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Order (Correctness) Quality Initiative

Case Study: NetAct

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Master's thesis
April 2017
Technology, communication and transport
Degree Programme in Logistics Engineering

Jyväskylän ammattikorkeakoulu
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Description

Author(s)	Type of publication	Date
Tourunen, Lauri	Master's thesis	20.04.2017
	Number of pages 80	Language of publication: English
	Confidential until: 18.05.2027.	Permission for web publication:

Title of publication
Order (Correctness) Quality Initiative

Degree programme
Logistics Engineering

Tutor(s)
Lähdevaara, Hannu

Assigned by
Nokia Networks

Abstract

This Master of Engineering Thesis has been written for Nokia Networks and the Operations' unit. The thesis is financed and shall be utilized by the Business Line.

The theoretical framework of the thesis consists of the following sections: Quality in Logistics, Total Quality Management and Lean Six Sigma. These are closely related to the selected case study: Order Quality Initiative, improving the order correctness from the of a complex network element product (NetAct) involving several different configurable items, with the operational parties involved in the order process being globally distributed in different organizations with independent purposes (and goals).

The thesis is targeted for persons in the establishment, development and management of the logistics function in the areas: Program & Product Management, Product Provisioning experts, Delivery Capability Managers and others involved in the demand/supply chain operations. I have chosen the action research approach for my study, as it is a suitable method for those conducting research in their workplace, and who have a focus on improving aspects of their own and their colleagues' practices.

The main objective is to present a "lessons learned" type of outcome, presenting key improvements areas and actions both professionally and academically. The thesis will provide a theoretical understanding of quality and providing tools on how process improvement ought to be managed.

This thesis is to be treated as **confidential** for the next 10 (ten) years.

Keywords/tags (subjects)
Quality, Lean Six Sigma, Project Management, (Sales) Order Correctness

Miscellanous

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Kuvailulehti

Tekijä(t)	Julkaisun laji	Päivämäärä
Tourunen, Lauri	Opinnäytetyö	20.04.2017
	Sivumäärä 80	Julkaisun kieli Englanti
	Luottamuksellinen 18.05.2027 saakka	Verkkojulkaisulupa myönnetty:

Työn nimi
Order (Correctness) Quality Initiative

Koulutusohjelma
Logistiikan koulutusohjelma (YAMK)

Työn ohjaaja(t)
Lähdevaara, Hannu

Toimeksiantaja(t)
Nokia Networks

Tiivistelmä

Opinnäytetyön aiheena oli käsitellä Lean Six Sigma -projektia, jossa tapaustutkimuksen kohteena on Nokia Networksin NetAct -(puhelin)verkonhallintatuote ja sen tilausten oikeellisuus. Operatiivisen toiminnan laadun parantamiseksi tarvitaan prosesseja, joiden avulla yritys voi tunnistaa potentiaalisia kehityskohteita sekä ottaa käyttöön korjaavia ja ennaltaehkäiseviä keinoja, jotka tukevat tilausten oikeellisuutta. Tässä tutkimuksessa tarkasteltiin virheellisten tilausten vaikutuksia ja kustannuksia globaalin, telekommunikaatio-alalla toimivan yrityksen tilausprosessin eri vaiheissa.

Opinnäytetyön tavoitteena oli tuottaa toimintatutkimus, jonka tarkoituksena on kehittää kohteena olevaa organisaatiota ja sen toimintatapoja mm. NetAct -tilausten osalta. Nykyistä tilannetta kuvailtiin päätöksenteon tueksi, virheellisten tilausten tyypilliset virheet tunnistettiin, sekä laskettiin virheellisten tilausten kustannukset eri vaiheissa. Työ esittelee, miten NetAct -tuotteen Lean Six Sigma Green Belt -projekti oli vaikuttamassa koko e2e toimitus- ja myyntiketjuun ja tilausten oikeellisuuden parantamiseen. Parannukset koskivat niin tuotteen (sähköistä) myyntirakennetta, käytössä olevia työkaluja, tuotteen toimitusmallia yleisesti, ja miten näillä oli suora vaikutus kustannussäästöihin. Tutkimuksen tulokset osoittavat, että tilausten oikeellisuuden laatu oli heikko ja että virheellisten tilausten vaikutukset näkyvät ylimääräisenä työnä ja huonon laadun kustannuksina.

Teoreettinen viitekehys esittelee, yleisellä tasolla, kokonaisvaltaisen laatujohtamisen-filosofian (Total Quality Management) sekä sen eri tasot ja vaiheet. Lisäksi kerrotaan teoriatasolla, Lean Six Sigma -menetelmästä sen eri käsittelyvaiheet ja työkalut.
Työn tuloksena oli esitellä kohteena olleen projektin kokemukset ja opitut asiat, sekä esitellä avainasioita, joilla parantaa tilaustenkäsittelyä.

Avainsanat (asiasanat)
Projektinhallinta, Laatu, Tilausten oikeellisuus, Quality, Lean Six Sigma, Project Management, (Sales) Order Correctness

Muut tiedot

Contents

Figures

1 The Aim of the Thesis

Austrian-born American management consultant Peter Drucker once said that: *"Quality in a service or product is not what you put into it. It is what the client or customer gets out of it"* (Tibco blog 2012).

Businesses are moving from traditional hardware companies to software and service/solution powerhouses. Also, moving from providing standard, fixed physical products to customized, complex, customer specific products and solutions.

Also, conducting business electronically is a change from traditional ways of doing things, leading to large scale transformation of existing business. To attain business efficiencies from e-business, it is imperative that organizations effectively manage the e-business environment, and all associated changes to digitize and maintain the environment (Singh et al. 2004).

This study looks into the customer sales order correctness from the perspective of ordering and delivering a complex network element product – NetAct - involving several different configurable items, with the operative parties involved in the order process being globally distributed in different organizations with independent purposes (and goals). The NetAct solution consists of several internal (licenses, software) and external (3rd party / OEM hardware & software) components, thus order configuration and its correctness play an important role. A correct or "clean" order consist of: correct product configuration, correct sales data in place and including the needed mandatory information for order placement.

The aim of the thesis can be described as the following:

- Presenting the selected (customer) Order Quality Initiative case study and its results.
- What is the number of incorrect (customer) sales orders, failure/error types and root causes?
- What is the impact of an incorrect (customer) sales order: both concerning lead-time and costs?
- How can the customer order process be improved, resulting in better order correctness?

1.1 Research Methods and Material

This Master of Engineering Thesis has been made for Nokia Networks and the thesis is financed and shall be utilized by Nokia.

The study is about quality in logistics and Lean Six Sigma, using the Order Quality Initiate (Green Belt) project as a case study. The main objective is to present a "lessons learned" type of outcome, presenting key improvements areas and actions. Please note, that the author of thesis has acted as the Project Leader/Manager for the Green Belt project.

The chosen research method is action research approach in the study. Action research or participatory action research – is a reflective process of progressive problem solving led by individuals working with others in teams or as part of a community of practice to improve the way they address issues and solve problems (Innovative Learning 2015).

Action research is a suitable method for those conducting research in their workplace, and who have a focus on improving aspects of their own and their colleagues' practices. It offers a research design which links the research process closely to its context, and is predicated upon the idea of research having a practical purpose in view and leading for change. Reflecting this method into the study, it proceeds with the following steps:

1) To introduce quality in logistics, and the Lean Six Sigma concept in theory as definition. Also, to provide an understanding of the (software) business environment from the ordering & delivery perspective.
2) Introducing Nokia and the product related to the case-study, also providing information about the key delivery processes, roles & responsibilities and the impacted organizations and tools.
3) Look into the selected case-study, and introducing the background and reflecting on gathered experiences on how this Lean Six Sigma project was executed.
4) Present a "lessons learned" type of outcome with improvements areas and actions identified:
    a) Academically, to provide the reader knowledge of the above-mentioned concepts and
    b) Professionally, to present Nokia Networks, and the especially the Delivery Capability Management unit, with a "lessons learned" type of outcome, where ideas and thoughts on key improvement areas for future cases are presented, also reflecting general theory.

All company, organizational and product related information and references are based on Nokia/company confidential, internal material.

2 What is Quality?

In ancient Greece, a philosopher named Aristotle declared that *"quality (excellence) is not an act, it is a habit."* (Kaizen Institute India 2013).

The Collins Cobuild English Dictionary has listed over five different definitions for the term, but the most commonly used and most understandable definition is: *quality of something is how good or bad it is* (Collins Cobuild English Dictionary 1996).

In today's environment, nothing is constant or predictable – not market growth, customer demand, product life cycles, the rate of technological change, or the nature of competition. These forces, separately and in combination, are driving today's companies deeper and deeper into territory that most of their executives and manages find frighteningly unfamiliar. These forces are the three Cs: Customers, Competition and Change (Hammer et al. 1996).

Process quality and customer satisfaction can be perceived as important operational measures of any company. If a company seeks to improve customer satisfaction, it is a necessity to improve process lead time and quality (Jakobsson 2010).

2.1 Quality in Logistics

Modern businesses must operate differently, as not only have the product and service life cycles diminished, but in an environment where the available time to develop new products (and to introduce them) has also diminished. Modern customers expect to receive real-time knowledge about their products, deliveries and availability, for example up-to-date, accurate data about stock and order/delivery statutes with most of the key information being pushed to different mobile devices "live". More and more information is shared - 24/7/365 - during the entire e2e supply chain.

In addition to the technology evolution, other key elements that influence change are the overall market conditions, customer demands and input costs. Nowadays, companies simply *"must move fast, or they won't be moving at all"* (Kirsikkala 2014).

From the ordering perspective, it can be said, that logistics management can play a key role in enhancing customer lifetime value through increasing customer satisfaction and thus customer retention. "Perfect order" achievement should form the basis for the measurement of service performance and the creation of service standards (Christopher 1998).

E-business is an innovation that modern day organizations cannot do without. It is based on technology, evolves with technological developments, digitizes and automates business processes, is global and leads to improved competitiveness, efficiencies, increased market share, and business expansion. E-businesses models include business-to-business, business-to-consumer, government-to-government, government-to-business, government-to-consumer and numerous others that evolve with new developments (Singh et al. 2004).

The trend towards global organization of both manufacturing and marketing is highlighting the critical importance of logistics and supply chain management as keys to profitability (Christopher 1998).

As previously stated, the key drivers for change are **technological evolution, market conditions, customer demands and input costs**, with logistics playing a key role in all of these:

1) Technological evolution (E-Business) with the customers wanting more real-time or even pushed information at their disposal: accurate stock values, real-time delivery tracking, special discounts, up-to-date pricing etc
2) Market conditions change due to the overall economic status, also with the overall customer need changing from bulk goods to more tailor-made, customized goods and products, from physical goods to immaterial or digital solutions and services.
3) Customer demands, as mentioned above, are changing, this also meaning that overall product life-cycles are shorter with the customer wanting more, faster and customized / customer specific solutions, services and products.
4) Input costs play a major role, as with shorter product life-cycles, the importance of supplier procurement is growing.
5) Products are shifing from material goods to immaterial services and solutions.

It can be said, that survival in the current global markets requires a logistics-oriented organization in place: the co-ordination of information and materials flows between the entities in the entire e2e supply chain requires logistics to be seen from an process focus, instead of a functional focus. This is why the overall compentence and skill-set of the modern day logistics professional should be targeted to manage the key drivers mentioned above.

Good quality and customer (service) satisfaction can be a competitive advantage as businesses need to understand that by not satisfying the needs and expectations of customers, their place will be taken by other companies who are able to fulfil these customer expectations. Therefore, logistics companies must ensure every customer service related aspect, no matter what it includes: acceptance of orders, their execution or the solution of problem (Meidutė-Kavaliauskienė et al. 2014).

2.2 Total Quality Management

Total Quality Management (TQM) is a philosophy that should be embedded in all aspect of logistics operations. Going beyond simple “quality control”, which monitors for problems in actual performance after the fact, TQM is a philosophy that is integrated in designing logistics system to achieve desired results, performing logistics activities, and monitoring results. Total quality management involves being proactive in performing the right activity the right way the first, and continuing to perform it to the required level (Lambert et al. 1998).

Total Quality Management is a method involving in the continuous improvement of the production of goods and services. The Deming Wheel has been used as a mean of organizing process improvements, and involves a continuous cycle of (Atkinson et al. 1995):

1. Planning: developing specific objectives and using measures of past performance to evaluate past results relative to those objectives.
2. Doing: putting improvements identified during the planning phase into effect.
3. Checking: identifying, by using performance indicators, whether the plan has had its intended effect.
4. Action: preventing the reoccurrence of the corrected problem by ensuring that successful process revisions become permanent for each task in the organization.

Figure 1. The Deming Wheel

The TQM approach stresses long-term benefits resulting from continuous improvements to systems, programs, products, and people. Improvements most often result from a combination of small innovations. A structured, disciplined operating methodology is used to maximize customer service levels (Lambert et al. 1992).

The idea is to continuously monitor and analyze a task's result and to look for a better way to do that task. When comparing TQM with Lean Six Sigma, it could be said that TQM provides the philosophy, whereas Lean Six Sigma provides the tools for operations improvement.

2.2 Lean Six Sigma

In the early 1950's Toyota developed the Toyota Production System based on its earlier work on waste removal and continuous improvement. The Toyota Production System, which is widely recognized as the precursor to Lean, emphasized the removal of waste, improving flow and improving overall customer value.

Six Sigma originated at Motorola in the 1980's driven by the CEO's challenge to the company to improve the quality of Motorola products 10-fold within five years. As Motorola executives explored ways to meet this challenging goal, an engineer, by the name of Bill Smith, studied the correlation between a product's field life and how often it had been repaired during development. He showed that if a product was found defect and corrected during the production process, other defects were sure to be missed and found during early use by the customer. But if a product was assembled error free, it rarely failed during early use. This led to the birth of Six Sigma (Lean Six Sigma Community).

Lean Six Sigma is a (project management) methodology that relies on a collaborative team effort to improve performance by systematically removing waste and reducing variation (Lean Six Sigma Wikipedia). Six Sigma is an overall methodology or management system that put a structure in place that drives business improvement, providing tools to improve the capability of business processes.

Lean Six Sigma projects comprise aspects of Lean's waste elimination and the Six Sigma focus on reducing defects, based on critical to quality characteristics. Lean is basically about eliminating “waste”, which means performing activities that do not directly deliver value to its customers. Below are some examples of waste in operations:

Table 1. Examples of Waste in Operations

Types of Waste	Example
Overproduction	Produce more than the customer requires, push production
Transporting	Poor plant layout
Inventory	Safety stock on all parts
Waiting	Waiting for machine, waiting for previous process
Processing	Hand finish
Motion	Sitting, bending, walking
Defects	Out of specification parts from supplier or processing error

The training for Lean Six Sigma is provided through the belt based training system similar to that of Six Sigma. The belt personnel are designated as white belts, yellow belts, green belts, black belts and master black belts.

2.2.1 Define, Measure, Analyze, Improve and Control (DMAIC)

Lean Six Sigma utilizes the Define, Measure, Analyze, Improve and Control (DMAIC) phases - the five stages of DMAIC (DMAIC Wikipedia):

Figure 2. The Five Stages of DMAIC

1. **Define:** to clearly articulate the business problem, goal, potential resources, project scope and high-level project timeline.
2. **Measure:** to objectively establish current baselines as the basis for improvement. This is a data collection step, the purpose of which is to establish process performance baselines.
3. **Analyze:** to identify, validate and select root cause for elimination.
4. **Improve:** to identify, test and implement a solution to the problem; in part or in whole
5. **Control:** to sustain the gains. Monitor the improvements to ensure continued and sustainable success. Create a control plan. Update documents, business process and training records as required.

More detailed information of the above stages/phases will be presented during the case study chapters.

3 Nokia Networks

Figure 3. Nokia Company Logo

Nokia is a global data networking and telecommunications equipment company headquartered in Espoo, Finland. Nokia is a public limited company listed on the Helsinki Stock Exchange and New York Stock Exchange. Nokia is the world's 274th-largest company measured by 2013 revenues according to the Fortune Global.

The company has had various industries in its 151-year history. It was founded as a pulp mill, and now focuses on large-scale telecommunications infrastructures, and technology development and licensing. Nokia is also a major contributor to the mobile telephony industry, having assisted in development of the GSM and LTE standards, and was, for a period, the largest vendor of mobile phones in the world.

After the sale of its mobile phone business, Nokia began to focus more extensively on its telecommunications infrastructure business, marked by the divestiture of its Here Maps division, its foray in virtual reality, and the acquisitions of French telecommunications company Alcatel-Lucent and digital health maker Withings in 2016, whilst the Nokia name will return to the mobile phone market through HMD Global. (Nokia Wikipedia).

3.1 Key Statistics & Financial Figures

Nokia operates in over 100 countries, with the number of employees (at the end of 2016) around 102 000. Nokia's net sales in 2016 23.6 billion euros, and Nokia invested in Research & Development 4.9 billion euros (Nokia Annual Report 2016).

For the year ended December 31	2016 EURm	2015 EURm	Change
Net sales	**23 614**	**12 499**	**89%**
Nokia's Networks business	21 800	11 487	90%
Ultra Broadband Networks	15 771	10 159	55%
IP Networks and Applications	6 029	1 328	354%
Nokia Technologies	1 053	1 027	3%
Group Common and Other	1 145	–	–
Gross margin	***35.8%***	***44.3%***	***(850)bps***
Operating (loss)/profit	**(1 100)**	**1 697**	**–**
Nokia's Networks business	1 935	1 349	43%
Ultra Broadband Networks	1 362	1 211	12%
IP Networks and Applications	573	138	315%
Nokia Technologies	579	698	(17)%
Group Common and Other	(342)	(89)	284%
Unallocated items[1]	(3 272)	(261)	–
Operating margin	***(4.7)%***	***13.6%***	***(1 830)bps***
Financial income and expenses, net	(287)	(186)	54%
Income tax benefit/(expense)	457	(346)	–
(Loss)/profit	**(912)**	**1 194**	**–**
Earnings per share ("EPS"), EUR diluted	**(0.13)**	**0.31**	**–**
Average number of employees	**102 687**	**56 690**	**81%**

Figure 4. Nokia Key Financial Data 2016 & 2015

3.2 Research & Development Business Units

Nokia has two main businesses – Network Business (as Nokia Networks) and Nokia Technologies – and within these two businesses there are five main Business Groups. The Networks Business in 2016 was conducted through its four business groups:

1) **Mobile Networks:** the primary market for Mobile Networks business group includes technologies for mobile access, converged core and microwave transport as well as related services.

2) **Fixed Networks Business Solutions:** The primary market for Fixed Network business group includes technologies for fixed access and related services in addition to fixed network transformation services with focus on transformation of legacy fixed switching networks.
3) **IP/Optical Networks Global Services:** The primary market for IP/Optical Networks business group includes routing and optical technologies and related services sold to Communication Service Providers (CSP). and
4) **Applications & Analytics:** The Applications & Analytics market is focused on software platforms and applications that help CSPs to optimize their operations, monetize services and improve customer experiences.

Nokia Technologies Business: develops advanced consumer and professional technology products in Digital Health and Digital Media, and licenses our industry-leading innovations as well as the Nokia brand for mobile devices.

3.3 Global Operations

In addition to these Business Units, the Global Operations (GOPS) unit is responsible for supply chain management for all hardware, software and OEM products. Global Operations is responsible for manufacturing (including make & buy), immaterial product supply, supply planning, direct sourcing & procurement and logistics as well as design for demand supply network and delivery capability creation in product programs. It is measured by for example by delivery performance (on-time-delivery, lead times), continuous product cost reduction, asset efficiency (e.g. inventories) as well as for quality and customer satisfaction. GOPS meets customer requirements of right quality, short order lead times and competitive cost; implements modular supply chain models; develops delivery capability and capacity flexibility; creates transparency in end-to-end inventory and in ordering.

3.4 Delivery Capability Management

In addition to these Business Units, Delivery Capability Management (DCM) unit is responsible for supply chain management for all hardware, software and OEM products. Operations is responsible for manufacturing (including make & buy), immaterial product supply, supply planning, direct sourcing & procurement and logistics as well as design for demand supply network and delivery capability creation in product programs. It is measured by for example by delivery performance (on-time-delivery, lead times), continuous product cost reduction, asset efficiency (e.g. inventories) as well as for quality and customer satisfaction. Operations meets customer requirements of right quality, short order lead times and competitive cost; implements modular supply chain models; develops delivery capability and capacity flexibility; creates transparency in end-to-end inventory and in ordering.

It is also worth mentioning, that DCMs manage several simultaneous DCC projects/releases at the same time - multiple product programs running in parallel in different Create Process phases, as shown below, leading globally distributed virtual teams in DCC task fulfilment.

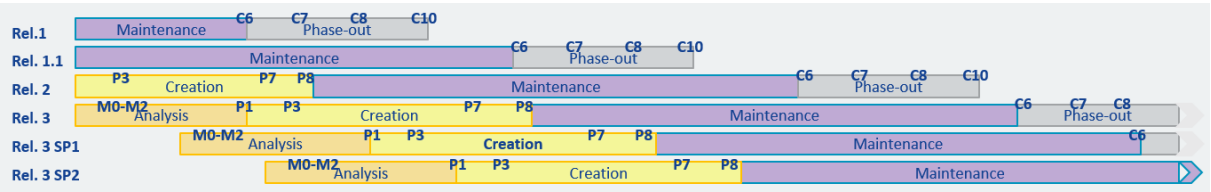

Figure 5. Release Planning

To summarize, the DCM's main responsibilities are to define, implement and develop logistical processes and systems: and so, establishing volume delivery capability as according to internal milestone criteria and program schedule. Also, the DCM acts as a GOPS representative bringing GOPS related input to the Product Program, for example influencing in supplier selection etc.

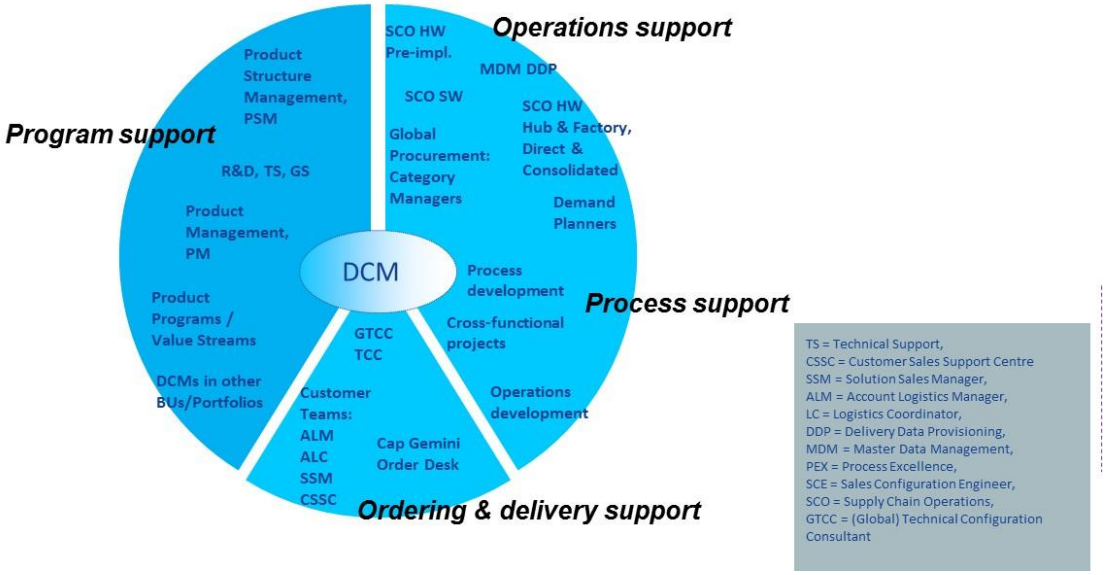

Figure 6. DCM Key Stakeholders

3.5 Delivery Capability (Creation) Process

Delivery Capability Management (DCM) is the main interface between Global Operations and the Business Units (BUs), driving Operational requirements in BU decision making bodies to influence product and business decisions. It contributes to the optimization of end-to-end cost, performance and quality.

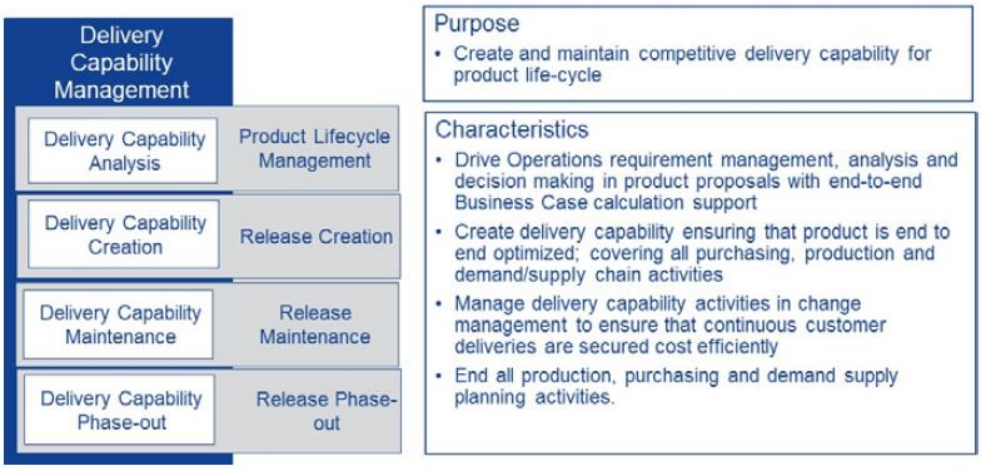

Figure 7. DCC Process Description: M0 – C10 Milestones

Delivery Capability Process (DCP) – also known as Delivery Capability Creation (DCC) - provides the guideline for Delivery Capability Management Process as part of overall Nokia Create Process (CP). Containing four sub-processes:

- Delivery Capability Analysis (M0-M2, C0-C1)
- Delivery Capability Creation (P0-P9)
- Delivery Capability Maintenance (P9-C6)
- Delivery Capability Phase Out (C6-C10)

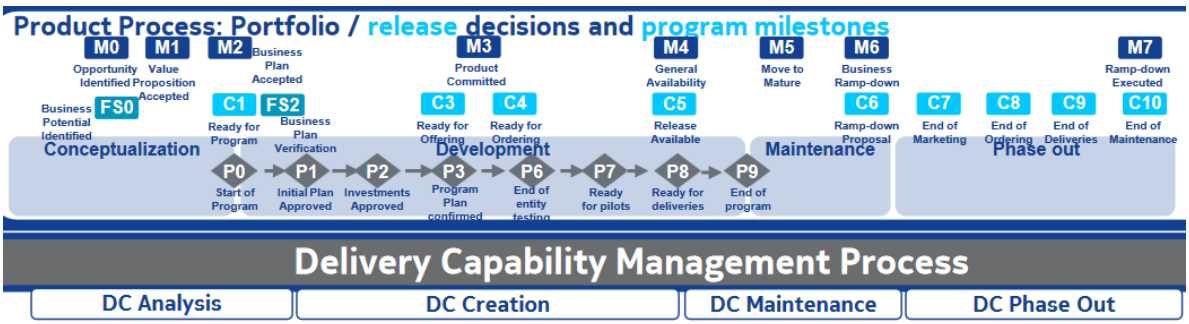

Figure 8. Product Process and Program Milestones

Some key milestones and actions from the DCC perspective are:

- **Pre-P3 - Feasibility Study phase:**
    - Analysis version of DCC document approved team head / steering
- **P1 - P3 – DCC plan is ready:**
    - DCC Document as a plan version is reviewed and approved by Program
    - SW delivery process is defined
    - OEM/3rd party suppliers and products (if any) are selected and contract status reviewed (GPR co-operation). Required actions are planned.
    - Purchasing and delivery processes are planned. Supplier Management Review @P3 review meeting is arranged.
    - SW asset protection mechanism is planned
- **C3 - Ready for Offering:**
    - Items and structures (build, release…) in place for offering (Y1)
    - IPC available for offering
- **C4 - Ready for Ordering:**
    - Sales data is setup in SAP P20 and Enovia for pilot deliveries (including SAP P20 status changes to Y3 or/and Y4)

- **P7 - Ready for Pilots**:
    - Nokia licenses and license keys orderable for pilots
    - P7 SW is uploaded to SWSt as E-delivery for pilots
    - Pre-implementation capability exists for pilots
    - Purchasing capability for supplier material exists for pilots
    - SMR Review @P7 arranged to close open topics from P3 meeting
    - Ordering Instructions available
- **P8/C5 - Ready for Volume deliveries:**
    - Nokia licenses and license keys available for volume deliveries
    - Pre-implementation capability exists for volume deliveries
    - P8 SW is uploaded to SWSt both as E-delivery and P-delivery
    - IPC configurator model is finalized and released for ordering
    - PDM structures and items are globally available for ordering and delivery
    - DCC document is up-to-date

The DCM organization manages delivery capability projects in product programs with full Operations mandate and accountability. Starting from early analysis phase, DCM drives implementation of DFx (Design for Excellence) requirements in product programs by efficient use of standard operations platforms. During the maintenance phase, DCM manages delivery capability for all active products in the BU's. DCM will drive product change management from an Operations point of view and, at the end of the product lifecycle, efficiently remove products with optimized assets and minimum scrap.

The Delivery Capability Creation sub-process covers all DCC activities that have to be done for creating delivery capability and the products during the Product Program is divided into four workflows:

- **Common**: general project management activities
- **Purchasing**: all purchasing process related activities and purchasing of material
- **Production**: all production process related activities (creation of production processes and production itself), prototypes for development and verification of delivery capabilities and repair capability creation for fieldback products. Digital provisioning and SW integration also included.
- **Demand Supply Chain:** demand supply planning, ordering, delivering and invoicing

To ensure operations alignment with the create process, Delivery Capability Management representatives participate to the programs. Working on behalf of Operations, Delivery Capability Management will make a strong contribution to BU Management Structures throughout the product life cycle (P0-P9), driving Design for Excellence (DFx) requirements analysis and decision making in product proposals with end-to-end Business Case calculation support.

4 NetAct Product

Text in this chapter has been removed due to confidentiality.

5 Case Study: Order Quality Initiative Project

Text in this chapter has been removed due to confidentiality.

6 Final Steps and Findings

Text in this chapter has been removed due to confidentiality.

7 Conclusion

It has been said that the main four elements for any successful business are: product, place, price and promotion. However as stated in chapter 2, the main business forces today are in the three Cs: Customers, Competition and Change. Competitive advantage can be reached with good quality logistics operations providing good customer service.

In general, it must be said that our environment is challenging from a logistics perpective as we are facing:

- a high number of suppliers with various different charisterictics,
- the products are fast-developing (agile) and constantly changing with shorter life-cycles,
- product structures and configurations are more-and-more complicated,
- operations are performed globally in several different time zones and
- the overall market environment is un-predictable.

As stated before, the overall e2e demand/supply chain is managed by several different departments, that are globally distributed and with independent purposes. As the main root cause for this issue is in discipline or behavior, we need to treat this as a change management exercise with upper management support: first this change needs to be **understood,** then this understanding needs to be converted into a **positive perception** and leading it into **implementation**, with the last stage is to get **ownership** in this change, so that the people most affected by the change believe, that this change is the only and right way in accomplishing the task.

The problem with change management is that very seldom is the company willing to invest in the time that is needed: change is a long process, that can take a lot of time (depending on the type of change) and which can be influenced by many things – even the smallest positive change takes time.

The time and effort needed for change can be illustrated in the following way:

What needs to be changed?	Change Method	Severity / effort needed
"Knowledge"	Studying, reading, education	Fair
"Skill"	Practice	Moderate
"Attitude"	Small group discussions	Large
"Values"	By living, experiencing, peer support	Significant

Target of change	Time required for change	Example of change
Individual skill	Weeks to months	Learning to drive a car
Individual opinion	a year	Transition stage in life: crisis, divorce
Group activities/work	a couple of years	Formation of a new group, team, unit
Organizational culture	several years	Company merger, fusion

To be committed to anything new, one must be able to process change and must be willing to give up on the past.

I cannot stress enough on how this exercise needs upper management support to succeed: central to TQM success is focus on continuous improvement that leads to higher quality and better customer support whether internal or external to the organization. It normally requires a cultural change, because most organization todays focus on activities rather than process improvement (Lambert et al. 1992). This brings us back to what Aristotle said about "quality being a habit". It is said that habits become behavior and behavior form culture. Therefore, quality is also related to the culture of the organization (Kaizen Institute India 2013).

Text in this paragraph has been removed due to confidentiality.

As Laura Jakobsson stated in her Master's thesis*: In the case of a big global organisation the long operative working processes are difficult to control, which leads to easily expanding problems with errors in the process. Therefore the impacts of errors are difficult to estimate. In addition, the organisation springs up self-reconstructive processes which make it even more challenging to explore the total impacts* (Jakobsson 2010).

Text in this paragraph has been removed due to confidentiality.

As Dr. W. Edwards Deming, has stated: *"If you cannot measure, you cannot improve".*

At the same time, I am pleased to notice that by showing the estimated (potential) annual cost saving, and the amount of money spent on order re-work, that this topic has been brought to the attention of a wider audience and has received the attention it deserves.

In a nutshell, minimizing the lead time and the optimization of an order / order process, thus having acceptable order correctness, is based on a process where the outcome is the level of operational quality the organization has been able to achieve in its different departments and used processes. Although the various functions have their independent purposes, the level of cooperation is a key factor affecting the performance.

The key words to the topic are “discipline” and “ownership”. If we see the output of the internal processes through the customer’s eyes the benefits of customer-driven focus and outside-in thinking can be expected. Improved lead time is concretely speaking speed but it is also a result of simplified ways of working. Continuous improvement efforts require teamwork and company-wide empowerment because in the end the maintenance of quality and prevention of the costs of bad quality is in everyone’s hands in the future (Jakobsson 2010).

As final word, I would also like to strongly recommend that the above topics are to be taken into consideration academically, with institutes like JAMK, providing accurate courses and education to logistics engineers supporting the future needs of businesses. The supply chain professionals of today must have, in addition to their technical and functional skills, strong knowledge in “soft” skills in areas like leadership, project management and change management.

Also, logistics is transforming from (physical) material deliveries of goods to immaterial deliveries of products, solution and services. The importance of the quality of data, data maintenance and data delivery is constantly increasing. Thus, the future needs of the logistics professional need to be updated as well to fulfill these needed requirements.

Abbreviations

BL	Business Line (organization)
BoM	Bill of Material
BU	Business Unit (organization)
CCR	Critical Customer Requirements
CEO	Chief Executive Officer (role)
CG	Capgemini (organization)
CLicS	Centralized Licensing System (tool)
CP	(Nokia) Create Process
CPU	Central Processing Unit
CRM	Customer Relationship Management
CSP	Communication Service Provider (organization) / Common Sales Platform (tool)
CT	Customer Team (organization)
CTC	Critical to Customer
CTP	Critical to Process
CTQ	Critical to Quality
DCC	Delivery Capability Creation (process)
DCD	Direct Customer Delivery Mode (process)
DCM	Delivery Capability Manager (role) / Delivery Capability Management (org.)
DCMP	Delivery Capability Management Process (process)
DDC	Digital Delivery Center (organization)
DEX	Digital Execution (organization)
DFx	Design for Excellence (process)
DMAIC	Define, Measure, Analyze, Improve & Control
DP	Delivery Process (process)
DPMO	Defects Per Million Opportunities
e2e	End-to-End
EOL	End-of-Life
ERP	Enterprise Resource Planning (tool)

F&C	Finance & Control (organization)
FMEA	Failures & Effects Analysis
GOPS	Global Operations (organization)
GPR	Global Procurement (organization)
GSM	Global System for Mobile Communications (technology)
HP	Hewlett Packard (company)
HW	Hardware
IC	Integration Center (organization)
IDS	Integrated OEM and Digital Supply (organization)
IPC	Internet Pricing Configurator Tool (tool)
IT	Information Technology
LC	Logistics Co-ordinator (role)
LK	License Key
LT	Lead-time
LTE	Long Term Evolution (technology)
LTU	License to Use
MEX	Material Execution (organization)
NOLS	NSN Online Service (tool)
NSN	Nokia Siemens Networks (organization)
O&M	Operation & Maintenance
OC	Order Correctness
OEM	Original Equipment Manufacturer
OPS	Operations (organization)
OS	Operating System
OSS	Operational Support System(s)
PCI	Product Configuration Item
PDM	Product Data Management
PL	Product Line (organization)
PLM	Product Lifecycle Management
PO	Purchase Order
PSM	Product Structure Management (organization)

R&D	Research & Development
ROCS	Ramp-up and Order Configuration Support (role)
RTP	Research, Technology and Platforms (organization)
SI	Sales Item
SIPOC	Supplier-Input-Process-Output-Customer
SO	Sales Order
SSM	Solution Sales Manager (role)
SW	Software
SWST	Software Supply Tool (tool)
TOCE	Technical Order Configuration Expert (role)
TQM	Total Quality Management
TS	Technical Service
USB	Universal Serial Bus
VOB	Voice of the Business
VOC	Voice of Customers

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Appendices

Appendices 1-3 have been removed due to confidentiality.