction of the other person. By email may not be good enough. Human communication can comprise much more than the actual words that are spoken or written, and will depend on the available bandwidth.

2.10 Information is for Everyone

To keep information to yourself may be a way to create a sense of power. But it may not be the best thing for the project or for the company. For the sake of efficiency it is preferable that individuals in a project can judge for themselves about the work they are doing, and that decisions can be made as distributed as possible in the project. Then the information must flow.

This gives everyone in a leader position in a project with a responsibility to judge how to distribute information. Too much information will be a problem. Telling everyone of all small changes in plans will be confusing at best, since on low level plans tend to change in different directions all the time.

However, if you make sure that relevant information is available to all that need it, you do just the right thing. During the intensive execution period, a weekly report on the status in the project, what has been achieved and where the problems are, is well worth the effort. If distributed to all project members and to related company line managers it is a way to make sure that everyone has the same picture. Keeping all related information easily available on a web-site is a common and good solution. But the weekly report may be better to distribute by email. To make sure that it is read at the same time by all, and to give everyone receiving it the feeling that they are important.

2.11 In case of Conflicts

It is not always fun and easy to cooperate with others. Sometimes you and a team mate will have different views. This is normal, and positive if you can argue about it and find a way forward. It will at times be the task for team leaders, and for the project manager, to resolve situations with different views in a project. It is customary to seek consensus agreements within a project organization as the preferred way to handle disagreements. Within a company there is also a formal hierarchy of power that can step in and take decisions if it is needed. How this works in practice will differ from company to company.

Persons working together in a project are expected to be able to cooperate and to resolve disputes in such a way that the work can be done. This is the norm, and as such it has a strong influence on the personnel. Furthermore, the fact that the persons working together in a project have a common goal, and presumably also some degree of common values, will make this possible. Still, we are all different, and some combinations of persons will not go well together. Some degree of sensitivity to this is necessary, when organizing teams.

If a controversy occurs somewhere in a project, it has to be resolved, and quickly. The individuals concerned are expected to take first action. If they do not succeed, or do not even try, and the situation becomes a serious conflict it is the responsibility of the closest team leader or line manager, whoever observes the situation, to take action. If the closest leader or manager does not manage to resolve the situation it must be escalated within the line management of the company. A real conflict can not be allowed to last. It must be sorted out, and the way to do it will depend on the individual case. To deal with a real personnel conflict is among the most difficult tasks that managers have to face, and this may cause a hesitation to act. But that is not OK. Action is needed.

2.12 The Learning Process

Beside the well-defined task that a project has, it is always also the most important part of a company's internal learning process. Learning by doing is the most efficient way, and this is the way design engineers learn their trade. It is also the way to learn how to cooperate with others, both as a team member and as a leader. These are the obvious parts of the learning.

Learning is also about how to cope with problems, and who is best at doing different things. Some team members will turn out to be valuable in the early creative process, but maybe not that keen to stick to a certain task and make sure to keep deadlines. Others prefer to focus on a specific task, and are necessary to have in the team to get the work done according to plan. Some get extra energy and perform best when the situation is really critical. And some, rather few, has the talent to create a good spirit in a team. There is room for different kinds of talent in a project, and by working in projects is how you learn about your talent, and how you develop your talents. Note that learning from others, more experienced, is an important part of it. For the individual this is the ground for finding out what task to opt for in the next project.

There is also a learning dimension for the company. Having concluded one project makes it possible to evaluate how things were done, and how applicable the design process was. This experience should be the foundation for finding the improvements to implement in future projects. In particular, severe problems and mistakes in a project shall be evaluated to make the company better prepared in the future. Experience reports from projects are primary input to a company's improvement process.

2.13 The Importance of Success

If a project was a success it will convince both the company and the individuals involved that they have the ability to take on and handse such tasks. It may lead to the conviction that it will be possible to take on an even bigger challenge. To create an even better product, doing it in shorter time, or handle a bigger project. If the success is obvious the result will speak for itself and the evolution may be quite unconscious to better and better performance. If there were problems and they were solved, maybe with a slight delay, it will still contribute to growing stronger from the experience.
But if the project was an obvious failure, a severe delay, a big budget overdraft, or even a close-down of the project beforehand? This will have an impact in the opposite direction. It will influence the result of the next How-study. No desire to try innovations, the planning will go for smaller risk, longer time schedule and higher cost estimate. In short, the organization becomes less competitive.

There is a human need to celebrate a success and the end of a joint effort. For a company it is therefore important to recognise and express gratitude to a project team when the Execution is done or when the project is closed. For the team it is also important to celebrate the achievements with the mates.

Properly closing a project on other conditions than a success is therefore really difficult. If it is possible to pin-point the reason and clearly identify a remedy for improvement to the next project, this is be the best thing to do. However, it is often tempting for the company to avoid admitting a failure and therefore give thanks for a good job, and blame the failure on some external condition. This is a very risky path, since it clearly leaves the organization in a weaker position for the future.

2.14 The Bottom Line is Trust

The most desired condition in an organization that seeks to be successful in trust. Trust is maybe more considered to be a condition between a pair of individuals. But you can also create it as a common asset within an organization. Characteristic for trust is that it takes time to establish, but that it can be instantly ruined. Thus, a very sensitive thing to handle.

When you feel that you can openly tell the others in your project about your problem, and will get their support in return. When you are convinced that others in the project tell you the truth and do not hide information. Then there is trust. And then you and the others can focus on the real task.

If bad habits are already established in an organization with a lack of trust, this may be hard to change. If it is not too bad, then good intentions, an open atmosphere and common values within a project should be enough to gradually build trust.

2.15 The Relation between Project and Company

The project has been given a task by the company. The project manager is responsible

to the project sponsor, who probably is a line manager in the company. The check-point decisions are formally taken by the project sponsor, but most often these decisions are made by a selected group, often called a steering group, with the project sponsor as chairman of the group.

During the run time of the project the project manager at times reports to a reference group, with the project sponsor as chairman. Or it may be the steering group mentioned above that also fills this role. The purpose is to give support to the project manager and to take decisions on major changes for the project, like revised goals or revised budget. It may happen that the project sponsor or the steering group collectively comes to the conclusion that a project shall be stopped before completion. This may be due to changes in the market situation or because the project has not achieved as expected.

Often a project is competing with other projects for internal resources, personnel or equipment. This is the most common topic for the steering or reference group to deal with, to take priority decisions on how to best use limited resources at a certain point in time. Due to this one project may have to accept to revise its plan, go for a second best solution etc., and accept that it was best for the company to favour another project. Such situations are always delicate, but much easier to handle in a company with common values and trust. It is important that such decisions are clearly communicated to all concerned.

Decision-making and the distribution of power between project and line organizations differ between companies. If decisions are strictly related to managers' responsibilities, the power for a project organization is limited, and most decisions are made in the line organization. Likewise, the room for initiatives of individuals is limited. Other companies may have a culture of delegating decisions, to project groups, and to individuals.

The following are areas of responsibility that may be differently distributed between line and project:
- Time schedule
- Cost
- Quality
- Personnel (competence and number)
- Technology

The most important thing is that the distribution is clear and consistent. It is often common practice in a company that a line manager may take priority decisions to move personnel between projects. If so, what is important is that it is communicated to affected projects.

2.16 The Relation to the Customer

If a project is specifically assigned to a customer contract, the project may also have to handle the relation to the customer. If so, it is the responsibility of the project manager to handle this. But others may of course be involved when details are to be discussed.

Handling the customer relation is very much a matter of meeting customer expectations. The customer will make specific requests, not only on the product itself but also on actions during the project duration like meetings and status reports. For a project there is always a delicate balance between doing what the customer asks for and keeping the cost within budget.

The biggest challenge regarding the customer relation is how to convey problems and needs for changes. The most obvious case is of course a project delay. While it is a good practice to have an open communication within the project about problems and potential impact for the customer, it is reasonable to be more restrictive with such information to the customer, as long as it seems realistic to solve the problem without impact to the customer. But when an impact to the customer is inevitable, this must of course be informed about. Coming too late with bad news to the customer is however a bad policy. And having a situation with a revised internal time schedule while the schedule towards the customer is still unchanged will affect the internal situation negatively.