LAPPEENRANTA UNIVERSITY OF TECHNOLOGY
Department of Industrial Engineering and Management

THE RAMP-UP OF NEW PRODUCTS IN THE OUTBOUND LOGISTICS

The subject of the thesis has been approved by the Department Council of the Department of Industrial Engineering and Management on April 17th, 2002.

Mikko Lukkari

Kalasääksentie 3A9

02620 Espoo

Tel: +358 50 3878475

ABSTRACT

Author: Mikko Olavi Lukkari

Name of the Thesis: The ramp-up of new products in the outbound logistics

Department: Department of the Industrial Engineering and Management

Year: 2002   **Location:** Espoo

Master's Thesis. Lappeenranta University of Technology.

65 pages, 22 figures, 3 tables, appendix

Tarkastaja Professori Tuomo Kässi

Hakusanat: kaaosjohtaminen, prosessijohtaminen, oppiva organisaatio, organisaation oppiminen

Keywords: chaos management, process management, learning organisation, organisational learning

This Master's thesis describes the basic mechanics of the chaos and learning organisation. This kind of thinking is applied to the ramp-up process of the Nokia Oyj Networks business group. The aim has been to find the solutions to improve the current way of operating.

Chaos management provides a complementary way for process management to model and explain phenomenon of the change. These two theories have been the instruments to define this vast and multi dimensional field. In the organization that permanently is in transformation the chaos is strongly present. The chaos contains the self-organisation and organisational learning. The learning is not as natural for an organisation as it is for a person. The requirement for the organistional learning is that the members of the organization recognize their roles and share their knowledge.

Changes in the market and in the technology have been radical in the telecommunication business. The objectives of the organisation may sometimes seem intangible and the changes uncontrolled for the individual. In these conditions it is important to aim towards the learning organisation that gives better chances to get through the change.

TIIVISTELMÄ

Tekijä: Mikko Olavi Lukkari

Työn nimi: The ramp-up of new products in the outbound logistics

Osasto: Tuotantotalous

Vuosi: 2002   **Paikka:** Espoo

Diplomityö. Lappeenrannan teknillinen korkeakoulu.

65 sivua, 22 kuvaa, kolme taulukkoa, liite

Examiner Professor Tuomo Kässi

Hakusanat: kaaosjohtaminen, prosessijohtaminen, oppiva organisaatio, organisaation oppiminen

Keywords: chaos management, process management, learning organisation, organisational learning

Tässä diplomityössä on perehdytty kaaoksen ja oppivan organisaation mekaniikkaan ja olemukseen. Niitä on sovellettu uuden tuotteen saattamiseen logistiikan toimitusketjuun Nokia Oyj:n Networks toimialaryhmässä. Samalla on pyritty löytämään ratkaisuja toiminnan parantamiseksi.

Kaaosjohtaminen tarjoaa prosessijohtamista täydentävän tavan mallintaa muutosta ja selittää sen aikaansaamia ilmiöitä. Näiden kahden viitekehyksen avulla on pyritty pureutumaan laajaan ja moniulotteiseen ongelmakenttään. Muotoaan hakevassa organisaatiossa kaaoksen elementit ovat voimakkaasti läsnä. Kaaoksen hallintaan liittyy saumattomasti itseorganisoituminen ja oppiminen. Oppinen ei ole organisaatiolle yhtä luontainen kyky kuin se on yksilölle. Se vaatii organisaation jäseniltä oman roolinsa tiedostamista ja tiedon jakamista.

Organisaation tavoitteet saattavat yksilön näkökulmasta tuntua joskus epäkonkreettisilta ja samalla muutokset hallitsemattomilta. Markkinoiden ja teknologian muuttuminen on ollut erityisen nopeaa telekommunikaatioalalla. Näissä olosuhteissa on tärkeää pyrkiä oppivaan organisaatioon, joka tukee organisaation toimintaa läpi muutoksen.

TABLE OF CONTENTS

Abstract

Table of Contents

Abbreviations

Abbreviations

3G	3rd Generation Networks
ATP	Available to Promise
BBS	Broadband Systems
BMS	Business Management System
BP	Business Program
CAT	Customer Account Teams
CM	Contract Manufacturer
CO	Customer Operations
COM	Customer Order Management
CT	Cellular Transmission
DC	Delivery Capability
DEM	Delivery Execution Management
DF	Demand Fulfillment
DFDS	Design for Demand/Supply Chain
DP	Delivery Process
D/SC	Demand/Supply Chain
DSP	Demand Supply Planning
ECCN	Export Control Classification Number
GEO	Global Export Operations
GPRS	General Packet Radio System
GSM	Global System for Mobile Communications
HR	Human Recources
HW	hardware
HWS	HardWare Services
IM	Information Management
IMN	IP Mobility Networks
IP	Internet Protocol
MEX	Materials Execution
MLS	Modular Logistics Systrem
MP	Manufacturing Partner

MSW	Mobile SoftWare
NBI	Nokia Business Infrastructure
NET	Nokia Networks
NMP	Nokia Mobile Phones
NVO	Nokia Ventures Organisation
NO	National Organisation
ODP	Organisational Defence Pattern
OEM	Original Equipment Manufacturer
OSS	Operationtions Support Systems
PBM	Product Business Management
PCP	Product Creation Process
PDM	Product Data Management
PMR	Professional Mobile Radios
PO	Product Operations
PP	Product Program
PP&TM	Product Programs & Technology Management
ROCS	Ramp up and Order Configuration Support
SC	Sales Configurator
SNM	Supply Network Management
SW	software
WCDMA	Wideband Code Division Multiple Access

1. Introduction

In the modern global competition you have to maintain the customer orientation even if customers are fast moving and scattered. Essential for the success of a modern global company is the ability to react the changes of the environment at an increasing speed. A fast changing, even turbulent or chaotic, environment sets high requirements for operating organisations. In order to answer these requirements an organisation has to have the ability to learn and the ability to maintain order through chaotic periods. Underneath this there must be the effective machine, clearly defined business processes. Processes form the backbone of the operations and give departments and employees the knowledge of their duties and meaning in producing the added value to the customer. This way the corporation can gain and maintain a competitive advantage.

Business process thinking provides an effective way to organise the enterprise and its operations in the fashion required by markets. The basis for this organising is the state of the corporation and the methods of the change should be selected from that point of view. The processes aren't the whole set. Among the actual workflow it is essential to adapt new environmental and organisational features. Turbulent environment puts the processes and learning organisation under test. Constant organisational and individual learning helps to succeed in these conditions. In order to achieve this state of effective constant learning the learning organisation must be promoted.

A turbulent and frequently changing environment can be called chaotic. This kind of uncertainty and non-linear environment has a chaotic effect on organisation. This state must be accepted and its innovative energy can be turned into advantage and profit. In a practical point of view the chaos is managed by open and effective communication. This way the organisation can adapt to the changes and turn it into the effective actions.

Nokia Networks is a worldwide company, which provides Network elements and solutions for mobile and fixed line operators. These products vary from whole networks to modems, and a single item can be a large three-meter antenna or software. This

creates special challenge for logistics. Accelerating product cycle challenges product ramp-up organisation. The complexity and variation of the products makes the ramp-up organisation even more complex. ROCS (Ramp-up and Order configuration support) is the focus of this thesis. This ROCS group takes care of the ramp-up into outbound logistics in Nokia Networks Product operations division. Delivery process is coming to the edge of the period of transition. This requires more concentrated product knowledge at organisational and individual level. Thereby the role of the link to sources of knowledge is increased. This requires more effort to organise support and knowledge transfer as effectively as possible.

1.1 Research Problem

It has been noticed in the outbound logistics department that sometimes new products and configuration inflict a bottleneck into the delivery. Orders are not placed correctly. There may be incorrect information or illegal configurations. For this purpose the ROCS was founded. This was clear improvement. The ramp-up process is defined and mapped, even though a ramp-up specialist follows the process description in an individual way. There are not much in common in their ways to work. It seemed that each individual in the group has different responses in a ramp-up project. Also the whole role of the team is sometimes somehow unsteady.

1.2 The Objective of This Work

The problems of the scattered field of ramp-up have been acknowledged. At the moment the control of ramp-up is depends on ad hoc actions and case-by-case decisions. Each individual action decision requires a huge amount of effort to execute. This kind of problems would occur less if the role and activities of the ramp-up group were clearer.

The objective of this work is to explore the ramp-up process task by task. This study of executed tasks will give the basis for the rationale of the Ramp-up team. This rationale

will give the base for the further development and assessment of the group. Also this rationale provides ground for measurement. In this way, in the future, planning and control become easier. Responsibilities of an individual ramp-up specialist must be defined clearer than they are. The chaotic and unclear form of actions is shaped into one solid image of process. The rationale also answers the question whether there is any need for ROCS.

1.3 The Scope of the Work

The ramp-up processes are essential for the work and will be examined at the extent of the ROCS. The focus of the process study is on outbound logistics ramp-up. The support phase is also included. This process study will include all relevant interfaces to co-operative organisations and customer organisations. These relations will be examined through case study and other relevant material. Task level examinations are focused on tasks, which are executed together with Product Program and Product Business organisations.

This thesis doesn't contain manufacturing ramp-up at all. This is done by product Programs and plant or partner organisations together. Also information systems of the Delivery Process are out of the focus. Data is updated in separate units, which are defined in product data management (PDM) process. PDM in Nokia Networks forms gigantic field, which has its impact on every action on organisation. Due to limited size of the thesis the PDM is limited out of the scope.

2. Managing Processes

Since Taylor published his writings about management, work has been divided and optimised. Modern process thinking tries to combine actions of enterprise into a combined and continuous flow. This flow reaches from supplier to customer. This workflow has defined inputs, a clearly designed set of activities and a predictable outcome (Zairi, 1997) In process the input is turned into output that has added value to the customer. Customer can be inside or outside of the company (Hunt, 1996, 6-7).

The challenge of managing the processes is to get the work of different departments or competence centres aligned in the best way. Processes are mapped and quality system takes care of necessary documentation and instructions. This thinking does not take the real dynamics of workgroup and lateral relation into account. They require effective information sharing and co-operation (Mullins, 1996, 539).

Process paradigm sees organisation as a mechanical entity and tries to simplify existing structures (Galbraith, 1993, 41). We have to understand basic organisational structures, functional, matrix and process organisation to get the full perspective of process management and its effects (Zairi, 1997).

2.1   Process categories

Processes can be categorised in several ways. They can simply be divided into production or service processes (Melan, 1993, 20-26). A more hierarchical way is that there are core, support, management and business network processes (Earl, Khan, 1994). A process crosses organisational or interdepartmental boundaries, thereby forming a system of tasks. (Hannus, 1994, 34) This system of tasks can be divided into hierarchical levels. In this way the process is divided into subprocesses, activities and tasks. Each subprocess are linked to another subprocess or subprocesses. This system of subprocesses forms the process itself. This structure helps in process mapping e.g.. This structure is presented in picture 1 (Melan, 1993, 18).
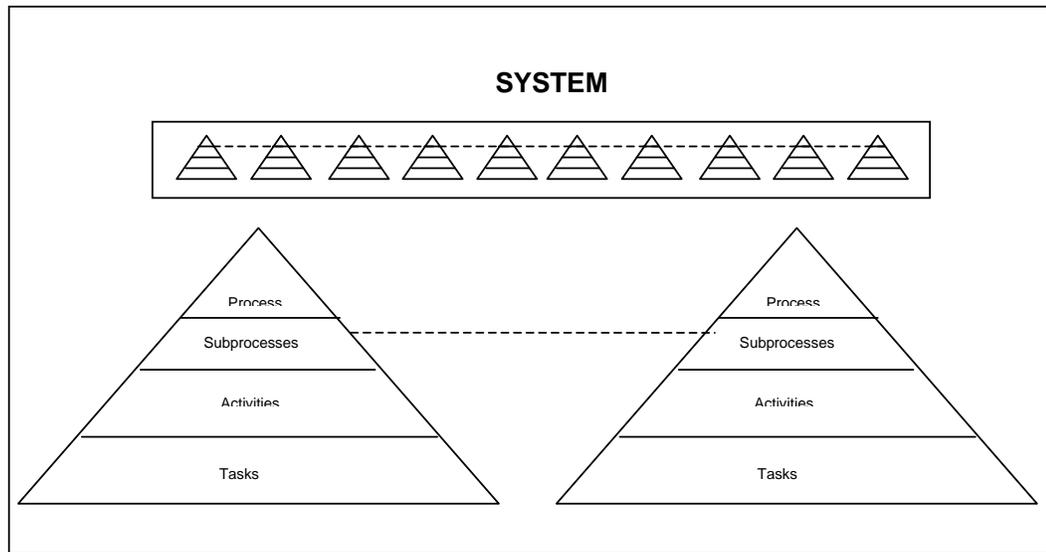
Picture 1: System Process Hierarchy.

2.2 Development of organisational structures

Organisational and management theories and methods have developed together with the changing business environment. Every theory and method has its own advantages. The usability of a method is strongly dependent on business environmental conditions such as competitors, technological cycles etc. The nature of business is another cause, which sets its own requirements for the structure and management method of the organisation. Increasing demand for speed and reaction capability lowers the vertical hierarchy and sets extra requirements for information distribution (Johnson, Scholes, 1999, 411-413).

2.2.1 Functional Organisation

Functional organisation is based on functions, for example: manufacturing, marketing, human resources etc. Structure of functional organisation is presented in picture 2. Corporation executes these functions in order to provide added value to customer. This model provides clear distribution of responsibility, clear contact of the corporate management, the simplicity of control and competence development in the management

5

of departments and corporation (Johnson, Scholes, 1999, 404).


```
                          ┌─────────────────────────────────┐
                          │            Executive            │
                          └─────────────────────────────────┘
          ┌──────────────────┬──────────────┼──────────────┬──────────────────┐
   ┌─────────────┐  ┌─────────────────┐  ┌──────────────────┐  ┌─────────────────┐
   │ Manufacturing│  │ Sales & Marketing│ │ Finance & Control│  │ Human Resources │
   │ Department   │  │ Department       │ │ Department       │  │ Department      │
   └─────────────┘  └─────────────────┘  └──────────────────┘  └─────────────────┘
```
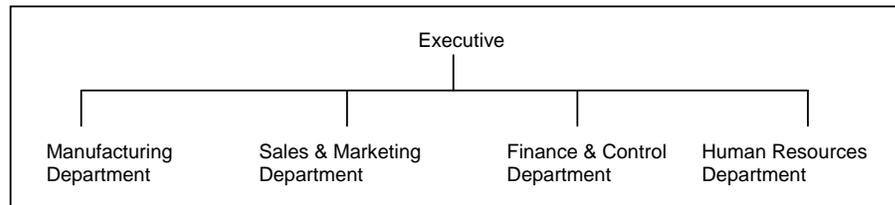
Picture 2: Functional organisation.

Whether the functional organisation is the model for a particular corporation depends on the business. This tayloristic way of organising is traditionally found useful on work force dominated branches, where responsibility is drawn from the low educated workers to management of the department (Hammer, Champy, 1997, 50-51). Still in some cases the functional structure gives the clearness for organisation that it needs. For example at SAS, whose operations are scattered around the world, this functional structure gives organisation a united operational model and security for air traffic (Johnson, Scholes, 1997, 369).

Disadvantages for functional organisation are that control of routine things burden the upper management, so strategic matters may suffer from this kind of responsibility structure. This set-up also weakens customer orientation because decision-making is drawn far away from customer interface. Reward systems in the functional model do not encourage interdepartmental co-operation. Either of the negative impacts are minimised by forming separate product or customer group based responsibilities. By developing these responsibilities far enough the matrix organisation is created (Johnson, Scholes, 1997, 371).

2.2.2 Matrix Organisation

In matrix organisation the functional organisation is combined with geographic division, product group or core process based responsibilities. This kind of organisation improves

decision-making quality even if there is a internal conflict of interests. There is also less bureaucracy in matrix organisations. Personnel in matrix organisations have better chance to develop themselves because responsibilities give wider view of operations. Strategic decision-making is more effective because there are more people involved in the strategic process. As negative circumstances it must be mentioned that roles and decision responsibilities are sometimes unclear. Decision-making is slow because two decision makers are needed for every decision, and every worker has at least two supervisors, functional supervisor and, for example, product line supervisor. This may cause conflicts. Sample structure of matrix organisation is presented in picture 3 (Johnson, Scholes 1996, 373-375).

Functional managers

Process, Product, Area Managers

Functional departments

Process, product, geographic area etc

Process, product, geographic area etc

Process, product, geographic area etc
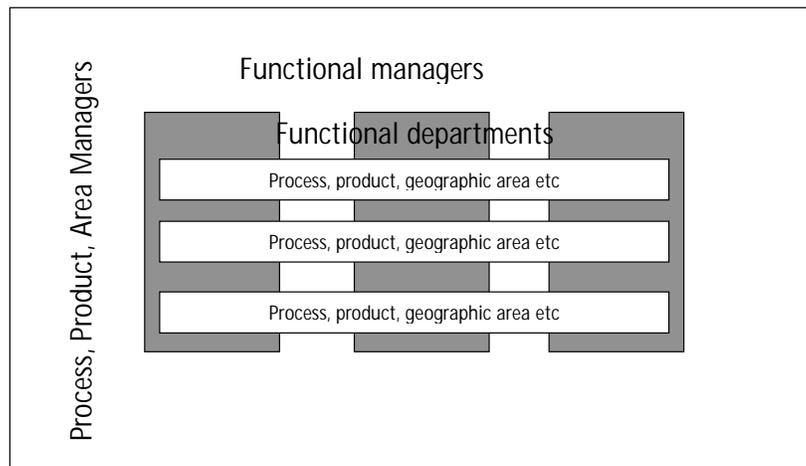
Picture 3: Matrix organisation.

2.2.3 Process Organisation

Process organisation is formed around processes, which are creating added value to customers. The real process organisation has control structures that are built for processes. In this kind of an organisation functional departments become competence centres (Hammer, 1988, 126). This kind of organisational model looks more like demand supply chain formed by several companies than the traditional organisation of

single company. This fact is emphasized especially when those competence centres exist only virtually (Johnson, Scholes, 1997, 413).

Professional or specialist, who is the member of the process organisation, is fixed to a particular centre of competence. He or she is at service of one or more processes. These processes can be changed. Hierarchical management structures do not exist in an excessive manner. Process managers control and distribute the work and the management of the competence centres takes care of recruitment and development of the personnel. They also allocate the resources for different processes. These structures can be physical or virtual. In physical competence centres specialists of the certain area assemble in the same office and virtual centres assemble occasionally for example for training or discussion sessions (Hammer 1988, 118-121). This kind of organisational structure is presented in picture 4.
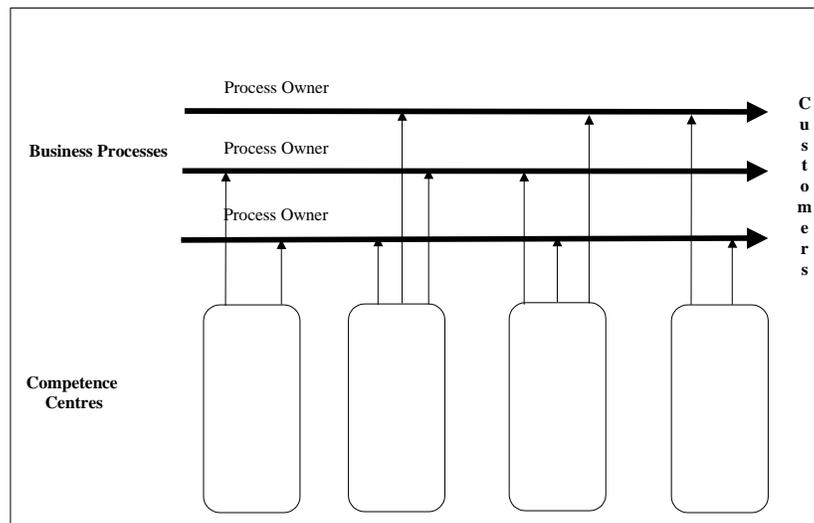
 Picture 4: Process organisation.

The process always involves process owner, as seen in picture 4. This owner may be a person or a group, whose task is to plan, improve and take care of customer's needs. The process owner has a significant role in aligning the processes into organisation. Still, in most of the cases, process owner is not defined because processes have evolved over

time (Laamanen, Tinnilä, 1998, 37). On table 1 there are some characteristics of traditional and process organisation compared to each other. These comparisons are made in order to clarify the advantages of process organisation.

Table 1: Differences of process organisation and traditional organisation (Nyman, Silen 1995, 44).

	Traditional Organisation	Process Organisation
Tasks	*Narrow*	*Wide*
Organisation	*Hierarchical*	*Team*
Development	*Department orientated*	*Process orientated*
Customer	*Outsider*	*Purpose of work*
Employee	*Executer of manual labour*	*Developer*
Superior	*Foreman*	*Trainer*
Manager	*Overseer*	*Inspiring leader*
Important	*Activities*	*Results*
Metrics	*Financially oriented*	*Based on activities*
Focus	*Internal efficiency*	*Customer*
Values	*Controlling*	*Developing*

2.3   Two Ways to Approach the Change

The process management paradigm assumes that change of the organisation can be preset. There is a certain initial state of a process. Redesigning the process can carry out this change. There are two basic approaches to change: incremental improvement and business process re-engineering. Addition to these two doesn't include that the company can seek new technologies for radical leap to new technology trajectory. The First one emphasizes the continuous improvement cycle. The processes are improved incrementally. Business process reengineering concentrates on the profound change of old processes, structures and functional modes. Target of this action is to achieve more efficient and better organisation.

2.3.1 Continuous Improvement

Continuous improvement originates from Japanese Kaizen philosophy, which is the oldest school of quality and process management (Hannus 1993, 360). This kind of incremental and holistic improvement is usually called Total Quality Management (TQM). TQM aims to incremental and small step approach to the development of process. Improvement is targeted equally to all processes at the same time. This improvement has to be constant and employees have to learn constantly new things, otherwise company loses its competitive advantage over competitors (Johnson, Scholes, 1999, 454).

Modern quality concept is much more than simply executing the specific phases of work with quality and efficiency. There is the strong customer oriented context, which controls the set of improvements throughout the organisation from top to bottom. The commitment and participation in improvement are mandatory for every member of organisation. Improvement is carried out in organised fashion. This process requires detailed process illustrations, from which organisational and personal tasks can be read (Nyman 1995, 27-29). One way to illustrate this incremental improvement is PDCA-cycle or Deming's cycle, which is presented in picture 5. PDCA-cycle reflects the continuity of improvement process and in the other hand it presents the importance of feedback for the learning.
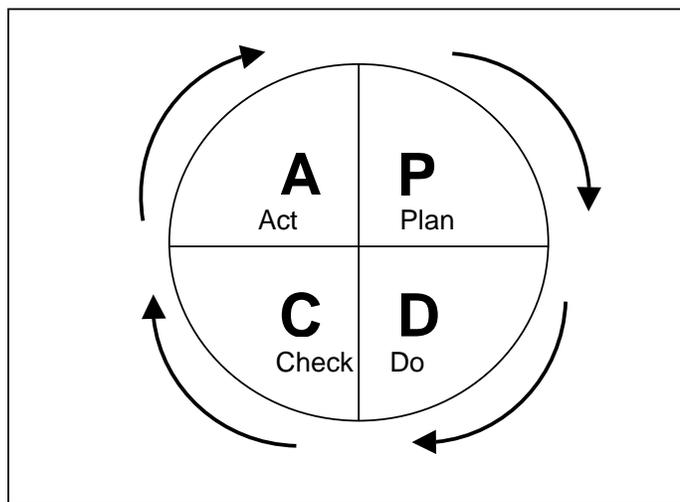
Picture 5: PDCA-cycle (Deming Cycle).

2.3.2 Business Process Reengineering

Business process reengineering aims in profound improvement in processes. The goal is to get free from old paradigms, which hinder the view to improved efficiency (Hannus 1993, 102). The old processes are not enough. There is a need for newly designed processes. These new processes aim at radical improvement of the performance. Goal in reengineering may be as high as from 60 to 90 percent increases from initial level. This kind of effort contains a great deal of risk, takes time and binds capital (Harrington et al, 1997,10). Reengineering doesn't necessarily involve process mapping, but core competences of corporation, added value that customer wants, has to be clarified among the shared vision (Malthora, 1998).

Reengineering can be used to solve the crisis. In this case reengineering is the only way to survive. Reengineering can be used by profitable and successful corporation, which detects that its actions are ineffective. Sometimes a reengineering project is conducted by a market leader that wants to increase competitive advantage over the others (Hammer, Champy 1993, 34-35). Five phases can be described for the reengineering process. They are: introduction of reengineering vision, creation of high level process map, selection of the reengineered processes, reengineering of the selected processes and the new process implementation.

2.4   Work Groups

Teams and work groups have been a part of the organisational structure for a long time. Still in recent years the value of teamwork and work groups has been increasing simply because managers and leaders cannot deal with the complexities of organisational life. Requirements for fast response, speed, online customisation and quality are simply beyond one individual's reach (Proehl, 1996). Individuals in organisations work rarely alone. Practically every one is a team or group member. These work groups have high efficiency compared to persons who work individually. This membership has been

structured so that a person can also be a member of a higher group or group on the same level This kind of overlapping is called a linking-pin process. So a team leader is a linking-pin between team leaders from different teams. This kind of overlapping is presented in picture 6 (Mullins, 1996, 457-458).
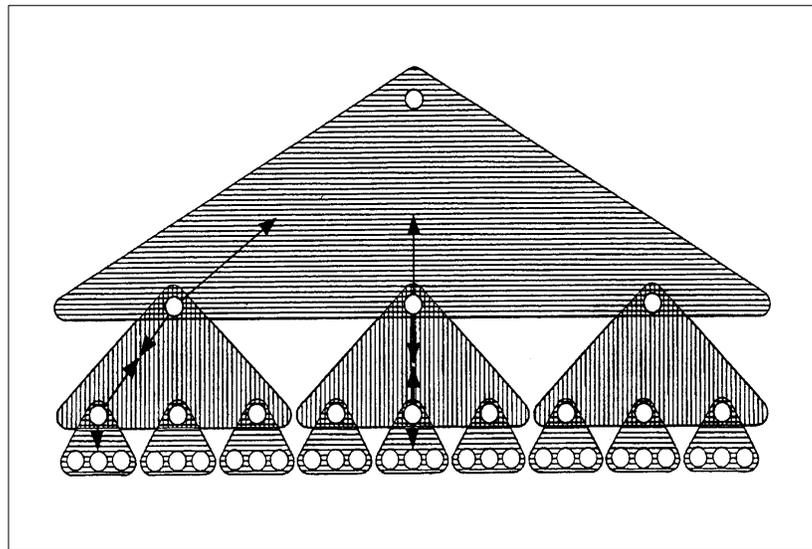
Picture 6: Overlapping group structure and the linking-pin.

Team or work group is a consequence of the organisation structure and division of the work. Work group can be a result from the way the work process is carried out and the nature of technology. They may be deliberately created in the organisation by management as a part of the organisational structure. This is the first type of work group and it is called formal group. Second type of work group is informal. Social relations of individuals are formed in these groups (Mullins, 1996, 459).

Management has created formal groups for certain organisational objective or task. Formal groups follow certain rules, relationships and norms of behaviour established by the management. This type of group has exact goals for the actions. Informal groups are based on personal relations and agreement of the members. These groups serve more social and psychological needs rather than related tasks to be undertaken. Informal

groups can cut across the formal organisational structure as presented in picture 7. Informal group has a function in maintaining communication system, implementation of social control and providing fun and interest in indifferent work life (Mullins, 1996, 459-561).
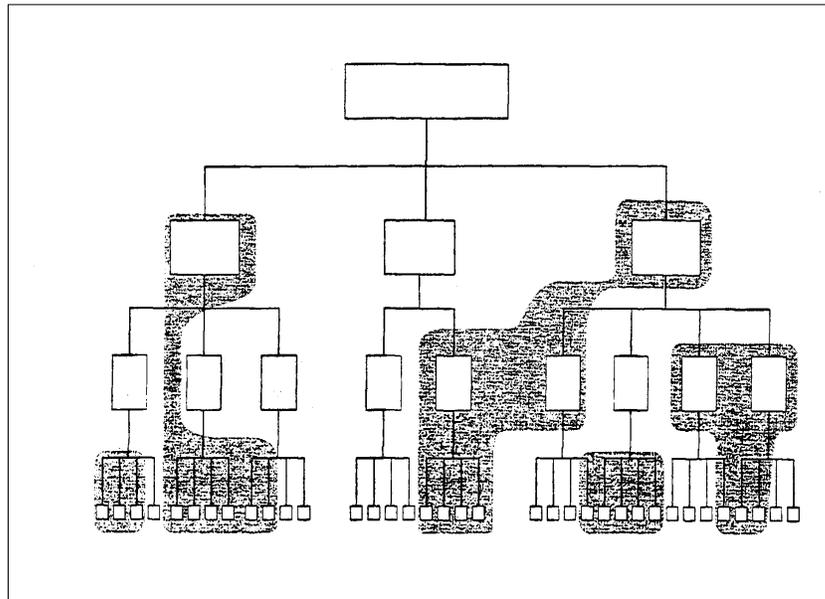
Picture 7: Formulation of informal groups.

2.5   Cross-Functional System of the Corporation, Lateral Relationships

In the organisation there are four kinds of relations. They are line, functional, staff and lateral. Lateral or horizontal relation is important for business processes. In the horizontal connection exist people from different departments or sections, especially individuals on the same level (Mullins, 1996, 539). The challenge of process management is to get different departments or competence centres to work efficiently for the same goal that is conducting the process. This is achieved by aligning the actions so that all tasks that are needed to perform a process are covered, roles and responsibilities are divided between conducting departments (Laamanen, Tinnilä 1998, 21). In order to acquire the effective performance lateral relationship in the lateral

process a proper co-ordination from management is required (Galbraith, 1993, 41).

There are three levels of lateral co-ordination, informal or voluntary organisation, formal groups and integrating leaders. The co-ordination needs usually show, which actions for co-ordination are sufficient. Voluntary is used for easy cases and integrating leader is appointed in the most challenging situation. Drivers for the control are speed of environmental change and strategic requirement for quality, variety of products and interdependence (Galbraith, 1993, 41-49).

2.5.1 Voluntary Organisation

Voluntary organisation lies upon communication between people from different departments. It is a minimal way to upgrade the lateral interaction. This kind of co-ordination is improved by lowering the mental barriers between different departments. The useful ways to do this is to rotate personnel between different departments, arrange interdepartmental events, locate the departments that are conducting consecutive phases of the process near each other, use information networks extensively and improve organisation more corresponding to process conducted (Galbraith, 1993, 49-55).

2.5.2 Formal Groups

Horizontal workflow can also be organised with a formal work group or cross-functional team. This is required when voluntary process does not provide sufficient co-ordination for the process (Galbraith, 1993, 58). These teams can be located at any level of organisation. Operational level teams, which are performing the actual work can be product-focused, project-focused or customer-focused. Managerial teams can be located at the top management or middle management. Top management teams provide strategic level integration and middle management teams for example can provide integration between functions of division (Galbraith, 1993, 125-126).

This kind of team is challenging to lead. Its success lies upon open-minded members,

skilled leader with authority, teams which must have authority, accountability, management support and proper communication system. With these abilities the team can be successful (Proehl, 1996). Often decision making in cross-functional team is difficult because authority may be several levels higher in the organisation than the actual team is. In this kind of situations a cross-functional management team is applicable (Galbraith, 1993,126).

2.5.3 Integrating Leader

Integrating leader or integrator is used with or without cross-functional team. Integrators role is to work beside of the general management. From this perspective integrating leader is like little a general manager (Galbraith, 1977, 152-153). This integrating role can be designed weak or strong by giving authority to fulfil the integration task. The integrator is typically appointed to be in charge of the project; he/she can be product manager or liaison manager (Galbraith, 1993, 124.125).

3. Learning Organisation or Organisational Learning?

The potential of employee's skills as a resource for the employer was acknowledged during 1940's but learning organisation and organisational learning has become familiar only during the past decades. Due to the novelty of the subject many of the features of the learning organisations and organisational learning are still unsettled. Learning organisation and organisational learning can be separated. The latter is a process or action of learning, which takes place in organisation without any effort. The first one, the learning organisation, is the form of organisation that needs effort to put into practice (Örtenbland, 2001). Learning organisation is learning from the environmental changes. This way it can transform in the way that is required to survive and success in the competition (Sydänmaanlakka, 2001, 51). Organisations can ever "not learn".

3.1 Learning mechanics

There are numerous types of learning. There are action learning, adaptive learning, deutero learning, anticipatory learning, generative learning etc. Each of these styles has its own distinct features but there can be drawn one basic mechnics between all of them. It is that they handle the reflection of an event or knowledge. This feedback between event and reflection is called single-loop learning or douple-loop learning.

Learning has two basic mechanics in an organisation. The first is that the organisation achieves the goal intented. The second case there is an error or missmatch in result compared to intention. If there is a mismatch, the case implicates correcting action. When the error is detected and corrected without changing the values of the system, it is single-loop learning. (Argyris 1992 p. 8) Picture 8 illustrates the single-loop learning. The center of lingle-loop learning is a single- loop learner. He detects errors and corrects them. Single-loop learning solves current problem but it does not solve the more basic problem why these problems existed in the first place. (Argyris 1990 p. 92)
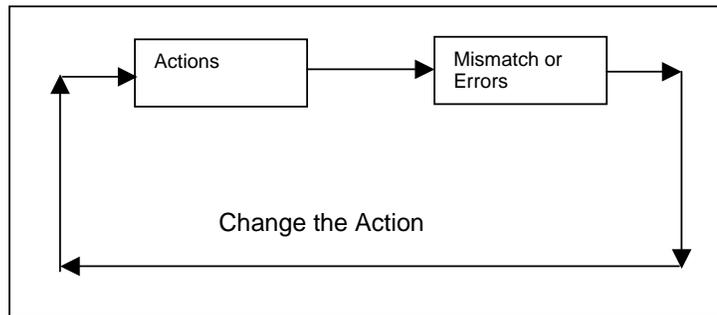
Picture 8:Single-Loop Learning (Argyris 1990 p.92).

Single-loop learning is not always effective. In cases whre the basis of actions is wrongly built the single-loop learning doesn't help. To be able to affect the source of the problems the governing values or basis of actions must be changed. Only that way new and correct actions can be designed. In order to achieve this we must have another loop of learning. This kind of situation is called douple-loop-learning. This mechanism is presented in picture 9.
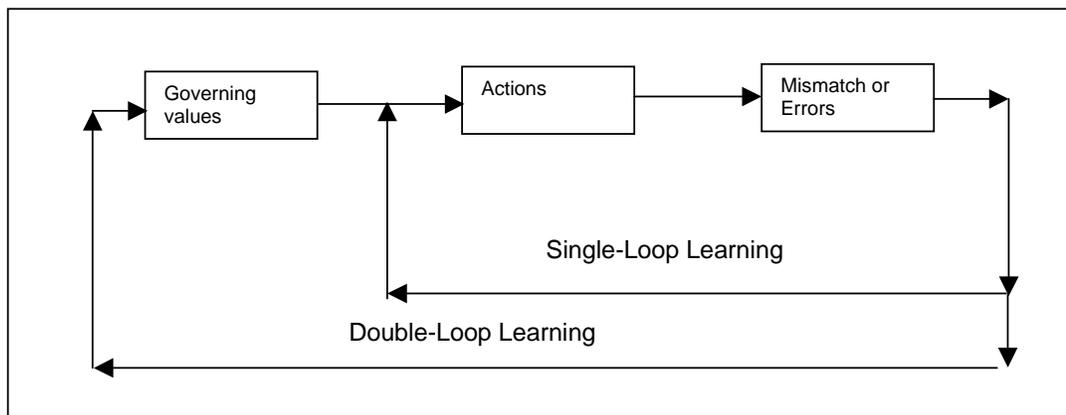
Picture 9:Douple-Loop Learning (Argyris 1990 p.94).

In practical life double-loop learning is difficult to achieve in effective use. It may be a painful experience to an organisation. Often difficulties of learning organisation are concentrated on winning the difficulties of double-loop learning. Formalized management decision-making models do not use the double-loop learning due to its

17

challenging nature. Often it is more useful to concentrate on single -loop learning techniques (Henderson, 1997).

3.2 Levels of Learning

There are three levels of learning in learning organizations, individual, group/team, and organization. Individual learning is the base of the organisational learning (Marquarad, 1996, 32). Every individual has certain skills and abilities which he/she can develop. There are two levels of knowledge or skill before the learning. The lowest level of skill is that person assumes to know. This does not help learning. The person can learn only if he recognises that his/her knowledge is inadequate. Advance on the next level can only occur through this recognition. Next steps in learning skills are that a person understands context and can even apply it into something new. The highest step is to develop the knowledge. The higher the level gets, the harder it is to achieve. Strairs of learning are presented in the picture 10 (Sydänmaanlakka 2001, 32).
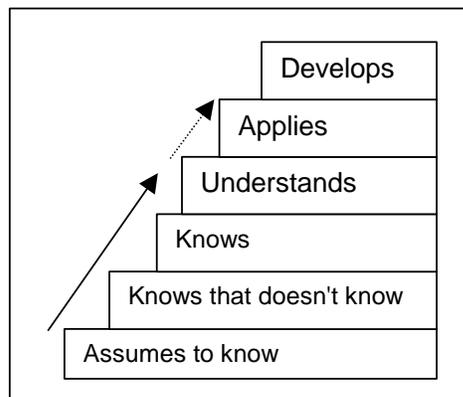
Picture 10: Stairs of learning

Groups and organisations are formed by individuals. Therefore the individual's commitment and ability to learn are important for organizational learning. Individuals also teach as well as learn from other people. People interact in organisations as social beings and that way they learn from each other (Örtenbland, 2001) .

Teams and groups have become more and more important to organizations. Their contribution to the organisation depends on their knowledge and skills. In a constantly changing environment learning right skills has become increasingly important. These skills are developed in teams (Marquardt, 1996, 35-36). This way us, the people, have been seen as social beings who are collectively learning as team members (Örtenbland, 2001).

Organizational learning differs from individual and group/team learning in two aspects. First, organizational learning occurs through shared goals, knowledge and mental models of the members of the organization. Second, organizational learning builds up on past knowledge and experience. So it depends on traditions and institutional mechanisms to retain knowledge (Marquardt, 1996, 35-37).

 Team learning model in picture 11 shows relations between individual and organizational learning. The lower triangle presents individual learning area. The top triangel presents organizational learning. In an ideal world people are empowered by organisational learning. This shows in quality and the working environment. The most interesting area is where those two triangles overlap each other. In this area treams are learning and developing trough collaboration. This is the form of learning where learning recources of individuals and organisations meet.
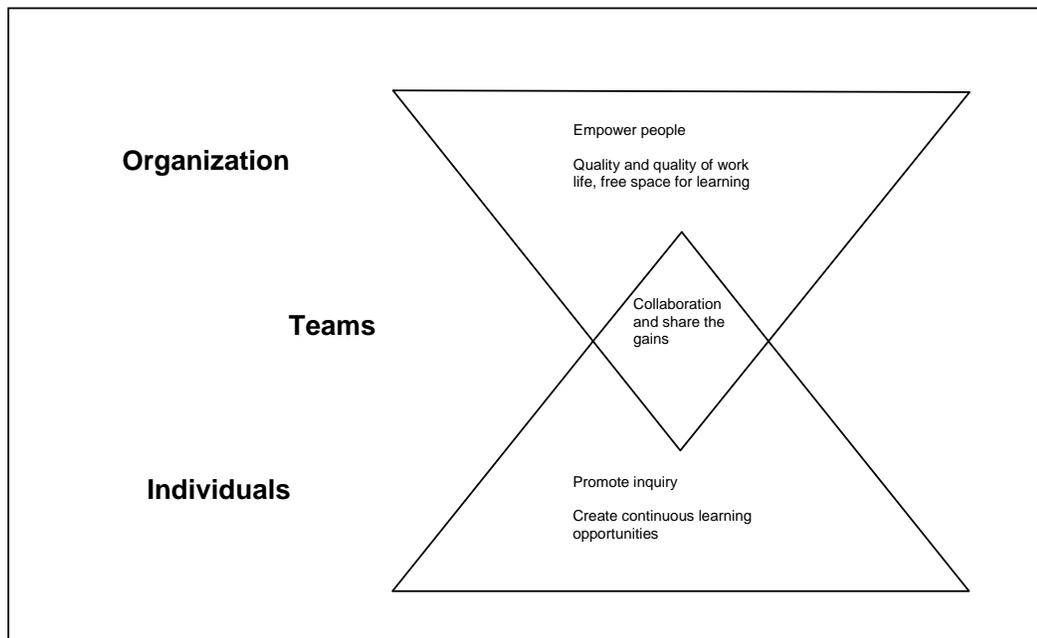
Picture 11: Team learning model by Watkins and Marsick (Marquardt, 1996, 36).

3.3 Styles of Learning in Organisation

Learning can be sorted in four styles. These styles are adaptive learning, anticipative learning, action learning and deutero learning. These four do not completely exclude each other (Sydänmaanlakka, 2001, 32). One person or organisation can easily learn with more than one style. It is not exclusively determined, which event belongs to given style (Marquarad 1996, 23).

3.3.1 Adaptive Learning

Adaptive learning occurs through experience and reflection. An individual or an organisation takes an action in order to achieve the intended goal. This action results in an outcome, which is analysed. Actions taken after the first action are modified by previous analysis. This kind of learning style carries out single-loop or douple-loop

mechanics. Adaptive learnig can be depicted as following process: (1) Action (2) Outcome (3) Result data (4) Reflection (Marguardt, 1996,38).

3.3.2 Anticipatory Learning

Anticipatory learning refers to the way we try to anticipate the future in our actions. The basis of this kind of learning is the vision or scenario. This vision is first assessed and after assessment and planning the best alternative is selected and carried out. After the process results are collected and analysed for learning (Sydänmaanlakka, 2001, 33).

3.3.3 Action Learning

 Action learning was developed over 50 years ago by Reginald Revans. He used to say that there is no learning without action and no action without learning. Learning equation is: Learning = Programmed instruction (i.e knowledge in use) + Questioning ((fresh insights)what is no yet known), or L = P + Q. Action learning involves working on the real problems. This occurs by acquiring learning and implementing actual solutions into practise. An action learning process gives the members of an organisation certain learning skills, which are new ways of thinking in the problems of the organisation, self-understanding, skills of critical reflection and teamwork skills for problem solving. This style of learning has proved out to be the most valuable way of learning for an organisation (Marquardt 1996, 39-41).

3.3.4 Deutero Learning

Deutero learning is a form of learning that learns from critically reflecting upon the whole model of thinking or acting. This process can create whole new way of practical actions or the way of thinking. This creates changes. They may be profound and the change process can be painful (Sydänmaanlakka, 2001, 33-34). This style of learning is some times referred as learning from learning. In this way the members of the

organisation become aware of the previous organisational context for learning. This helps to generate new strategies for learning and these results are reflected into organisational learning practices (Maquardt, 1996, 39).

3.4 Disciplines for Organisational Learning

Peter Senge presented that there are five disciplines to commit in order to promote the learning organisation. These were personal mastery, mental models, shared vision, team learning, system thinking. Michael Marquardt added the sixth discipline, which was dialog. Pentti Sydänmaanlakka provides four disciplines to support these six previous ones: strategic learning, feedback systems, use of information systems and sharing the competences and knowledge. These are more instruments for development of learning organisation than strict disciplines so they are included into chapter 3.5 about learning organisation.

First six disciplines have an effect on individual or group level learning. These six originate from a person's ability to learn. Feedback and information systems are supporting and directing the dialogue. Sharing competences and information enlarges the dialog to socialisation of knowledge. Strategic learning focuses to management and their ability to learn. In this context the whole personnel is important.

3.4.1 Personal Mastery

This discipline reflects the individual's commitment to continuous learning and development of personal know-how. Ideal picture of personal mastery could be for example the craftsman who develops his skill for duration of his life or samurai who strives for perfection in his whole life. Organisation rarely encourages personal mastery. As a result the personnel is untapped. People have lost their commitment and sense of vision (Senge, 1999, 32).

3.4.2 Mental Models

Mental models give us the way that we realise the surrounding world and how we react or take an action. These models are based on our perspective of event, situation, activity or concept. For example we all have different model of school, police or horses. It is based on our previous experiences on our culture. These models provide the basis of the collective thinking of the organisation. Strong models can inhibit renewal of the organisation. So they should be made visible sometimes and they have to be tested (Senge, 1999, 32).

3.4.3 Shared Vision

Shared vision is important for the learning organisation. It sets the direction for every action. It is not only the vision of a strong and visionary leader. It provides the picture of the future in every member's mind. In this kind of situation people learn and excel not because they are told but because they are sharing the objective. The shared vision is valuable for learning because it provides focus and energy for learning (Senge, 1999, 32).

3.4.4 Team Learning

Team learning reflects the ability of a team to create learning. Members of the teams do not work as aligned. In this kind of situation an individual works hard but alone and the results do not translate into efficient team effort. When team learning occurs less energy is wasted and objectives and direction are harmonised. Good teamwork results always more than the sum of the individual efforts. Team learning requires insightful thinking, co-ordinated action and ability to encourage learning in other teams (Senge, 1999, 32).

3.4.5 Systems Thinking

System thinking tries to see the complex thing as a whole, unlike normally, when we try to breakdown the problem or complex. Breaking down the problems gives us the difficulty to the see whole picture and causalities of the fragmented pieces. System thinking provides the tool for realising and analysing large and complex problems. System thinking can be formalised in system dynamics, which is a powerful tool for organisational learning. Organisations are like gigantic networks of interconnected nodes. With system dynamics we can find the positive and negative interactions, which would not have been discovered otherwise (Senge, 1999, 32).

3.4.6 Dialogue

Dialog is a form of communication, which involves listening and sharing as well as speaking. Dialogue involves learning how to recognise the pattern of interaction within teams and how these patterns are promoting or inhibiting learning. For example, patterns of defence are deep-rooted in how people operate in organisations. If this pattern is detected and properly illuminated, this process will promote learning. Dialog is a critical factor for connecting, inventing, and co-ordinating learning and action in the team (Marquardt, 1996, 46-47).

Dialog is in the centre of organisational learning. It helps collective thinking and communication. There are many ways to communicate, they are presented in table 2. Dialog helps the organisation to see the world as a whole, not a fragmented group of things. With the dialog people can recognise when people are jumping from observation to generalisation. Dialog also exposes what they are not saying while they are in conversation. It also balances the relation between the inquiry and the advocacy as well as the theory and the practice (Marquardt, 1996, 46-47).

Table 2: Ways of talking.

Suspension	Discussion
Internal discussion, accepting differences, building mutual trust	*Advocacy, competing, convincing*
Dialog	**Dialectic**
Confronting own and others' assumptions, revealing feelings, building common ground	*Exploring oppositions*
Metalogue	**Debate**
Thinking and feeling as a whole group, building new shared assumptions and culture	*Resolving logic and beating down differences*

3.5 Learning organisation

Building a learning organisation is the matter of right learning environment for the individuals. The learning environment encourages the people to continuously develop their behaviour and practices. This involves the organisation to be successful. The improvements have to be made into reality. The benchmarking in form of transferring and emulating the best practices all over the organisation has to be carried out. People who want to succeed and learn have to be retained. (Teare, Dealtry, 1998). The development of learning organisation can be seen as a process, where leader brings his clear vision to a measurable action plan. Implementation of this plan requires sharing the knowledge and an innovative mind (Appelbaum, Göransson, 1997). In this development an organisation can be considered as a complex learning system, where organisation, people, knowledge and technology are linked together with learning (Marquardt, 1996, 21).

3.5.1 Organisation

From angle of learning the organisation consists of vision, structure, strategy and culture. Vision is the leading star. It must be clear for every individual of the

organisation. This vision helps people to join their effort in learning and shared vision. Culture is also a part of the mental essence of organisation. Organisational culture is shown in on the artefacts, beliefs and values. Artefacts are the visible symbols like logos, heroes and celebration. Beliefs are not visible like artefacts and the most concealed cultural features are values. These latter ones are more difficult to change than artefacts, but they have more impact on learning environment of organisation (Marquardt, 1996, 67-74).

Strategy defines the concrete plans to achieve objectives and these plans must contain learning as a part of the process. Also learning can be achieved on the strategic level. This can be called strategic learning. It means the capability of management, and in increasing extent the whole personnel, to understand and interpret the signals of the environment. This also involves challenging the mental models and creating new models and strategy. This means an ability to implement the strategy in short time and react to the customers' movement (Sydänmaanlakka, 2001, 55).

The structure of an organisation is also essential for learning. It determines the amount of internal control, the work organisation, performance monitoring, lines of communication, and the decision making process. These have no doubt an effect on learning. The structure of learning organisation can be described fluid and boundaryless, which has no respect for internal barriers of different unit or divisions. Hierarchy levels have also flattened to improve learning and information flowing (Marquardt, 1996,82-83).

3.5.2 People

There are people inside the organisation that have an impact on learning. Also people of interest groups have an impact on learning. The key factor is that the employees and especially their leaders can make a difference in learning. Leader has a great role in bringing the vision and action plan into practise (Appelbaum, Göransson, 1997). There are also external activators in the people context of learning. Customers are the group

that often sets the most important requirements for operations of the organisation. These requirements have to be learned. Partners, vendors and suppliers have their own role in the chain of learning not forgetting the community that provides educational, social and economical agencies of learning (Marquardt, 1996, 25-26).

3.5.3 Knowledge

Sharing competence and knowledge is more than just a dialog. It is the foundation of the intelligent organisation. Knowledge must be truly shared unlike the natural way of people who are hiding their knowledge (Sydänmaanlakka, 2001, 57-58). Essence of knowledge is that it has to be acquired, created and stored for utilisation and transfer to areas where it is needed or to people that utilise it (Marquardt, 1996, 26-27).

3.5.4 Technology

Traditionally use of information systems have had strong role in operational execution. This role is under considerable change. Use of information systems has become more and more important to organisational learning. Information systems enable more effective ways for communicating. This has an effect on organisational learning. These have become enablers for new innovative ways of learning and that way the use of information technology has increased (Sydänmaanlakka, 2001, 57). Several electronic performance support systems, decision support systems and expert systems have been developed. All of these promote learning or cover the gaps of learning.

3.6 About Disabilities of Organisational Learning

Due to fierce competition and the changing environment the corporations do not learn fast enough. Organisations can't keep their freshness. The reasons for this are in organisational learning and of course in the individuals. People tend to think that they are only an indifferent part of the big organisation and their effort has little impact and

they do not have to take responsibility for the bad result. People are defending themselves from the enemy outside. In many cases this enemy is in the same system. People are rarely truly proactive. The real proactivity is to contribute first on own problems by solving those. People have also delusion about learning from experience. It is true but many of the decisions have long-range effect that the decision maker does not experience. Last is the myth about the management team that is always ready to battle with problems and dilemmas. In real business management team is trying to avoid every thing that makes them look bad (Appelbaum, Göransson, 1997).

Those disablers of organisational learning are due to ODP (Organisational Defence Pattern) that is presented in the picture 12. ODP appears in some form in every organisation. The trigger for the ODP is skilled incompetence. Every organisation contains skilled incompetence to some extent. Skilled incompetence is simply incompetence that generates results that are counterproductive to indent. Actually the decision makers and doers are unaware of the fact that they are acting counter productively. Organisation is tending to increase bureaucracy in order to protect the incompetence. There are also rules for the defence routines that are repeated constantly. Errors have been bypassed and persons are acting, as if the problem does not exist. This bypass is also made undiscussable and its undiscussability has been made undiscussable (Argyris, 1992, 20-43).
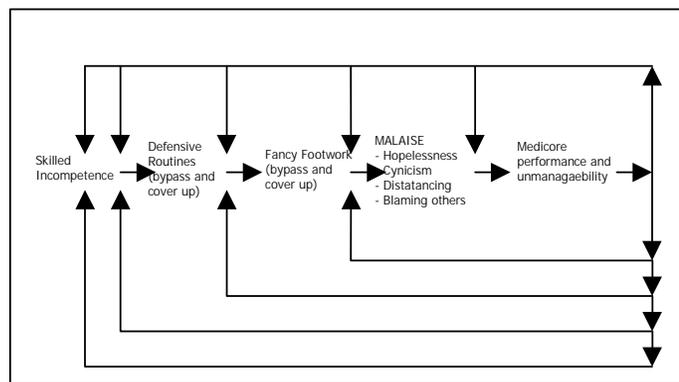
Picture 12: Organisational Defence Pattern mechanics.

While the defensive pattern is going on, people in the organisation begin to feel

frustrated and cynicism takes over. People learn how to avoid organisational minefields. The organisation can't perform properly. People who feel themselves personally responsible will become exhausted and burned out in the end. People in those positions take other jobs or early retirement easily. This kind of development can lead into organisational blow-up. In that case many people are burned out and need psychiatric help. This situation can be avoided by developing the learning organisation (Appelbaum, Göransson, 1997). The organisation reduces its defensive routine by productive reasoning. This means adaptive learning that is shaping the governing values like double-loop learning. This way the affect of skilled incompetence is realised to be truly counter productive and problems can be solved.

4. Chaos and Organisation

Next chapter will illuminate how chaos effects organisations. Chaos has initially meant disruption of to the change process of the organisation. This kind of state should be avoided. Science has developed and today's scientists see chaotic phase in a change process as a necessity. Only through the chaotic phase the system can evolve and move forward. (Sullivan, 1999) How this inspiring phase of development effects on organisations? It has a strong influence on the innovative power of an organisation. (Nonaka, Takeuchi, 1995, 78). Chaotic environment creates a need to be sensitive and proactive to environment (Ståle, 2000, 121). These dynamics have become important in the modern business environment.

4.1 Chaos in Physics and in Business

There is no single theory called a chaos theory, but in science there are a lot of methods and theories to model non-linear phenomena. These are called chaos theory. In science it is relevant to build simplified models to analyse and calculate nature's phenomena. Chaos theory has inspired theories in business economics and management. (Aula, 2000, 61) In business economics the need for modelling a complex and non-linear environment has become obvious in recent years. Speed of change has increased. Organisations have become larger and more complex. This is due to globalisation and effective information technology. (Ståle & Gröhnroos, 2000, 76-78) The future planning of corporations should be executed as constantly changing iteration in very frequently changing and uncertain world. (Bechtold 1997)

4.2 The Butterfly Effect

There are rarely butterflies in organisations but the most popular reference to chaos theory is the butterfly effect. Enormous effort may not have any effect on complex system, such as on organisation. Sometimes small event is amplified and it causes

dramatic consequences. Practically a flap of butterfly's wings in South-America can be amplified non-linearly and cause powerful storms in Africa (Lichtenstein, 1997). Butterfly effect reflects the sensitive dependency of the system on the initial state of the system. Tiny events in one state of the system can cause a chain of events, which is changing the state of the system dramatically. In our electrical media dominated society the butterfly effect has a fertile ground to blossom. (Aula, 2000, 62-63)

4.2.1 The Case Example of Butterfly effect - Finnish co-operative association EKA

EKA went bankrupt during the early 1990's. Autumn 1993 there was information about losses of milliards Finnish marks and there was also rumour about order to enter EKA into liquidation. This caused immediately panic among the customers who had made deposits in EKA. This caused cash flow out of the EKA. Guarantees of EKA were not sufficient and Finnish government had to guarantee all deposits. By this action direction of cash flow was changed but too late. Banks ordered EKA into liquidation just a few hours after the government decision. (Aula,2000, 63-64)

4.3 Three Types of Organisation

There are three main images of organisation, a mechanical machine, a living organism and a dynamic network. These all are products of their time but in every organisation there are some features from all of them. Actually an organisation should be seen like three-dimensional entity, which contains all three dimensions (mechanical, organic and dynamic). Each one of these plays its own role in the competitiveness of organisation (Ståle &Gröhnroos, 2000, 73-81).

4.3.1 The Mechanical Machinery

Since Taylor published his texts about management and later Weber his, an organisation has been realised as a machine. Taylor introduced the idea of the product line and

Weber's bureaucracy was a perfect description of a perfectly working organisation. Work in an organisation is divided and organised in the most effective and profitable way. According to this school the most important characteristics of an organisation were predictability, continuity and manageability (Ståle &Gröhnroos, 2000, 73-81).

4.3.2 The Complex Organism

Mechanical features were not enough to describe all phenomena in a real organisation. These kind of things began to realise in 1940s. Environment became more sensitive to competition and change. Education increased and firms become to realise their employees skills as a resource for business. In this world an organisation did not seem mechanistic anymore. The organisation was more like an interactive structure or a living organism, which adapted to changes internally and externally (Ståle &Gröhnroos, 2000, 73-81).

4.3.3 The Dynamic Network

The third dimension of an organisation, the dynamic network, is a response to today's fast changing environment. Value chain has been seen more like value network and to get top efficiency your demand supply chain has to be integrated with your partner organisations. So an organisation is not alone interacting with its environment in the current environment. It manages the fast change together with its close contacts: interest groups, customers, vendors and other partners. This environment makes actions in the organisation hectic or even chaotic (Ståle &Gröhnroos, 2000, 73-81).

4.4 Dynamics of Change in Organisation

An organisation can be seen as a complex structure. Often has it been taught that the larger the organisation and the more units and departments, the more complex it is. These structures form socially created systems. These systems work by the laws of

individual and shared expectations of people (Sullivan, 1999). Organisations are constantly under changing process. There are several ways to see the change: deterministic, through equilibriums, dissipative and the fourth way to see the change is chaos. (Aula, 2000, 102-104)

4.4.1 The Deterministic Way of Change

The deterministic way of change suggests that the changing process can be preset. This kind of deterministic model complements the image of an organisation as a mechanical machinery. Changing process can be predestined and a perfectly operating organisation executes those processes and ends up on desired state. In this image the change is completely reactive to the change of the environment. (Aula, 2000, 102)

4.4.2 System change through equilibriums

An organisation can be seen as a system that is in equilibrium. A pressure from the environment makes the organisation to seek a new equilibrium. Sometimes equilibrium is changing in cycles. These cycles might depend on economic cycles, product life cycles etc. This equilibrium is constantly and incrementally changing from equilibrium to another. This equilibrium can be seen as punctuated. The organisation is in equilibrium during given time. Longer period it is in constant fluctuation and transformation. (Limerick et al, 1994) This kind of model regards all kind of chaos and disorder as bad organising. (Aula, 2000, 102-103)

4.4.3 Dissipative

According to dissipative change model, organisation slips into a change because of internal and external pressure. This kind of organisation retains its capability to regenerate order after dramatic change. The regeneration of order in organisation occurs through a dramatic chain of changing events. This kind of organisation changes between

states of instability to stability and vice versa through changing process. Appearance of a dissipative organisation is dynamic, open, multidimensional and unsubtle. (Aula, 2000, 103)

4.4.5 Chaos & Bifurcation

An organization, which develops through the chaotic change of form, is riding on the edge between rigid and chaotic states. This is called bifurcation. Bifurcation means that the state or the behaviour of the system is instantly dividing into two separate branches. The bifurcation point illustrates the point of discontinuity in the development of the system. Typical for bifurcation is to make choices between two alternatives. The organization is in flux state   (Aula, 2000, 103-104).

This kind of organization uses all its energy to maintain its position on the edge of chaos. Other organizations are spending their energy to win chaos in order to maintain a rigid and stable state. Other alternative is to slip into a complete state of disorder. In that state all the energy of the organisation has been exhausted and nothing productive will happen. Stability creates a sense of security and continuity but it does not response environmental changes. Also stable organizations are not as creative as those who are in bifurcation. (Aula, 2000, 103-104)

Attractor in chaos theory can be defined: it is the set of states that the system is heading towards. Literally attractor draws the systems toward itself like a powerful magnet. A chaotic system has often a strange attractor, which means that the final state of the system is unknown. The nature of strange attractor is like a ball of yarn. The string crosses itself immeasurable times never touching itself. The attractor reflects the cultural ability of the organisation to organise itself in chaos. The more there is freedom to choose in the organisation, the more complex is the attractor, which describes the organisation. The culture of the organisation is the attractor, which justifies the actions of the organisation (Aula, 2000, 65-68).

4.5 Self-organization – Anti-chaos

Chaos is only one part of the behaviour of the chaotic organization. There is a counter force to chaos that is called self-organization. A system or an organization that is in disorder can sometimes spontaneously achieve the state of order (Aula, 2000, 68-70). This new order cannot be logically deduced from the initial state but it has been formed from initial ingredients. Therefore this new order is innovative. This is called self-organization. A self-organized organization is sensitive in two directions: sensitive to outside and inside of organisational borders. (Ståle & Gröhnroos, 2000, 129-130)

The clearest sample of self-organization in real world are self-managing teams. The idea is to give a team or a unit autonomy to execute given tasks. This kind of organizing reduces need for planning and these self-organizing units are more flexible. With this method lean organizations can be created. There are several pitfalls in this kind of organization: wrong understanding of the model, resistance of change in management and poor training for the system (Peters, 1987, 360-362). Self-organizing isn't only for team or physical organization. Self-organizing can be seen as a part of the strategic development. Strategy development process involves all organizational levels. This way the system or organization adapts the environmental change in the best possible way and the organization is truly self-organizing (Bechtold, 1997).

4.6 Knowledge and Information in an Organisation

Chaos increases the innovative power of an organisation. (Nonaka, Takeuchi, 1995, 78) There are two types of information, tacit and explicit. The tacit form of the knowledge is restored in people of the organisation in their skills and capabilities. The explicit, hard knowledge is complementary to the tacit knowledge. It is written in documents, manuals and so on.

Difference between knowledge and information must be recognised. Our environment provides us plenty of information but it is not all knowledge to an individual. First,

knowledge unlike information is about beliefs and commitment. Knowledge can be defined as justified belief. Second, knowledge is about action. When regarding information as knowledge there must be action in the end. Last definition for knowledge is that it is always about the meaning. In this aspect knowledge and information are similar (Nonaka, Takeuchi, 1995, 57-59). Therefore adding available information does not automatically increase available knowledge (Aula, 2000, 106).

4.7 Knowledge Creation and Knowledge Spiral

Organisation creates new knowledge by converting existing knowledge. Conversion of knowledge is interaction between tacit and explicit knowledge. These conversions are presented in following picture number 13. Tacit knowledge is transferred from person to another via socialization, from mouth to mouth. It can also be transferred to explicit form by externalisation, which increases amount of explicit knowledge. Vice versa tacit knowledge can be increased by internalisation. Transformation from explicit knowledge to explicit knowledge is called combination.

	Tacit knowledge	To	Explicit knowledge
Tacit knowledge	Socialization		Externalization
Explicit knowledge	Internalization		Combination
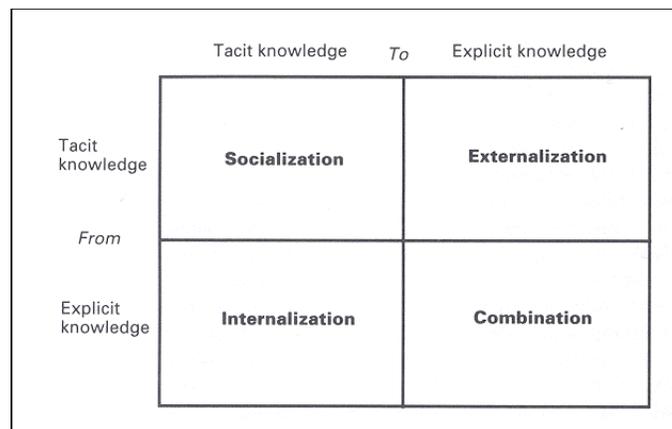
Picture 13: Knowledge conversions.

These knowledge conversions increase amount of knowledge like the spiral presented in the picture 14. The idea of the knowledge spiral is that tacit knowledge is shared between individuals. Tacit knowledge is spreading slowly through the organisation. To be levered to the whole organisation it must be transfered to explicit knowledge. This

way distribution of knowledge through the organisation becomes more efficient. Explicit knowledge is collected and linked to other explicit knowledge. This innovative process produces new things for learning and growth of tacit knowledge (Nonaka, Takeuchi, 1995, 62-70).
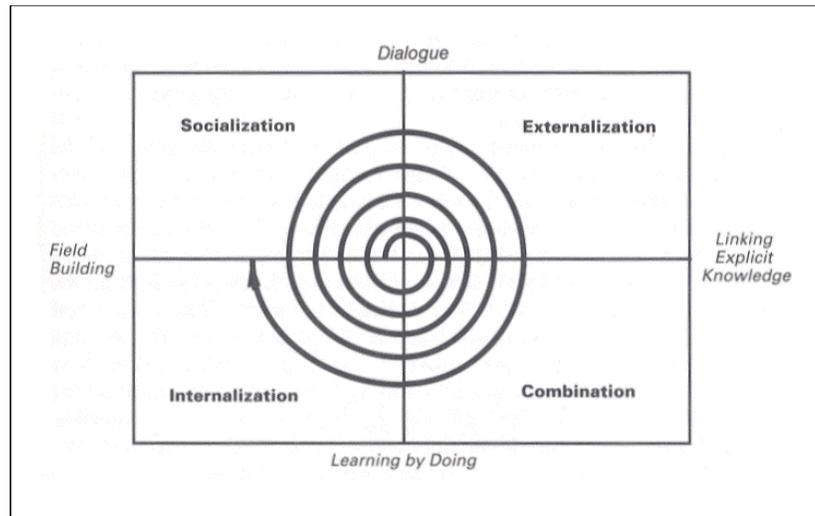
Picture 14: Knowledge spiral.

A conflict between this theory and real life can be found. Success of the organisation relies on sharing information and knowledge (Aula, 2000, 197-199). Still sharing knowledge is not natural to an individual. The previous process might sometimes be painful. It can be said by experience that this kind of thinking is hard to get to practical use (Ståle & Gröhnroos, 2000, 37). The knowledge spiral can be enabled by right intensions. This means giving enough freedom for creative chaos to exist (Nonaka, Takeuchi, 1995, 70). For this development an open communication culture is essential, which is based on organised and spontaneous arenas. It is the way of organisational evolution (Aula, 2000, 115-116).

5. Empirical part: Case study

This empirical part consists of internal documents of Nokia and interviews of ramp-up personnel in different organisations. I have interviewed 15 persons from product programs and ROCS (Ramp-up and Order Configuration Support team). This study shows the challenges of the wide variety of products Nokia is producing and bringing to market. There are differences in processes and configurations between different products. These differences have an impact on ramp-up work. They originate from previous organisational structures, partners and their abilities.

The first case reflects the average ramp-up with Product Program support. In this case whole ramp-up is followed from the beginning to the end. The following two smaller cases are meant to reflect diversity of practices and processes. Main point of view is from ROCS, which is the assisting organisation of logistics ramp-up. The organisation of ROCS is a simplified line organisation.

5.1 Case enterprise and organisations

Nokia Networks (NET) is one of three separate business groups of the Nokia Corporation. The others are Nokia Mobile Phones (NMP) and Nokia Ventures Organisation (NVO). There are also a separate support group for all of these. It is called Nokia Business Infrastructure (NBI). NBI provides processes and information technology for the other Business Groups.

This case study focuses on NET, which is one of the leading suppliers of mobile, broadband and IP network infrastructure and related services. Customers of NET consist of telecommunication operators and Internet service providers. NET consisted 25% of total sales of Nokia and 40% of total Nokia employees worked at service for Nokia Networks.

Picture 15 bellow illustrates Nokia Networks organisational structure. Operational

functions are divided into five Divisions. IP Mobility Networks (IMN), Broadband Systems (BBS) and Professional Mobile Radios (PMR) divisions form the product businesses. PO and CO provide services for all product business divisions. Customer Operations (CO) division is the interface to customer. CO includes Customer Account Teams (CAT). Product Operations (PO) is the organisation that actually provides all NET products and provides logistic services. Customers of these services are product business divisions (BBS, PMR, IMN), and the respective Product Business Management (PBM) departments. Among these divisions Nokia Networks contains several expert staff functions such as Legal, Human Resources, Finance etc. to provide the required support. (NET organisation chart 3.10.2001)
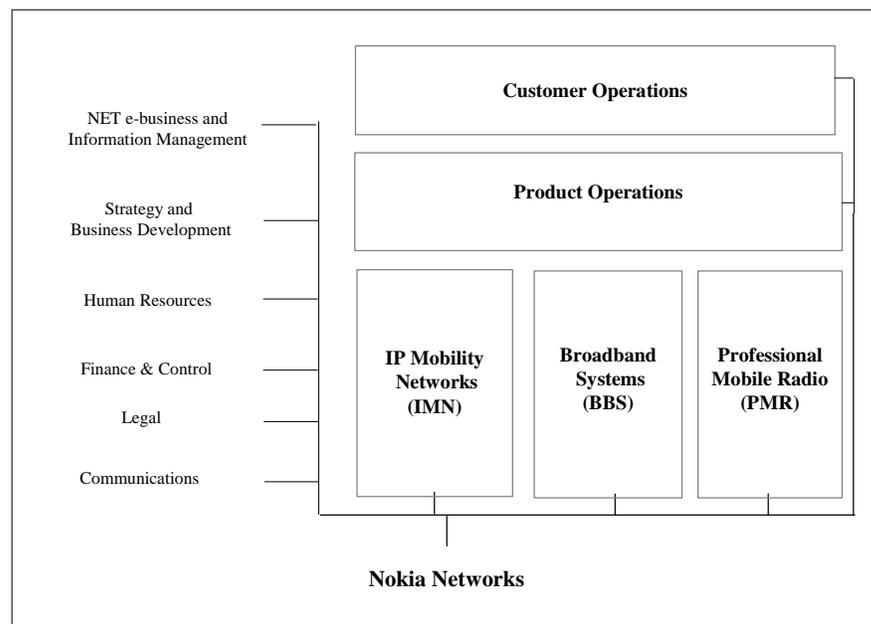
 Picture 15. Organisational chart of Nokia Networks.

Picture 16 presents organisation of Product Operations (PO). PO consists of Plants, Partner Management, Supply Network Management (SNM), Product Programs & Technology Management (PP&TM) and several support functions such as Human Resources, Finance & control etc. Following case study will concentrate on the SNM and PP&TM interface on the operational level. On this operational level ROCS and

Product Project are communicating and executing the ramp-up process. From an organisational point of view ROCS is located in SNM. It is a part of GEO (Global Export Operations). ROCS is a complementary part of GEO which gives GEO the competence to adopt new products into delivery. GEO and Material Execution form the operational edge of the Delivery Execution Management. In this composition MEX is responsible for buying and GEO delivering products.

As it can be seen SNM organisation has four vertical levels of hierarchy. Corresponding levels can be found from the organisation of PP&TM. For simplicity reasons they are not presented in picture 16. Sometimes that many levels create difficulties in decision making and co-operation between different units.
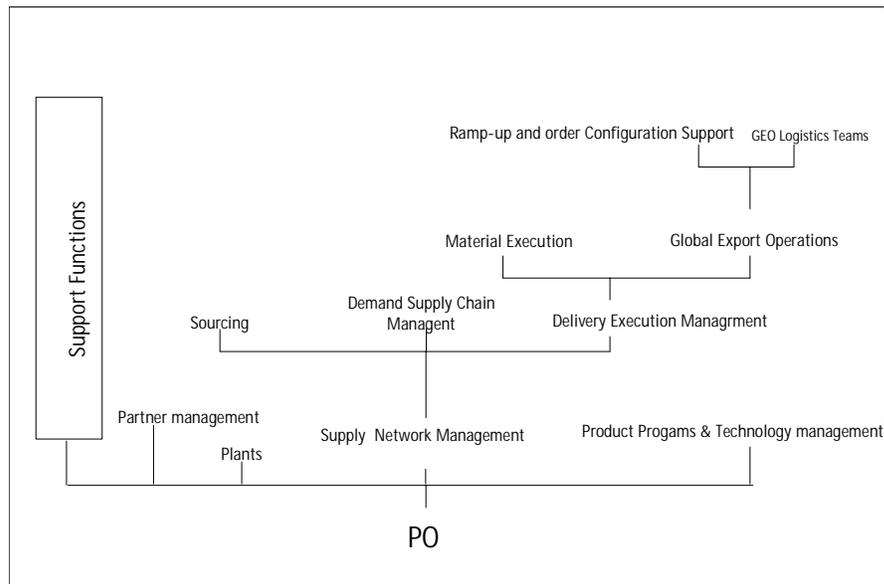
Picture 16: Product Operations (PO) organisation.

Product Programs & Technology management has a three-dimensional organisation chart, presented in picture 17. The site dimension is the line organisation. Sites authorise resources for the projects and manage administrative matters. The project dimension forms together with sites matrix, which deals all product projects. Project dimension has a great importance in reaching the operational goals. ROCS contacts in PP&TM are persons dedicated to specific projects. Last dimension in PP&TM organisation is

competence. That branch develops this organisation by growing competence in selected technologies.
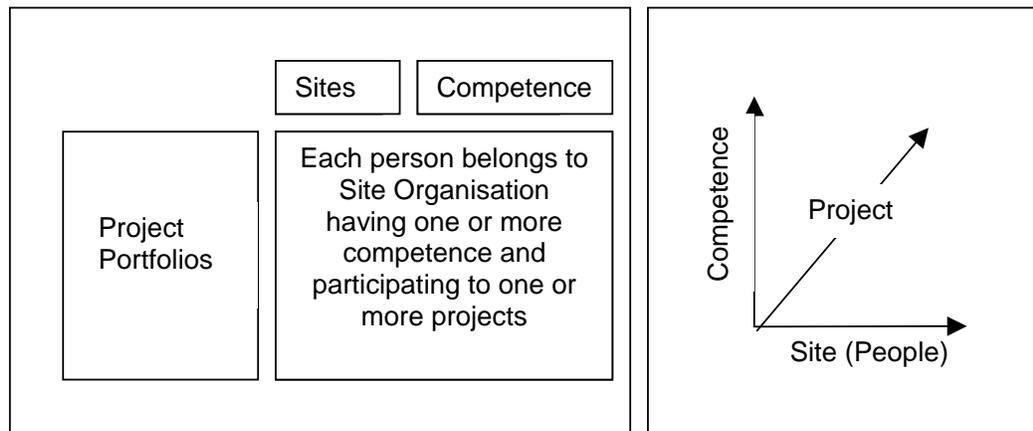
Picture 17: Matrix organisation of PP&TM.

5.2 Nokia Process Management

Three core business processes are implemented in Nokia Corporation wide. Those processes can be seen in picture 18. The Product Creation Process provides products to meet customer requirements. The Delivery Process produces and delivers created quality products to customers and maintains customer relationships. The Business Support Process gives sufficient management control to keep other processes on the right course. These all are so called end to end processes, which reach the whole chain from supplier interface to customer interface covering the whole enterprise. The whole set of processes is supported by Process Management Principles. These principles provide the environment and support for creating, deploying and using processes. This process environment is supported and developed by NBI.
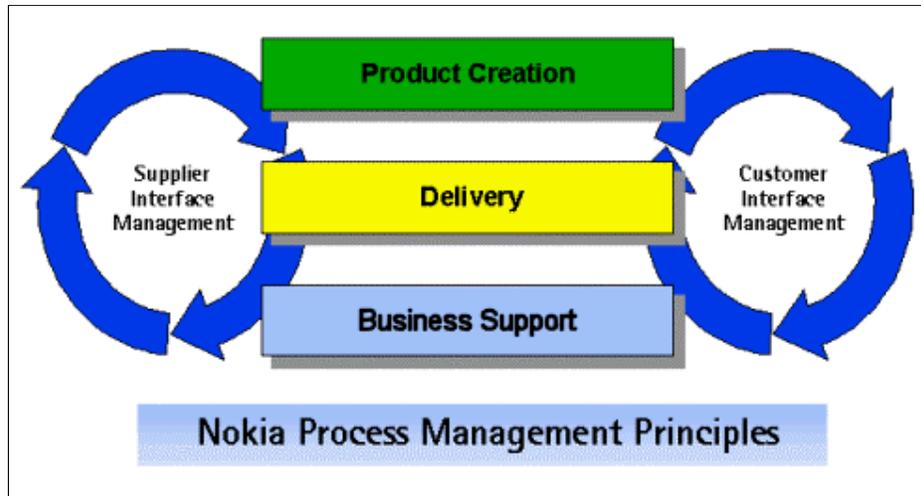
Picture 18: Nokia Business Processes (NBI Intranet pages).

5.3 The logistic Ramp-up process

On the strategic level Logistic Ramp-up process can be located between The Product Creation and Delivery processes, which were seen in picture 19. The Ramp-up process is not an end-to-end business process itself. It contains a part of the Product Creation and Delivery Processes. These sub-processes together form a process, which gives an organisation an ability to deliver a new product. In functional view of the organisation the logistics Ramp-up process forms a cross-functional workflow. The process combines product program (PP&TM, Product Program & Technology Management), business administration (PBM, Product Business Management) and outbound logistic functions (GEO, Global Export Operations) into the same continuous workflow. This workflow is divided into phases. Milestones of the Product Creation process separate these phases. R&D and Logistics Ramp-up has their own checklist for each milestone. These milestones are presented in picture 19 where they are denoted from E0 to E10.
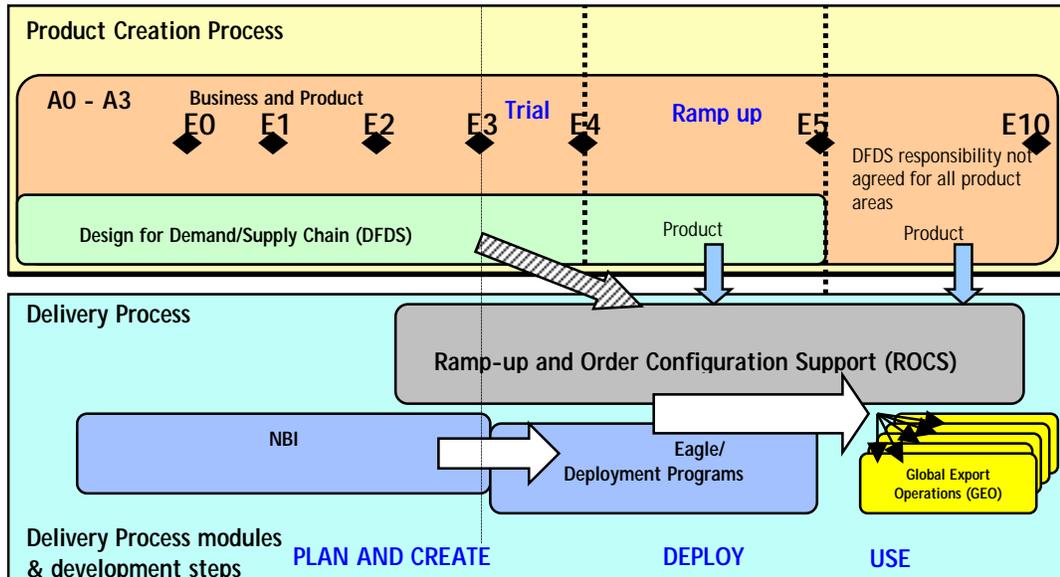
Picture 19: Paths of the new product between Product Creation and Delivery processes (Ramp-up manual v1.2 modified by Mikko Lukkari)

Picture 19 also illustrates the position of different functions in the processes. In Product Creation the ramp-up responsibility is in DFDS (Design for Demand/Supply Chain) function. DFDS is not an independent organisation but it is one role of the PP&TM. The respective function in the Delivery Process lies in ROCS (Ramp-up and Order Configuration Support). Organisationally ROCS is a team in GEO organisation. ROCS and DFDS functions form an interface between Delivery and Product Creation processes. Third organisational part in the Ramp-up process is NBI (Nokia Business Infrastructure) and the respective deployment programs. This division has developed delivery process and three delivery platforms: direct delivery to customer, delivery through hub, and delivery via integration centre. These delivery modes are applied in all kinds of deliveries. GEO organisation is also presented in picture 19. This group actually delivers and looks after forwarding manufactured products.

5.4 Ramp-up phase-by-phase & task-by-task according to Delivery Capability creation manual v 1.2

The following description of the Ramp-up process is taken from Sami Viherkari's Ramp-up manual. This manual is only a written document, which describes Ramp-up process step by step. Mr Viherkari is the concept owner of the Ramp-up process in Nokia Networks logistics. In this document Milestones E0 to E5 divide the Ramp-up process to 5 phases.

5.4.1 Initial phases: E0 to E2

In these phases PP&TM is taking first steps to bring a new product into production and in delivery. D/SC capability creation is prepared and started. Responsibilities in the program are identified. As illustrated in picture 19 the responsibilities for planning and designing supply chain related actions are in DFDS at early stages of the process. This phase contains phases 0, 0.5 and 1. Note that the milestone E0.5 is used to clarify the goals of early stages. The objective of these phases is to organise and plan the following ramp-up.

5.4.2 Phase 2 milestones: E1 to E2

At phase 2 the responsibilities of the ROCS team begin. The objective of the phase for ROCS is to create a logistics ramp-up plan together with Product Program. Program and ROCS go through the product program stage by stage. Production volumes, logistic processes and plans of the program are taken into account. Resources and transferring competence are defined. Also in this Ramp-up plan the distribution of the responsibility on different tasks can be agreed. It is possible that many of the tasks can be divided between ROCS and DFDS. From the practical point of view ordering infrastructure and export formalities have to be ensured to obtain successful trial deliveries. ROCS responsible persons have to familiarise themselves with the new product. The list of phase 2 tasks is in table 1 in the appendix.

5.4.3 Phase 3: milestones E2 to E3

In phase 3 D/SC capacities are implemented. Competence and resource plans are updated to match the present outcome of the ramp-up. Training of Account teams (CAT, Customer Account Teams) is planned at this phase. Also post E4 configuration learning is started. These tasks are done together by ROCS and DFDS. Communicating availability to customers is also a task of the DFDS or ROCS, while Demand Fulfillment process is implemented. Demand Fulfillment process will steer whole D/SC so it is important for the high volume products.

ROCS plans together with GEO the resources for the execution of trial and volume deliveries. It also ensures that PDM actions for the new product are completed and export control clarification is granted before trial deliveries. ROCS ensures configuration support for trial orders. It also provides training material for ordering the trials. ROCS gives feedback to DFDS concerning the process. List of phase 3 tasks is on table 2 in the appendix.

5.4.4 Phase 4: milestones E3 to E4

Main goal of the ramp-up in phase 4 is to get trial orders delivered to customers. In the same phase training material must be available on the intranet. Logistics personnel are trained in using appropriate tools and ordering correct configurations. This training is focused on Account organizations, which are located near customers all around the world and GEO logistics teams who are actually handling those trial orders. The target of this training is to get correct orders from the beginning. These are tasks of the ROCS.

Testing the demand fulfillment process takes place in this phase, but still additional communication with customers about availability is needed. This testing is done together by DFDS and ROCS. Post E4 configuration is also still under learning and development by both organizations. List of phase 4 tasks can be found on table 3 in the

appendix.

5.4.5 Phase 5: milestones E4 to E5

Finally during phase 5 the ramp-up of the delivery capability is carried out. The goal for the ROCS at this phase is to ensure smooth handover of the product to the GEO organisation. This is achieved by training final post E4 configurations and process to Accounts and GEO teams. It is still the responsibility of ROCS to co-ordinate deliveries. ROCS is also responsible for ensuring further support for ordering and configurations. Updating the ordering instructions on the intranet immediately does this. List of tasks is on table 4 in the appendix.

5.4.6 Tasks after phase 5

Final phase is called post E5 phase. It contains phases from E5 to E10. Main goal of the ROCS is to implement product changes to operative D/SC. Communication about the changes is equally important with ensuring changes on information systems. Typical changes are new releases, configuration modifications and vendor changes. Finally E10 product will be ramped-down by ROCS or respective PBM organisation. Post E5 tasks can be found on table 5 in the appendix.

5.4.7 General Tasks Throughout the Process

Some product programs, especially the larger ones, do not reach milestones with the whole configuration at once. For instance one subconfiguration might be reaching the state that corresponds to the milestone E5 specification and the rest of the subconfigurations are behind and the confirmed status for the whole program is milestone E2 and so on. Schedules are also constantly changing. In this kind of environment there are several tasks that must be done in spite of the phase of the process. These are called General Tasks. These tasks will ensure trial deliveries and

information distribution in crucial stages of the ramp-up. One example of these general tasks is information sharing on availabilities with customers. In some projects it is necessary earlier than in phase 3 and if Demand Fulfilment process is not working properly it might be necessary after E5.

ROCS is the group which in the end is responsible for execution and management of trial deliveries regardless of program phase. This includes delivery process from configuration and order handling to invoicing. It also includes delivery scheduling. ROCS also takes care of information distribution during the whole program.

5.5 Angle of Information Flows

Tasks presented in the appendix tables 1 to 6 mainly concern the actions through interface between DFDS and ROCS. This is the main interface. Most information and work procedures are flowing through it. In the conditions of real life regular ramp-up also requires attendance from several other organisations. These interfaces have been illustrated in picture 20. Organisations in the picture 20 left from the ROCS are mostly sources of information and organisations as the right side of the ROCS are mostly organisations where information and competence must be transferred and distributed.

As it has been told, on the left side of the ROCS in the picture 20 there is the PP&TM organisation whose DFDS function plays a major role in the ramp-up. ROCS contributes detailed logistic information for DFDS and DFDS provides schedules, information about availability and plans for ROCS. Comprehensive product knowledge is from the PP&TM organisation. They also provide knowledge about the delivery process in which the product is fitted. PBM (Product Business Management) provides competence for the product and its configuration. The role of the PBM grows stronger after the initial ramp-up. Supplier Management is also given information about logistic details but the main thing is to get information about the supplier contracts referring to the new OEM (Original Equipment Manufacturer) products. Amount of these OEM products is increasing (Leppänen). NBI (Nokia Business Infrastructure) and Eagle

programs are supporting the process environment so they provide the general knowledge about Nokia's wide processes.

To achieve smooth and effective ramp-up ROCS does co-operate with MEX. It is the buying organisation although it is physical only when products are delivered throughout hub otherwise GEO is executing the process of buying. These Hub products have often huge volumes; so co-operation should be more effective and information shared about hub's state, processes and volume must be adequate. Information is shared with GEO logistics teams, Accounts and customer. Information is distributed on intranet and via special training sessions. These usually packages include the instruction to order the right configuration, induction new product and communication about availability. Post E5 this contact means configuration support.
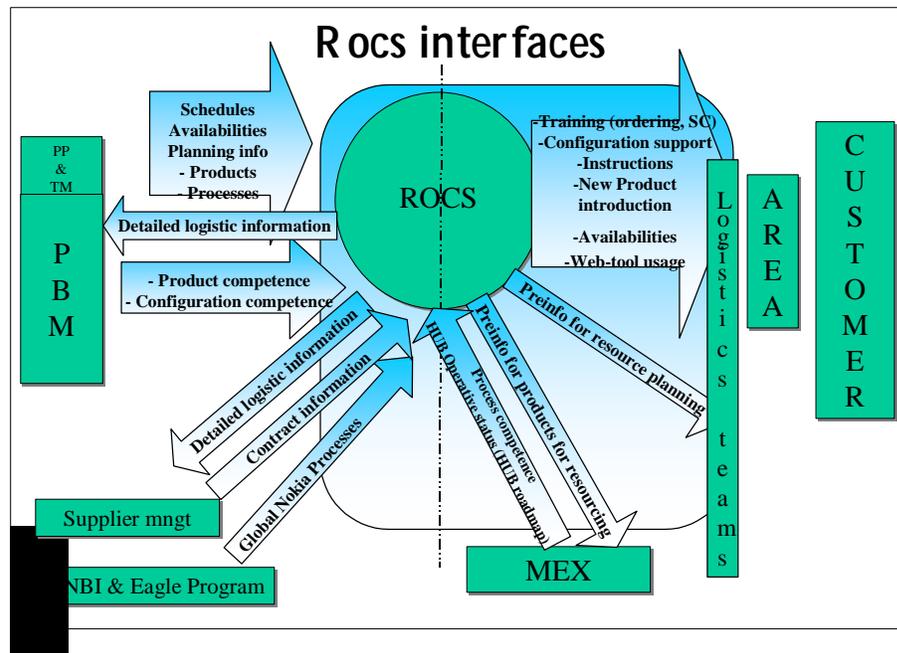
Picture 20: ROCS Team ramp-up environment and interactive interfaces.

5.6 Case I: Ramp-up with Design for Demand/Supply Chain support

For this first case I'm using two product families as an example. These two product families represent those products that are ramped-up with DFDS support. The First one is WCDMA (Wideband Code Division Multiple Access) better known as 3G (3rd Generation Networks). It was in the middle of the ramp-up during this study. 3G-product family contains the whole range of equipment from cables to software that is needed to deliver a mobile network. Base Station deliveries create the main volume at the first stages. 3G product family forms a large entity, which integrates systems from several suppliers and product programs. This kind of large ramp-up operation requires extra co-ordination. Therefore this 3G Business Management has been formed. This management group has an integrating role in all business programs for 3G.

WCDMA projects have not reached phase 5 properly. In order to cover whole ramp-up I'm using another product, GPRS (General Packet Radio System) product family, as an example. GPRS networks are operating with packet protocol just like the internet. This provides better data transmission capacity than existing networks have. This product family has passed E5. It has generated more and more new releases to improve the performance of the product. I'm using this product to reconstruct the Phase 5 and Post phase 5 actions.

5.6.1 Phases 2 and 3

In WCDMA product program ROCS work started with learning the product and it's configuration. A ramp-up plan was not created. DFDS person Anu Niemi initially guided actions. She had previous experience on ramp-up process, so she had the knowledge of needed procedures like meetings and organisations. In this phase ROCS was attending DSP (Demand Supply Planning) meetings. These meetings provided the basis for the delivery ramp-up. Trial deliveries were made during this phase. GEO teams handled all trial deliveries because the volume of the trials was too much for

ROCS resources. Sales Configurator tool was used for trial deliveries in accounts where it was already in use. It wasn't implemented in some new accounts that have not ordered products earlier. Configurations for these orders have been done by ROCS in Finland. (Tapio)

In operational work same tasks are done during the different phases. In this respect the milestones are not visible for ROCS. For example ensuring PDM actions and export clarification formalities are continuous during phases 2 and 3. Product Program is constantly doing decisions concerning the product. This implies that the information concerning product is changing daily. The configuration and the other PDM features achieve fixed state after the series of changes. From the WCDMA program information transfer is very effective. All involved organisations are located physically in the same building. Interaction between departments is frequent. There are weekly meetings in which information is transferred and decisions concerning the program are made. There are three separate meetings where ROCS members are attending as well as Logistics Task Force, ATP (Available to Promise) and Delivery Readiness. The importance of these meetings varies depending on the program status. Logistics Task Force assembles ROCS and GEO team members to survey the configuration changes and delivery volumes. ATP meeting is a forum for sourcing, manufacturing and marketing people to survey the futures capacity. ROCS has also participated in this meeting. Focus of the Delivery Readiness meeting is to survey stage of coming configurations. In this meeting the communicating parties are the same as previously. (Pikkarainen)

Attendance of 3G Management in operational actions has been minor during the sessions. Especially in ATP it would be appropriate. Due to this absence and general fuss, ROCS has been forced to allocate trial deliveries during summer 2001. This wasn't a favourable situation because ROCS doesn't have a sufficient view to the customer (Pikkarainen). Another thing that reflects management challenges in this turbulent situation is demand planning. 3G Management has designed the system for demand planning during ramp-up but the responsibility to use it is undefined. This reflects the speed of change and problems in controlling such a vast organisation. (Salama)

Information transfer isn't limited to official meeting only. It is far more effective. Tacit knowledge about the program is directly transferred to ROCS during numerous informal sessions in office and over coffee or lunch. (Murtomäki)

5.6.2 Phase 4

During this capacity trial weekly meetings are still important, but relevancy of these meetings is decreasing. This development goes along the Demand Fulfillment process implementation. (Tapio)

After the first trial deliveries there are important issues in upgrading and retrofitting. All WCDMA pre-zero series base stations are retrofitted to match to final zero series products. That way their hardware is adequate to industrial electricity norms. Upgrading is carried out together with retrofit. Initially base stations have been delivered with a minimum configuration so they are missing some of the ordered hardware. This upgrade is physically delivering the hardware to obtain full operational capacity for WDCMA base station equipment. ROCS is responsible for the execution of retrofit and upgrade deliveries. (Pikkarainen)

Training material is created and put in the intranet. Constant changes on the product generate a need to update instructions even during the phase 4. This training material includes brief product introduction, configuration and ordering instructions and even information about packages for new accounts. Training accounts are carried out. (Murtomäki) Training concept is under development. Accounts have not been satisfied in all aspects. Training comes too late and there have been technical difficulties and overlapping. (Internal Survey) Training and instruction quality has a critical impact on order correctness and process functionality in post E5 phase of the product.

5.6.3 Phase 5 and Post phase E5 GPRS

These products have reached a steady state. They have been in delivery in volume for a

long time. Development of the new product release can be seen on roadmaps of the product family and it has communicated with DFDS person of the program about two months before it is deliverable. Instructions have been developed on the basis of delivery capability plan. After this point communication focuses on phase 2 to 4 procedures. (Mälkönen)

Phase 5 gives the most work in answering questions placed by accounts. Most of the questions deal with configuration related problems and are solved by reading the instructions. These kinds of queries are vain and emphasis is on the fact that in the future the superior training will decrease this kind of activity. Another type of queries are problems related to non-updated product or configuration data in information systems. This kind of carelessness causes the most work during phase 5 and post phase E5. Due to organisational changes responsibilities are a bit mixed between PP&TM and PBM. This has caused extra bother (Mälkönen).

At phase 5 the handover ought to be happening. GEO logistics Teams are handling all orders and deliveries. Real responsibility of support and managing changes does not change. Frequent changes and updates need to be communicated and trained to accounts and GEO teams. (Mälkönen)

In the GPRS business practically every piece of equipment is ordered from OEM suppliers. This forms a special environment for logistics actions. Many processes are different from the standard. In this environment managing the vendor relations are important. This means vendor contracts should also take care of logistics matters. However, in the GPRS program there are examples of contracts where logistics are not taken into account. Afterwards ROCS and DFDS have been involved in designing an appendix for the vendor contract. One sad example deals with Cisco equipment. This vendor contract didn't define lead times or available configurations. (Mälkönen)

Information blackout and the fact that in GPRS program responsibilities between PBM and Program are undefined possibly cause lack of control in vendor matters. One example of this is item management. Item management is updating product data to

information systems including changes on item names, configurations and prices. During initial phases of the program product program personnel update and create items into information systems and in post E5 phase it is sent over to respective PBM. In the GPRS case item management has never been handed over to PBM. DFDS or ROCS personnel have done it. There are also other after-care activities of this kind during post E5 phase on which responsibility haven't been agreed upon. For example development of bill of material is still after E5 in responsibilities of program. (Mälkönen & Tuomi)

Mixed responsibilities have implications to work of ROCS. It has driven the task into the state where every product has its own procedure for ramp-up. There is pressure from other parties of ramp-up to give more tasks to ROCS. Examples of this can be found. Those retrofit and upgrading actions are typical extra tasks where ROCS is acting as Product Program or Product Business Management. This phenomenon is a kind of outsourcing executed by respective Program or PBM and thereby ROCS is only acting as a stooge (Virtanen-Jaakola).

5.6.4 Case 1: What has been learned?

In general the real ramp-up process is following the process tasks as specified in the ramp-up manual. There are still many exceptions generated by specific program. In this form of process a DFDS person and a ROCS person have been collaborating, which is generally working well when observed from the logistics point of view.

This collaboration transfers the knowledge from product program to logistics use. DFDS and ROCS are providing the needed synthesis of the product structure. There is no guarantee that this is an effective way for the logistics organisation to get the latest information about the configuration of products. However this arrangement gives the logistics department capability to utilise the configuration in their work. This utilisation is generally originated from effective internalisation of the synthesis created by the ROCS and DFDS collaboration. Still from the logistics angle of view GEO and Account organisations receive their information from one point. This creates lateral connection

from logistics to sources of the product specific information. This relation helps the logistics organisations to maintain their ability to deliver new products. This ability is based on learning that is constructed between the organisations.

This way in the WDCMA case it can also be said that this process form is balancing the workload of the Oulu site. On the other hand the product program is outsourcing some of its work to ROCS by giving extra tasks such as retrofit projects. These kinds of additional responsibilities are also problematic from competence's point of view. The more there are tasks that are not routine, the more it takes to learn to do them. This takes time and more important things like training fall to lower priority. On the other hand this close relation between ROCS, DFDS and Product Program generates a unique situation – these organisations are learning together to solve the problems. Dialoque between organisations is open and this generates team learning in an informal work group formed by ROCS, PP&TM and PP personnel.

5.7 Case 2: Ramp-up without Design for Demand/Supply Chain support

Cellular Transmission (CT) products programs do not have a DFDS person of their own. The respective person in ROCS is also acting in these program activities throughout the Ramp-up process. ROCS person has to have good contacts to PBM and Program. Thus ramp-up process advances through personal interaction guided by experience rather than by delivery capability or ramp-up plan. (Leppänen).

CT products have reached the milestone E5. Responsibilities are concentrated on updating configuration and process changes on instructions. CT products contain products from four product families. Those families seldom receive new product. In these cases the ROCS person has to ensure that the new product fits in the processes and fulfills PDM requirements. Luckily new Cellular Transmission devices have a configuration similar to their predecessors, so adaptation of a new product isn't hard. (Leppänen) On the other hand there is an increasing need for training these CT products to fresh 3G account teams (Leppänen).

WCDMA person Sirpa Pikkarainen deals with the CT training because one person's time is not enough for controlling program matters and training the accounts. (Salama) Training must contain product, configurations and ordering. In fact the content of the training is not fixed. PBM has a role concerning the configuration and the product. In these issues it is best that PBM gives training and ROCS can that way concentrate on logistics issues. This principle also goes with answering questions. (Leppänen)

Sometimes a product structure has become obsolete. Due to the strong involvement in the program ROCS has been interacting in development of Bills of Material (BOM) and respective changes on Sales Configurator in order to improve ordering and control of delivery. (Leppänen)

5.7.1 Case 2: What has been learned?

Successful ramp-up can be achieved with the sole assistance of ROCS. This requires experienced and capable personnel, who have strong vision, good communication and negotiation skills. In this case there is little logistics competence in the PP, which has negative impact on decision-making and functional co-operation. So a strong requirement exists for personal competence in case 2. This model of working narrows the possibility of one person to have cross-competence with another in ROCS organisation. This narrows the team learning possibilities within ROCS.

From the process point of view this kind of liaison role saves resources. In this case a person is located in ROCS organisation. One person collects and edits information from the product program. This synthesis is presented for logistics organisations. In this case it is clearly the ROCS who is working on providing the service for logistics. The provided information is created through individual learning of ROCS personnel. The lateral bond between the organisations is almost non-existent and organisational structure is more formal than really collaborative and informal. This kind of set-up limits the dialogue. Actions of the organisation are not as creative and innovative as

they could be.

In this case knowledge transformation through synthesis to internalisation falls a bit short. The lack of creative dialogue sometimes creates interferences in the leaning process of the logistics. This kind of action creates a chaos-like situation. Sudden changes and ad hoc actions are daily routine. This kind of environment doesn't encourage personal mastery and the other virtues of learning.

5.8 Case 3: Ramp-up without ROCS support

In this case there are two product families which are brought into delivery without ROCS guidance. Operations Support Systems (OSS) and Mobile Software (MSW) units have developed these product families. The main value of these products contains deliveries of software (SW). OSS and MSW products are delivered with hardware (HW) systems. These HW items are OEM products, and the main vendor of these is Hewlett Packard. (Sandman & Saari)

Some SW items of OSS are OEM. The Product Management Board generally guides these programs. Logistics are presented in those meetings in the form of the GEO logistics team leader. All relevant parties are presented (R&D, PBM, Logistics) in these meetings. PP& TM organisation is not involved in this product. This way all relevant information is directly received (Laukkanen).

MSW software is ramped-up differently. Organisationally MSW don't belong to NET. It's part of the NMP. This sets an extra challenge. There are about 35 active product programs. So there is the team of DFDS persons who are designing supply chain actions for MSW products. This group is dealing with all tasks from phase 1 to post E5 phase. They create instructions for GEO logistics teams. These products have a low volume, about 10 deliveries per year per product. As the volumes are this low, all deliveries can be considered to be trial deliveries, when considering the work a single delivery requires. (Saari)

5.8.1 Case 3: What can be learned?

In the case of low volume products the program has the required competence to execute whole ramp-up process. In this model the responsibility of ramp-up success is partly in GEO organisation in form of trial deliveries. This model requires more competence from logistics and time to execute a single order. Dialog is directly between the origin of the information and daily operations conducting logistics. This sets some requirements for the learning abilities of the logistics department.

Supporting the logistics organisation is not conducted as well as in two previous cases. This organisational separation creates the illusion of distance between departments. This illusion provides a barrier towards the forming of an informal organisation and open dialogue for learning. On the other hand, there are no overlapping organisational resources. Information is not circled via an extra organisation. If the mental barrier between organisations can be avoided, this solution can be very effective. There is still a doubt that the current systems and organisations can be adopting this angle to ramp up. This is possible strictly for this marginal product family.

On the other hand, PP&TM has more and clearer responsibility than in previous cases. In this set-up the PP&TM will learn the actual requirements of delivery capability. This cross-functional relation works by the dialogue and team learning that crosses organisational barriers.

5.9 Word from Leaders

This diverse field of action is problematic in several ways. Controlling the team sets a challenge. A superior can't help in the details. Diversification through the whole group is appearing in tasks and responsibilities. This diversification is mostly due to the spectrum of product line traditions. The details are not the only problem. Communication about the progress of the ramp-up of a certain product is difficult because of the lack of knowledge. There are no tools for control. Present reporting

systems are not a proper way to monitor the progress of the ramp-up in the range of whole NET (Sillanpää). Additional challenge is the 3G ramp-up group in Oulu. This geologically separated unit is challenging to steer from Helsinki. They are strongly involved in action of PP&TM (Salama).

Creating the strategy for the operational plan of ROCS is difficult. The guidelines given from the top management are lacking. This makes operational planning difficult. There are three possible ways for ROCS to locate in PO organisation. The first is to remain in the GEO organisation and continue to support ramp-up and configurations as earlier. In this case the team remains close to GEO. If the service level for GEO isn't enough ROCS team can be decentralised among the logistics teams or stay in centralised form. The second alternative for the ROCS is to move closer to CAT. Transferring ROCS in organisation under the Demand Supply Chain Management can do this. This organisation is developing the customer interface of the NET. Third alternative for ROCS is to emerge to the PP&TM organisation. That way the Product Programs would have the logistics support and products would be brought correctly to logistics delivery. The alternatives are presented in the table 3 (Sillanpää).

Table 3: Organisational Development Options

Alternative	Advantages	Disadvantages
Staying in GEO	- Good visibility to delivery process - Excellent support to GEO	- Lack of contacts to CAT organisations - Limited ability to effect ordering process and order correctness
Attachment to PP&TM	- Better co-operation with programs - Increasing product competence	- Poor understanding the changes in CAT and GEO processes
Attachment to Demand Supply Chain Management	- Good interaction with CAT development	- Poor contacts with PP&TM

6. Case Study Conclusion

Project milestones are important from the viewpoint of the Product Program but from the logistic point of view they are only trend setting and they are strongly dependent on the program. Roughly three phases can be defined for ramp-up: delivery planning phase, trial deliveries phase and support phase. These three and Ramp-up phases 2 to post E5 phase are presented on picture 21.

During the planning phase that includes about same tasks as ramp-up process phase 2, ROCS plans ramp-up together with the Product Program. It learns the new product. ROCS also looks after that PDM and tariff actions for the trial deliveries are conducted correctly. During the Trial Phase ROCS manages trial orders and deliveries. This requires testing physical tools and process. In this phase training is also planned and executed. This phase also includes PDM customer information and configuration control tasks as listed on tables 2 and 3 in the appendix. This trial phase gives most of the workload. After the handover configuration has achieved steady state, ROCS concentrates on the tasks of informing and training the product changes to accounts.

Product Program				
Milestones	E2	E3	E4	E5
Ramp-up Phases	Phase 2	Phase 3	Phase 4	Post E5 Phase
ROCS	Planning Phase	Trial Phase		Support Phase

Picture 21: Ramp-up process phases.

There is a dramatic difference in workload between the different phases. During the Planning phase responsibilities do not offer a huge amount work for ROCS. As the project advances towards the Trial phase ROCS workload starts to grow. It achieves its peak during the Trial Phase. After the Trial phase ROCS workload begins to decrease. This decrease depends on how frequently product changes are implemented and how clean is the whole ramp-up is. Defining resource need for different ramp-up projects is

difficult because of the variation of the workload.

Workload variation is not the only challenge for management. General picture of ROCS actions is a bit unclear. Responsibilities and tasks are blurred in the sense that the whole organisation performs the same actions, as it can be noticed in the case studies. It might seem that Ramp-up specialists are doing their work despite the process. Still there can be traced the same general procedures of ramp-up in every program. Certain information has to exist in information systems. This data includes all item related information such as VAT codes, prices, configurations etc. Trial deliveries have to be delivered. What is the problem? There are several undocumented tasks which ROCS is doing. This is due to various practises in various organisations. These practices have been developed during the time. Different products formed organisations of their own with R&D, factory, logistics and marketing department. This existed three years ago. Today there are separate production, marketing and logistics organisations that serve the product business divisions (IMN, PMR, BBS). Still the old practices can be seen in actions of the logistics and logistics ramp-up.

7. Conclusions

Environmental changes in today's telecommunications business are hectic and in some cases even chaotic. This evolution of the environment is followed by respective organisational changes. This process is painful right now because the markets have gone down and inside the organisation the mechanics of double-loop learning has caused profound structural changes. These changes are the organisations' way to maintain the competitiveness and the efficiency of operations. This organisational pressure is reflecting the learning by transformation. Transformation forces an organisation to learn and evolve along the environment and the competition.

In order to maintain operational capability through the change learning has to be maintained. This learning organisation or learning environment is created by the vision that every member of the organisation is sharing. That way in the newly designed model can be put into practise. The implementation process can't be one sided because rarely newly designed models are working on the field 100 percent. The implementation must be carried out with feedback and resources must remain for the further development as the knowledge about the subject increases.

7.1 The process paradox of ROCS

The complementary role of ROCS is the first thing that appears to a viewer. ROCS is the part of the organisation that adopts new products from ramp-up to volume delivery. This is the first role of the ROCS, the ramp-up. Another role that the GEO main organisation is not capable at to support the delivery in the environment where the product is changing. Extra challenge for ROCS is to ramp-up and support the ordering and configuration to account organisations around the world. In this task the knowledge transformation and transfer to actual ordering and configuration making persons is important.

In this situation it can be assumed that there is a gap between the Product Creation

Process and Delivery Process. There are insufficient knowledge, competence and resources outside of ROCS that are mending the void. That gap is filled with actions by ROCS. The Gap has been illustrated in picture 22.
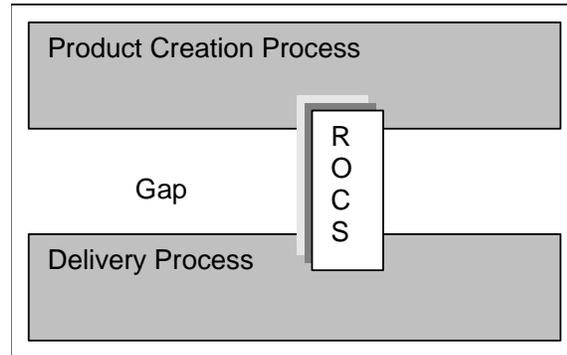
Picture 22: Realised GAP between processes

The gap between the processes can be noticed during the ramp-up phase. The people in PP&TM organisation aren't aware of detailed requirements of logistics delivery. This way the PP&TM is not learning the real requirements of the delivery process. That is why ROCS should participate in the early stages of ramp-up. This way the later trial phase, support phase and later releases would be easier and less complicated. This set-up generates a paradox. The early stages of the ramp-up process are in hands of the PP&TM organisation. On the other hand the speciality of ROCS is needed because the PP&TM organisation does not have the sufficient resources to execute smooth ramp-up to delivery process.

ROCS possesses a view to the demand supply chain, its processes and information systems. PP&TM is bounded to a certain product project. These projects are bounded to certain product business, and its traditions that rely on previous products. This way PP&TM is completely executing its projects in individual process form, not in generic form. In organisation terms there is some kind of matrix philosophy in the PBM and PP&TM organisations. Every product or program manager runs the show by his own specifications as a separate product line. ROCS is this way balancing the equilibrium between efficient delivery process and scattered product program processes.

The philosophy of independent project can be observed on the variation of roles and procedures between different products. Product programs have been in process before the current process model was created. In these conditions PP&TM hasn't got enough time to harmonise the process. In these conditions ROCS ramp-up personnel are competing with the chaos of different ways of bringing the product to delivery process. There are process specifications created by concept and process owners. Somehow these are not followed or interpretation varies from program to another. There is a need for harmonisation of operational models. PP&TM and PBM are not the only party that are causing differentiation to actions. The GEO organisation obtains only scarce development resources. The personnel of ROCS obtains the speciality for development of processes. This way they are a wanted resource inside of GEO.

There is a need for the horizontal harmonisation of processes. There has to be time for an individual to adopt the new way of operation. In a process organisation implementation of the new process is not only a matter of one person or department to adopt the model but it is a matter of the whole chain of operating departments or competence centres. The whole orchestra must commit to learn the new process. This is the matter of management that creates and transfers the vision to whole corporate organisation. Without the holistic vision change is only partly adopted and horizontal harmonisation is not reached. Vision isn't enough: the management should have the knowledge about the desired state and direction should be maintained and corrected if necessary.

7.2 Knowledge Conflict

The problem can be observed from the angle of knowledge. ROCS has an important role in the knowledge creation of the delivery process. Written instructions for each product are created. The information for these instructions is combined from documentation of PP&TM and PBM. Information is also collected by direct contacts to the respective parties. These instructions are distributed by intranet to all CAT and GEO

members. These instructions are tailor made for each product. Content of the instructions varies from one product to another. This variation originates from the product specific ordering process. The ordering process in the CAT is the feature that practically dictates the content of the instructions.

There is also a need for improvement in knowledge of the CAT at the end of the supply chain. There are several processes of setting order to the information system. This has implications to the content of the ordering instructions. The particular reason for that is variation in the account organisations. Responsibility about configuration varies from position to another between different account organisations. Information about these roles is scarce. This variation is partly dependent on product characteristics and partly the specification of account organisation itself.

The training issue forms a conflict between PBM and ROCS. PBM is responsible for product and on that field ROCS is giving the training for the accounts. The point of the ROCS is that the PBM doesn't give training or instruction on logistics matters and the configuration support from PBM to CAT logistics persons are minor. The training and instruction specifications should be decided together with PBM and CAT. In practice this is at least challenging. The direction should be set in process specifications and all parties should be presented in the development process.

7.3 How to Get Along with the Chaos?

The case studies have proven that the ramp-up process has chaotic features. Horizontally, examining different products in the same phase, the procedures are scattered. Along the interfaces the chaos is in for changing organisations, product configurations and procedures. In the short run this state of affairs isn't necessary a destructive thing. People usually learn the new situation fast. New pieces are fitted soon in the puzzle and procedures are polished into effective mode. Continuous state of chaos or bifurcation in operational machinery like GEO or ROCS is not necessarily a good thing. Constant struggle with the same details weakens the learning environment. This

state consumes energy from the daily routines. In this evolution management loses its visibility to the field. This situation can be prevented by extensive communication, dialog. This way management retains the real control of the situation. If management can't retain awareness of the ongoing situation, skilled incompetence can emerge and the group or some individuals may fall into an organisational defensive pattern.

On the other hand I don't believe that there is there an easy way to harmonise the process and the same time reserve the capability to operate in the chaotic environment. From this angle ROCS is covering an important part of the process by transforming to needs of the process. In this role is important that ROCS is given clear role. This way the organisation can learn and develop in chaos.

It would be nice if there was a neat five-year or other kind of long term plan for the organisation, but that is impossible for the time being. In these conditions creating the learning environment is essential. That way the organisation can scoop energy to fill its function. This is hard. The examined group is a bunch of specialists, each of which have their own projects and problems that they have to solve in their own directions. The discipline of team learning is not working in this kind of environment. The strengths have to be picked somewhere else. Dialogue gives the way of learning that increases the knowledge of the group by socialisation. The socialisation must be over the product-originated borders. This way the organisation learns the scattered procedures and may learn that there are similar problems all around the organisation. This development has to be co-ordinated to harmonisation of the processes.

It is so easy to blame chaos about process disharmony. In many respect it is so. Who makes all the chaos, is it us, people? Answer isn't that simple because there is only one set of process description. There is only one official implemented process that is the same for all. Environment changes fast and so process development is also fast. People in the process executing position can't adopt the process in the pace that it is developed and changed. Still development can't wait. There seems to be no feedback to process development from the actual operative organs of the organisation and still the feedback loop to environment is running.

REFERENCES

1. Appelbaum Steven H and Goransson Lars: 1997, Transformational and adaptive learning, The Learning Organisation, Vol.4 No. 3

2. J. Ashayeri, R. Keij and A. Bröker: 1998, Global business process re-engineering: a systems dynamics approach, International Journal of Operations & Production Management, Vol.18 No. 9/10

3. Argyris Cris: 1990, Overcoming Organizational Defences – Facilitating Organizational Learning, Ally and Bacon, Boston, ISBN 0-205-12338-4

4. Argyris Cris: 1993, On Organizational Learning, Blackwell, Cambridge, ISBN 1-55786-262-1

5. Aula Pekka, 2000, Johtamisaen kaaos vai kaaoksen johtaminen, WSOY, Juva, ISBN 951-0-2401-7

6. Bechtold Brigid L: 1997, Chaos theory as a model for a strategy development, Empowerment in organizations, Vol. 5 No. 4

7. Bolan Tony and Fowler Alan: 2000, A system perspective of performance management in public sector organisations, The International Journal of Public Sector Management, Vol.13 No.5

8. Checkland Peter, 1981, Systems Thinking, Systems Practice, John Willey & Sons Ltd, UK, ISBN0-471-27911-0

9. Earl M, Khan B: 1994, How New is Business Process Redesign? European Management Journal, Vol.12, No.1

10. Galbraith Jay R, 1977, Organziation Design, Addison-Wesley Publishing Company, Philippines,

11. Galbraith Jay R, 1995, Designing Organisations - An Executive Briefing on Strategy, Structure and Process, Jossey-Bass San Francisco, ISBN 0-7879-0091-5

12. Galbraith Jay R, 1993, Organizing for the Future, Jossey-Bass Publishers, San Francisco, ISBN 1-55542-528-3

13. Hannus Jouko, 1994, Prosessijohtaminen - Ydinprosessien uudistaminen ja yrityksen suorituskyky, HM&V Reserch Oy, Jyväskylä, ISBN 951-96708-0-7

14. Hammer Michael, 1988, Beyond reengineering – How the process-centered organization is changing our work and our lives, Harper Collins Publishers, New

York, ISBN 0-00-638711-X

15. Hammer Michael, Champy James: 1993, Reengineering the corporation – a manifesto for business revolution, Hrper Collins Publishers,New York, ISBN 0-88730-687-X

16. Harrington James, Esseling Erik, van Nimwegen Harm: 1997, Business Process Improvement Workbook – Documentation, Analysis, design, and management of business process improvement, McGraw-Hill, New York, ISBN 0-07-026-776-0

17. Hendersson Steven:1997, Black Swans don't fly double loops: the limits of the learning organization, The Learning Organisation Vol.4 No.3

18. Hunt V. Daniel: 1996, Process Mapping - How to Reengineer Your Business Processes, John Willey & Sons Inc, USA, ISBN 0471-13281-0

19. Johnson Gerry, Scholes Kevan, 1997, Exploring Corporate Strategy, Prentice Hall Europe, ISBN 0-13- 525619-4

20. Laamanen Kai; Tinnilä Markku: 1998, Prosessi johtamisasen käsitteet - Terms and Concepts in Business Process Management, Metalliteollisuuden Keskusliitto, Helsinki, ISBN 9518176922

21. Lichtenstein Benyamin M: 1997, Grace, magic and miracles – A chaotic logic of organizational transformation, Journal of Organizational Change Management, Vol. 10 No.5

22. Limerick David, Passfield Ron and Cunnington Bert: 1994, Transformational Change – Towards an Action Learning Organization, The Learning Organization, Vol. 1 No. 2

23. Marquardt Michael J, 1996, Building the Learning Organization, McGraw-Hill, USA, ISBN 0-07-040534-4

24. Melan Eugene H: 1993, Process Management - Methods for Improving Products and Service, McGraw-Hill, USA, ISBN 0-07-041339-8

25. Mullins Laurie J, 1996, Management and Organisational Behaviour, Pittman, London, ISBN 0-273-61598-X

26. Nonaka I, Takeuchi H, 1995, The Knowledge -Creating Company, Oxford University Press, New York, ISBN 0-19-509269-4

27. Nyman Göte, Silén, 1995, Muutoshallinta ja business reengineering käytännössä, Andersen Consulting, Helsinki, ISBN 951-97364-0-9

28. Peters Tom, 1987, Thriving on Chaos - Handbook for a Management Revolution, Harper Perennial, USA, ISBN 0-06-097184-3

29. Proehl Rebecca: 1996, Enchanging the effectiveness of cross-functional teams, Laedership & Orgzanisational Development Journal 17/5

30. Senge Peter, 1999, The Dance of Change – Challenges of Sustaining Momentum in Learning Organizations, Nicholas Bearley Publishing, London, ISBN 1-85788-243-1

31. Sullivan Terence J: 1999, Leading people in a chaotic world, Journal of Educational administration Vol.37 No. 5

32. Sydänmaanlakka Pentti, 2001, Älykäs organiasatio - tiedon, osaamisen ja suorituksen johtaminen, Talentum Media Oyj, Jyväskylä, ISBN 952-14-0223-7

33. Ståle Pirjo and Gröönroos Matti, 2000, Knowledge Management in Theory and in Practice, WSOY, Vantaa, ISBN 951-0-25286-7

34. Teare Richard and Dealtry Richard: 1988, Building and sustaining the learning organsiation , The Learning Organisation, 5/1

35. Zairi Mohammed: 1997, Business process management: a boundaryless approach to modern competitiveness, Business Process Management Journal, Vol.3 No.1

36. Örtenbland Anders: 2001, Organsiational Learning and Learning Organization, The Learning Organization 8/3

ELECTRONIC DOCUMENTS

1. Nokia Business Processes (NBI Intranet pages) http://www.connecting.nokia.com/nokia/www/nokiawww.nsf/document/ES22T 4PAM7E?OpenDocument (18.09.2001)

2. Delivery capability manual v 1.2

3. ROCS Manual (7.9.2001) http://www2.connecting.nokia.com/nokia/net/po/snetmweb.nsf/document/ES344 YHJQ2?OpenDocument

4. Nokia 2000 annual report http://nds1.nokia.com/insight/pdf/rev2000en.pdf

5. Supply Network Management Organisation Chart (19.11.2001) http://www2.connecting.nokia.com/nokia/net/po/snetmweb.nsf

6. Product Operations Organisation chart (12.10.2001) http://www.net.nokia.com/NTC/www/operatio.nsf

7. Nokia Networks Organisation chart (12.10.2001) http://www.net.nokia.com/ntc/www/net.nsf/document/000004EE

8. PP&TM Operational Model (30.9.2001) http://www.net.nokia.com/ntc/www/po/mtu.nsf/document/ES14T4SUBFH?Ope nDocument

VERBAL REFERENCES

Laukkanen Rauno, GEO, Group Leader

Leppänen Markku, ROCS, Ramp-up Specialist

Luukkanen Kalle, IP-Mobility Networks, Business Development Manager

Murtomäki Anita, ROCS Ramp-up Specialist

Mälkönen Aki, ROCS, Designer

Niva Minna, ROCS, Ramp-up Specialist

Pikkarainen Sirpa, ROCS, Ramp-up Specialist

Saari Sari, NMP/MSW, Group Manager

Salama Markku, ROCS, Competence Manager

Sillanpää Sinikka, Manager of the ROCS

Sandman Johanna, OSS, System Marketing Manager

Tapio Heidi, ROCS, Ramp-up Specialist

Tuomi Hanna, NBI, Process Development Manager

Viherkari Sami, Ramp-up Concept Owner

Vilkki Mari, MEX, Process Development Consultant

Virtanen-Jaakola Aija, ROCS, Competence Manager

APPENDIX: Tasks of the ramp-up

Table 1; Phase 2 tasks
Going through product program; plans, product, volumes, processes *
Getting familiar with product and its configuration
Ensuring trial ordering tool & export control classification number (eccn) and tariff are defined formalities are done
Tasks with asterisk (*) are done with PP&TM or responsibility is agreed separately

Table 2; Phase 3 tasks
Create the SC (Sales Configurator) and WEB-tool and ordering training material
Ensure that PDM (Product Data Mangement) actions completed for trials (codes, structures, prices, customer data)
Ensure the configuration support of trial orders to accounts and GEO
Ensure export control classification issues and possible lisences
Update resource and competence plans *
Complete the training plan *
Doing personnel arrangements for execution
Configuration management assistance
Pre-trial order flow handling and delivery scheduling according prioritization
Product learning and induction's
Communicate availabilities to projects and internal customers *
Learn post-E4 ordering process and configuration rules
Participate in trial Demand Fulfillment process testing and verification *
Feedback to DFDS about the maturity of the processes
Tasks with asterisk (*) are done with PP&TM or responsibility is agreed separately

Table 3; Phase 4 tasks
Logistics competence training; GEO, Accounts
Trial order handling, distribution, forwarding and invoicing: co-ordination, reporting, communicating
Ensure the support for trials: PDM and configuration management
Co-ordinate orders and deliveries between source of supply, R&D and projects
Communicate availabilities to projects and internal customers *
Go through the post-E4 process and plan with DFDS *
Learn post-E4 ordering process and configuration rules
Carry out trainings: plants, Supply Network Management unit, accounts *
Participate to Post E4 Demand Fulfillment process testing and verification *
Tasks with asterisk (*) are done with PP&TM or responsibility is agreed separately

Table 4; Phase 5 tasks
Train product, Post E4 process and tools to accounts/projects and Supply Network Management Unit according the program roll-out plan
Ensure order handling, distribution and invoicing resourcing and support
Offer PDM, order and configuration management support
Co-ordinate orders and deliveries between source of supply, R&D and customer projects
Communicate availabilities to projects and internal customers *
Ensure that material is available and updated in the web
Tasks with asterisk (*) are done with PP&TM or responsibility is agreed separately

Table 5; Post-E5 Phase tasks
Communicate and implement changes to operative D/S Chain: configuration changes, related process changes
Ensure that changes in PDM and I-M systems are completed
Ensure that material is updated in the web
Tasks with asterisk (*) are done with PP&TM or responsibility is agreed separately

Table 6; General tasks
Handling first deliveries (resources from outbound logistics and MEX (Material Execution) if required) including executing order management , material execution, distribution, invoicing
Communicate availabilities to projects and internal customers*
Trial delivery scheduling according prioritization
Inform outbound logistics and accounts of new programs (incl. Volume estimate, schedules and availability)
Tasks with asterisk (*) are done with PP&TM or responsibility is agreed separately