

Documentation Management System for R&D

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<p>The target organisation is a payment industry software company. It has developed its own software for transmitting the money transactions. This software is continuously developed mainly in Finland. Research and development department did not have a proper documentation system and also its internal processes were only vaguely described.</p> <p>The main object was to create a working documentation system inside the existing processes. Different research methods were compared and a case study method was selected with the qualitative approach to execute the research.</p> <p>The research was started by creating a research frame of reference. Different literature was explored, but there were not many high level documentation management theories to be found. Some literature was found to be more useful than the others. The frame of reference was not very strong but it was enough that the actual empirical work could be done.</p> <p>Many good quality process charts were created and after some analysis and investigations based on interviews, two important lacking documents were found. The gathering of the information needed to create those documents was added into existing process charts. The model for documentation on that part was created. The end documents are now easy to develop and distribute to different stakeholders. The results were satisfactory and the research successful.</p>	
<p>Keywords Document management, development, software, process</p>	

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<p>Kohdeorganisaatio on maksuliikennelalla toimiva ohjelmistoyritys. Se on kehittänyt oman ohjelmistonsa kuljettamaan rahaliikennettä ja maksutapahtumia. Tätä ohjelmistoa kehitetään jatkuvasti pääasiallisesti Suomessa. Kehitys- ja tutkimusosastolla ei ole käytökelpoista dokumentointijärjestelmää ja sen sisäiset prosessit on kuvattu vain ympäripyöreästi.</p> <p>Tutkimuksen päätarkoitus oli luoda toimiva dokumentinhallintajärjestelmä upotettuna olemassaolevien prosessien sisään. Erilaisia tutkimusmenetelmiä vertailtiin ja case-menetelmä kvalitatiivisella lähestymistavalla valittiin tutkimuksen tekemiseen.</p> <p>Tutkimus aloitettiin tekemällä kirjallisuuskatsaus olemassaolevaan tietoon. Useita lähteitä tutkittiin, mutta ylemmän tason teorioita dokumentinhallinnasta oli vaikea löytää. Jotkin tekstit olivat hyödyllisempiä kuin toiset. Viitekehuksesta ei tullut kovin vahva, mutta sitä oli tarpeeksi, jotta itse empirinen työ voitiin tehdä.</p> <p>Monia hyvälaatuisia prosessikuvauksia saatiin tehtyä, ja erinäisten haastatteluihin perustettujen analyysien ja tutkimusten jälkeen kaksi tärkeää puuttuvaa dokumenttia löytyi. Olemassaoleviin prosessikuvauksiin lisättiin puuttuviin dokumentteihin tarvittavien tietojen keräämiprosessi. Niiden osalta dokumentinhallintajärjestelmä saatiin luotua. Lopulliset puuttuvat dokumentit on sen perusteella helppo kehittää ja lähettää eri asianomistajille. Tulokset olivat tyydyttäviä ja tutkimus onnistunut.</p>	
Asiasanat Asiakirjanhallinta, documentti, kehitys, ohjelmisto, prosessi	

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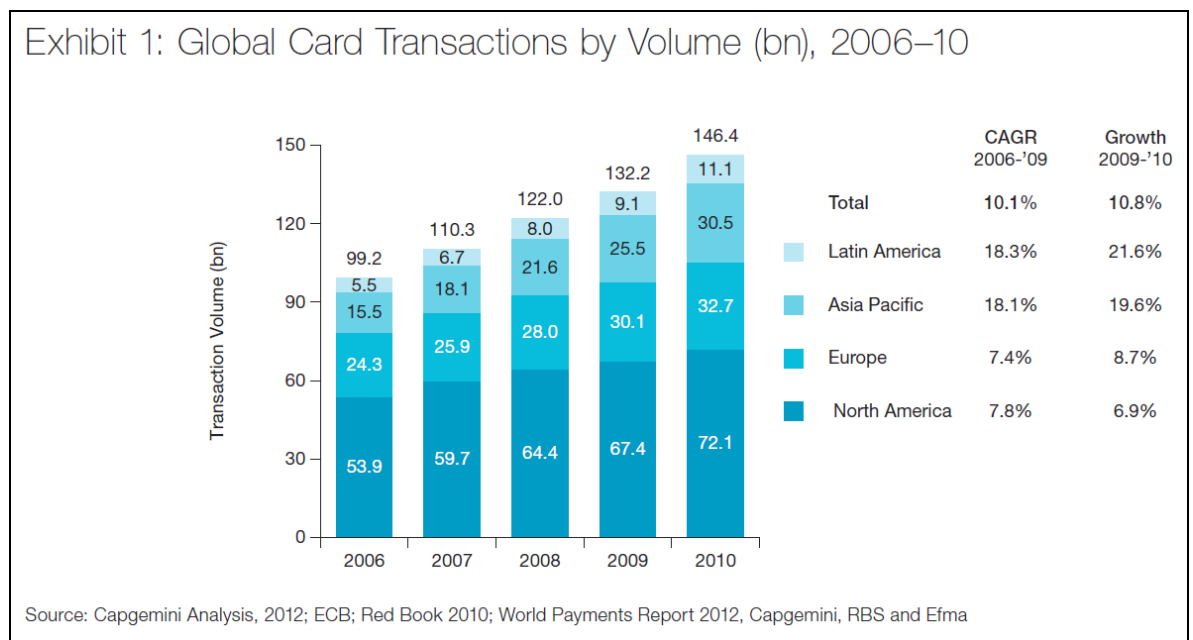
1 Introduction

1.1 Thesis background

The author of this thesis works for a company that is a market leader in payment industry in Nordics and Baltics. The target organisation delivers its clients not just the payment devices but also moves the actual payment transactions from the beginning of the purchase to the end, when the money is cleared to the merchant's bank account. The target organisation has created its own software and gateways to transmit the money.

1.1.1 Card payment industry

Card payment industry touches everybody's life in Western economies. According to Capgemini (2012), the rest of the world, Latin America and Asia in front, is catching up and maybe even overtaking soon in volumes as picture 1 shows.



Picture 1. Global card transactions by volume in 2006-2010. (Capgemini 2012.)

North America was still ahead in 2010 with its 72,1 billion¹ transactions per year. Europe's volume 32,7 billion transactions has already been defeated to Latin America's and Asia's combined figure of 41,6 billion transactions. When it comes to growth of these figures compared to previous years, both North America and Europe come far behind both Latin America and Asia Pasific regions. (Capgemini 2012.)

1.1.2 Target organisation

Point Group is a market leading payment service provider in Europe, which is present in 9 countries, has 800 employees and 250,000 customers. It is owned 100 % by US company Verifone Corporation, which is active in over 110 countries and has 4 800 employees worldwide. The whole group has systems installed in over 20 million locations globally. The group's systems handle 10 million transactions every single day.

Point Transaction Systems Oy (later as "Point") is a 130 employee subsidiary to both Point Group and Verifone Inc, located in Helsinki metropolitan area, Southern Finland. Point concentrates on transmitting card payments and provides card payments as a service to its customers. The monthly charge includes the rents of the payment terminals, verification/authentication service, transmitting of payment transactions, and also special tools for managing and reporting these transactions. This whole system is called Sales Connector.

Point has been given creditor's rights in Finland (which is supervised by Financial Supervisory Authority, FIVA) and it also has PCI DSS Certificate (issued by major credit card companies). These two require wide and adequate documentation. In addition, the whole Point Group software development is located in Finland and it also requires good documentation. As in many companies that have grown very fast, everybody creates and manages their own documents and there is no centralised management system or instructions available. The author of the thesis was hired to Point in summer of 2012 to take care of certain documentation. At that time Point R&D had no existing

¹ Billion in both American and British English nowadays mean a thousand million, i.e. 1.000.000.000 (Oxford University Press 2013).

system for documentation. The idea was to create a homogeneous documentation system, and to concentrate especially to technical documentation. Some of the development processes were vaguely described with some bullet points or some preliminary graphs.

In R&D department there is circa 35 programmers and it writes most of its own documentation and keeps it in the intranet. These documents are used throughout the company and also by the clients. Sales Connector is managed and monitored via certain self-made software, which is partly visible for the customers. This requires manuals, which has earlier been created by the author, but the current system doesn't help keeping the manuals up to date.

R&D has its own processes for development, but documentation is currently not part of those processes. This entirety creates a good basis for an MBA thesis, is useful for author's own work and is valuable for the company. The author's work and this thesis project are done simultaneously and they support each other.

1.2 Research problem, objectives and questions

The problem at Point is that there is no existing system for documentation. The processes are not clear and the responsible people are not assigned. Without a clear system of who creates or updates the documents, and when or to whom they are reported, nobody in R&D can work effectively. Point clients use some of the documents, so there has to be a system to confirm they have up-to-date guides. Also other stakeholders for R&D need proper and updated documentation.

Creating a system starting from notifying the development need, all the way to updating the user manual will serve not just customers but the whole R&D department, not to mention everybody in company personnel. In order to address the above problems, the project objectives have been identified as the following:

- Create process charts to describe the current processes
- Create process charts where documentation is added to existing processes
- To create a model to accurately inform the changes into the software

- To create a system how to ensure the automatic updating of existing guides
- To help and centralise the document management in the future.

As a result from all of the above, R&D is able to produce good quality documents to personnel, its clients and other stakeholders.

Project research questions concluded from the research problems and objectives are:

- What is included in good document management?
- What kind of model is needed to document changes well in R&D?
- How to implement that model into existing processes?
- How to manage the documents to meet their readers' requirements the best?

1.3 Limitations and evaluation

The thesis does not include a model for entire company, or even the whole of R&D, but the most acute needs. Project will be evaluated by interviewing the management and new document management model users. It is also assessed against the research problems and how well they were solved.

2 Research approach

Rapid changes in operational environment have brought new challenges to organisations and all development has gained a significant role. The companies need to predict these changes, estimate their implications and make strategic choices based on it. Innovativeness has become a significant competitive factor, and the importance of product and service users as a source of innovation will increase. (Ojasalo, Moilanen & Ritalahti 2009, 11.) All this requires companies to invest in research and develop strategies and processes – also inside the research and development department.

To be able to effectively stop reacting to markets and starting to offer whatever it will need next, means effective research. To maximise research is to know how to use its methods in a most appropriate way concerning the problem in hand. The most academic research method is not always the best way to approach a problem, sometimes

even just common sense is enough. The idea is to find the most convenient method, but before that the methods need to be compared.

According to Hirsjärvi, Remes and Sajavaara (1997, 120), in an upper level a research can be done by using two different approaches, academic or applied. Academic research is sometimes understood more theoretic than the applied research, which often aims to solve problems based on practice. The differences according to Hirsjärvi etc. (1997, 121) are shown in a table below (table 1).

Table 1. General features of practical problem solving and activity recommendation pursuing (applied) research (Hirsjärvi etc. 1997, 121)

According to Hirsjärvi etc. applied research method compared to academic research is (translated by TV):		
Solving problems	rather than	just collecting data
Estimating consequences	rather than	finding the reasons
Creating vast effects	rather than	measuring and testing relations between variables
Developing and testing programs, interventions and services	rather than	developing and testing theories
Done in the field	rather than	done in laboratory
Outside organisation	rather than	research institute
Tied strictly to schedule	rather than	takes as much time as needed
Tied strictly to budget	rather than	takes as much funds as needed
Less conformity between researches	rather than	lots of conformity between researches
Subject from the sponsor	rather than	subject from the researcher
Researchers often general science experts	rather than	researchers highly specialised experts
Combination of methods	rather than	single method
Directed to a customer	rather than	directed to science community
Usually a bit suspicious according to academic researchers	rather than	high academic respect.

2.1 Research purpose

Research always has a purpose or objective, which guides the methods and strategies used in the research. Hirsjärvi etc. points out (1997, 128) that the purpose and the research questions usually define the strategy as in the following table (table 2).

Table 2. Research objective and chosen strategy (Hirsjärvi etc. 1997, 128)

According to Hirsjärvi etc. the research objective and chosen strategy are connected like this (translated by TV):		
Purpose of research	Research questions	Strategy
1. SURVEY		
<ul style="list-style-type: none"> - To see what happens - To find new approaches and new appearances - To clarify less known phenomenon - To develop hypothesis 	What happens in this process? What are the main themes, models, classes? How the characteristics are in respect to each other?	Usually qualitative (but not necessarily) Field research Case study
2. INTERPRETIVE		
<ul style="list-style-type: none"> - To find an explanation to situation or problem, usually through causal relations (reason-result finding relations) - To identify probable reason-result chains 	What happenings, beliefs, attitudes and action have affected to this phenomenon? How these factors are in relation to each other?	Could be quantitative or qualitative Field research Historical methods
3. DESCRIPTIVE		
<ul style="list-style-type: none"> - To express precise descriptions about people, incidents or situations - To document pivotal and the most interesting features of a phenomenon 	What are the most visible behaviours, incidents, beliefs and processes that occur?	Could be quantitative or qualitative Field research Historical methods
4. PREDICTIVE		
<ul style="list-style-type: none"> - To predict incidents or people's actions that are a result of the phenomenon 	What is the result of the phenomenon? Who are influenced by the effect?	Experimental strategy

2.2 Research types

According to Ojasalo etc. (2009, 36–37) there are four types of approach to research: case study, action research, constructive research and producing and investigating innovations. Usually none of the approaching methods is meant to be used alone, but these methods are often best mixed.

2.2.1 Case study

The objective of a case study research method is to provide scrutinised data from a certain target. As a research method it is appropriate when the aim is to thoroughly understand an organisation and solve a specific problem or find development suggestions. Pure case study doesn't bring the change forward into action or develop anything concrete, but it helps to create new developing ideas or suggestions to solve a certain problem. The case study can concern a company, department, human resources, product or customer group, or system or process. It is typical for a case study that many different methods to gather information are used to form a deep and holistic picture. (Ojasalo etc. 2009, 37–38; Cohen, Manion & Morrison 2007, 84-86)

2.2.2 Action research

Action research as a method is usually used when the target is to produce scrutinised data and accomplish a concrete change. It is typical method when trying to change the operating of people or organisation. The main thing is to take the change into the action and assess its effects, which often requires long time. Crucial feature of the research is the active participation of the people in the organisation. (Ojasalo etc. 2009, 38.)

2.2.3 Constructive research

Constructive research aims to solve a practical problem by creating a new construction, which can be for example a product, data system, instruction or manual, method or design. The change is thus projecting to a concrete target, whereas in action research it was focused to people's actions. Both methods can use similar procedures. In both it is

also important to bind it earlier theories, which is a major difference between constructive research and consultation. (Ojasalo etc. 2009, 38.)

2.2.4 Producing and investigating innovations

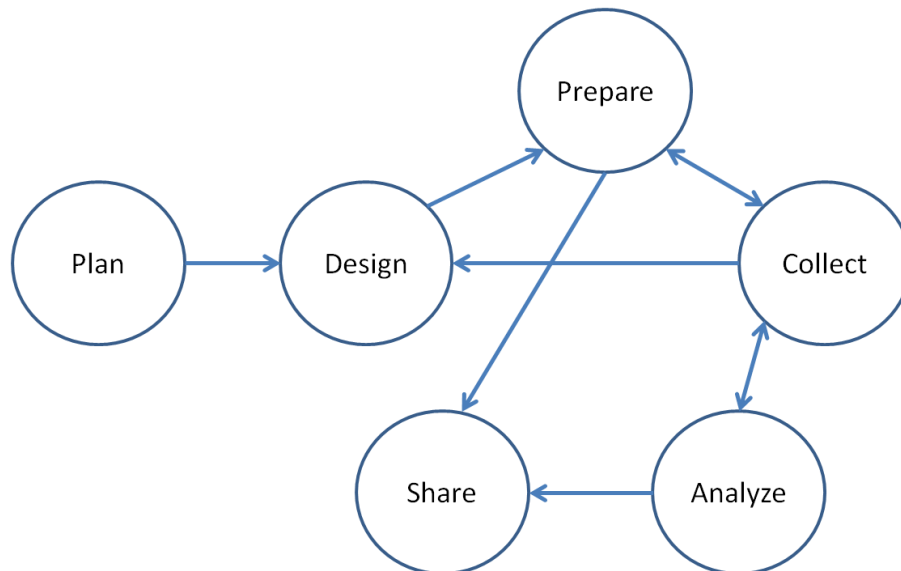
Producing and investigating innovations as a research method is very close to constructive research. These two are overlapping and the biggest difference is in how innovative the outcome is. In constructive research the output is not necessarily new at all. In innovation it is important to actually execute and commercialise the result. The idea or invention itself is not yet an innovation. (Ojasalo etc. 2009, 38.)

2.3 Selected methods

Case study has been selected as a research method in this thesis, with qualitative approach. Ojasalo etc. (2009, 52-62; 158-158-159) and Cohen etc. (2007, 84-86) describe case study to be the best when producing deep and detailed information about a particular case is needed, and when the objective is not just to describe the existing process, but to enhance it. According to them the qualitative approach is shown in used means, which include interviews, group questioning, process analysis and observations.

As mixed methods help to achieve complementary strengths and non-overlapping weaknesses (Punch 2007, 288-292), quantitative methods are not excluded from this research. They might be used if found useful when the study advances.

Robert K. Yin is, according to quick research through Google, one of the most cited experts when it comes to case study research. Yin's theory is simple enough; although linear, the process is also iterative, i.e. returning and improving any parts of a process can be done from any step. Yin (2009, 1) describes the process with 6 easy steps: planning, designing, preparing, collecting, analysing and sharing your research (picture 2).



Picture 2. Doing case study research: a linear but iterative process (Yin 2009, 1)

Planning has the targets for finding the research questions, justifying using of case study compared to other methods and learning what case study is good for (Yin 2009, 2-23). Designing phase's targets are defining the case to be studied, choosing the case study design and placing measures to maintain quality (Yin 2009, 24-65). Preparing phase is meant to polishing the skills in case study research and developing used protocol (Yin 2009, 66-97). Collecting has the targets for following the developed protocol, using several sources when finding the evidence and creating a database for case study (Yin 2009, 98-125). Analysing aims to rely on strategies, consider all different techniques to gather data and show pure data before interpreting it (Yin 2009, 126-163). Sharing phase has the targets for finding the audience for reporting the findings, preparing the reporting material, showing enough evidence for your findings and rewriting until reported well (Yin 2009, 164-191).

3 Research frame of reference

Research and development methodologies are well researched and many techniques are widely used in companies' R&D departments. However, many companies seem to lack of documenting all the important work that has been done. If the documentation exists, it often seems to be non-managed and not to be found for those who need it.

3.1 Document and technical writing

What is a document? Definitions for the document are many:

- A piece of paper with writing or drawing on it
- An electronic file formed with Word, Excel or PowerPoint
- A file containing the best song you have ever heard
- Poetically "A guardian of man's thoughts", as Leonardo Da Vinci defined (Robitaille 2005, ix)
- "Any concrete or symbolic indication, preserved or recorded, for reconstructing or for proving a phenomenon, whether physical or mental", as Suzanne Briet, an early documentalist, also known as *Madam Documentation* defined in 1951 (Wikipedia 2013)
- "Information and its supporting medium", as *ISO 9000:2000 Quality management systems – Fundamentals and vocabulary* defines (Robitaille 2005, 1).

All of these define a document, but the documents that are relevant to this thesis are the ones used in an organisation. They include the know-how about how the business runs. No matter what the organisation's nature or size is, the documents are vital tools for its trade.

Anne Eisenberg is a professor at New York Polytechnic University in Brooklyn (Eisenberg 1992, iii). According to her (Eisenberg 1992, 4) the following four basics are vital to any technical writing process:

- strategy
- organisation
- audience

- objective.

As different people read different sections of documents, the contents of the document need to be well indexed. The table of contents will be the most read part of any document as it shows the reader the parts he needs. Only few people ever read a document fully, so the document should be made appealing to audiences that read selectively. To use the widely read sections to maximum advantage, the title and summary should be written for the widest audience; the sentences should be short and direct (and any abbreviations defined); the message should be clear (the farther the people are from the task, the less likely they are to be able to read between the lines); and the findings could be repeated at least in the summary before the actual report and in the conclusion. This is the strategy part. (Eisenberg 1992, 3-5.)

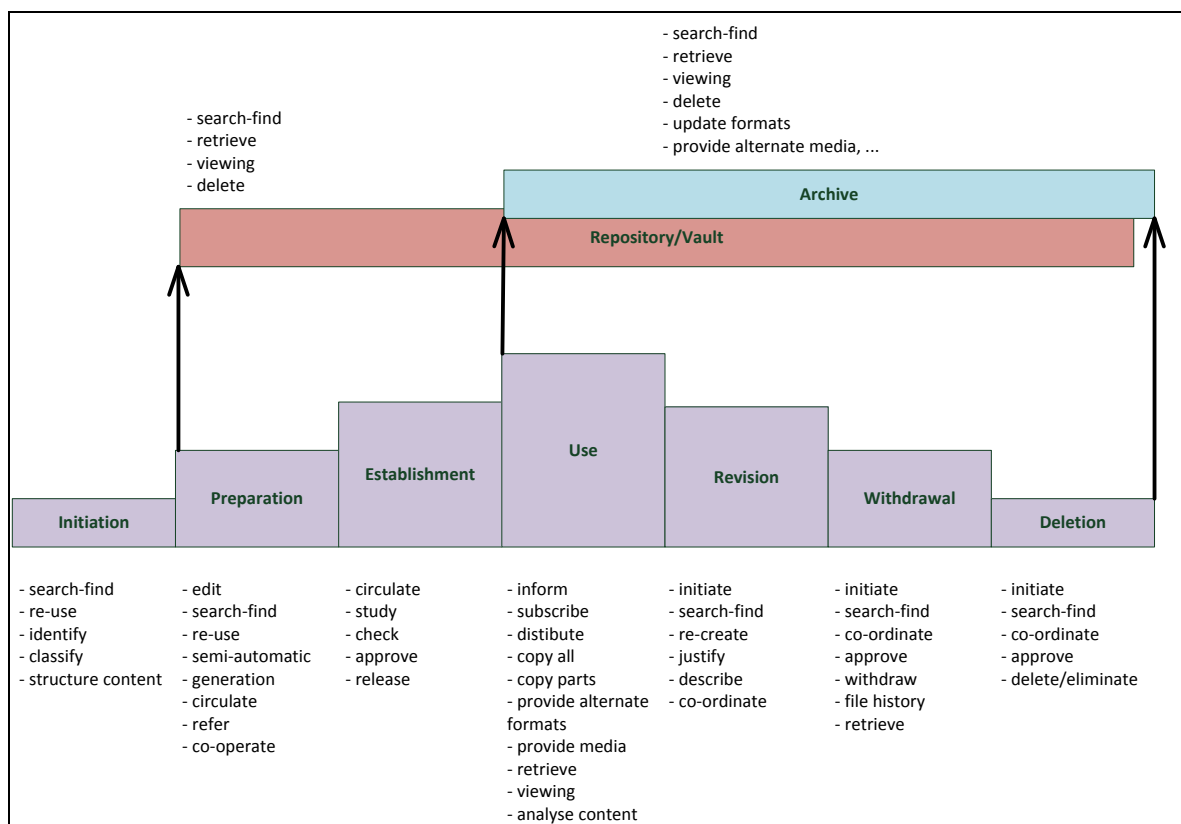
The organisation of the document includes the summarisation before the details, says Eisenberg (1992, 5-9). It also makes reading easier to introduce the details in a pattern; dividing them in logical categories and concluding them, and then giving the reader a suggestion of what to do with the information. One of the basics is audience analysis, as this guides the writing. One cannot write the same way to unskilled readers and professionals of the subject. It is also useful to think about the primary and secondary readers. Though the document's primary reader might be the funder of the project, the secondary readers might be other professionals, so the report should answer both parties' interests. The last basic is the objective of the writing, the purpose why this particular document is created. The objective is usually about the writing task (proposal, report, instructions etc.), personal objective (what is wanted to tell about the personality of the writer or his political position after the reading) or technical objective (usually the topic of the document or the subject you are evaluating).

3.2 Document life cycle

The International Organization for Standardization (ISO) is an international organisation which provides different standards. These standards ensure that products and services are safe, reliable and of good quality. Standard EN 82045-1:2001 defines principles and methods for good document management.

According to European document management standard (European Standard 2001, 17-27) the life cycle of a document can be divided to the following phases:

- Initiation
- Preparation
- Establishment
- Use
- Revision
- Withdrawal
- Deletion.

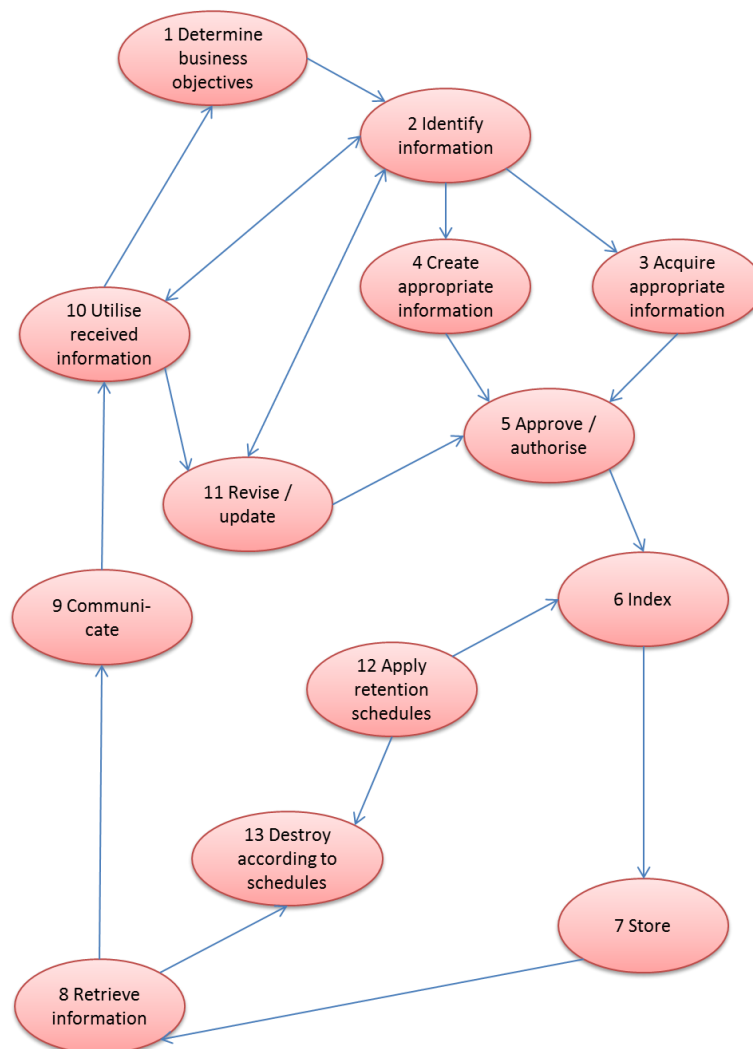


Picture 3. Lifecycle of a document. (European Standard 2001, 17.)

In initiation phase in picture 3 the document is given identification that separates it from all other documents. Also classification is given on this stage. The next phase, preparation, the content is developed and the document reviewed by the appropriate parties. The establishment phase gives time to circulate the document and do the possible corrections, and ends for approving the document into use for the intended purpose. After the document is been used for an agreed time, it's time to revise it. The

revision phase iterates the document back to establishment phase and then to use phase accordingly. When the document seems to be of no use anymore, it will move to withdrawal phase, when it is no longer active, but will remain in archive. This needs to, of course, be approved first. When there is no point to keep it in archive anymore, it will move to deletion phase and be deleted after approval of the action.

Bob Wiggins is a long term information management professional at British Gas, British Petroleum and his own consultancy company for 20 years (Ashgate 2014). Planning and developing of an information management system need to consider all stages of information lifecycle, says Wiggins (Wiggins 2000, 34). This lifecycle can be seen in picture 4.



Picture 4. The information lifecycle (Wiggins 2000, 35.)

Business objectives need to be defined (1), as all information systems need to be based on helping to achieve specified and agreed objectives. When the objectives are known, the information of which is needed to achieve them, is identified (2). After this the sources for information must be found; it could be other people's knowledge that needs to be written down (4) or already recorded information (3). When this information is created, it will need approval (5) before it is processed further. After approval indexing and referencing need to be added to a document (6) and then it needs to be stored (7), these both help with finding the information easily. As the information can now be anywhere and in any form, retrieving the information need to be abled (8), this is particularly important with the information in external sources. Information is no use if it is not communicated to people who can use it (9). This is for example too much jargon or wrong language that needs clarification or translation. Utilising the information (10) is the key factor to its existence, it means using the information to solve problems. Revising a document and then maybe updating it (11) is needed to everything to keep the information accurate. Often also the audit trail is required, so the version control should also be in place. All good information management need retention schedules and security classifications (12) to ensure that the information is available when needed and those, but only those, who need it. When the information has become obsolete, it needs to be destroyed safely (13). The above described system also need monitoring and a life cycle control, as well as organising and applying the possible standards. (Wiggins 2000, 34-38.)

3.3 Document strategy

Kevin Craine is the manager of document services for Regence BlueCross BlueShield of Oregon and Regence BlueShield in Washington, and has worked in information processing for over 20 years (Amazon 2014). In his book Craine (2000, 1-3) starts describing the documentation far from history. 40 000 years ago the primitive human tribes wanted to remember the movements of bison for next year. They documented those locations and timings drawing them in the cavern walls. This information, like information today, did not feed the families. Document always contain information only valuable when it is used. Hypertext or hieroglyphs, the basic function has always been the same: converting information into action. This also works in documents in-

side an organisation, where the main issue is: do workers get the right information when they need it and then act accordingly?

According to Craine (2000, 12), to make documents really work for company, a document strategy is needed. Every company's three basic elements are:

- Increasing revenue
- Decreasing costs
- Increasing customer satisfaction.

If a document going to external customers is confusing or incorrect, what is the outcome? Maybe the customer pays the invoice only partially or not at all (decreasing revenue), or needs clarification and calls to the company (increasing costs), or become frustrated and annoyed (decreasing satisfaction). Accurate and effective documentation is a vital tool for reaching any organisation's objectives. The same happens when looking at company internal processes. The main elements to that are:

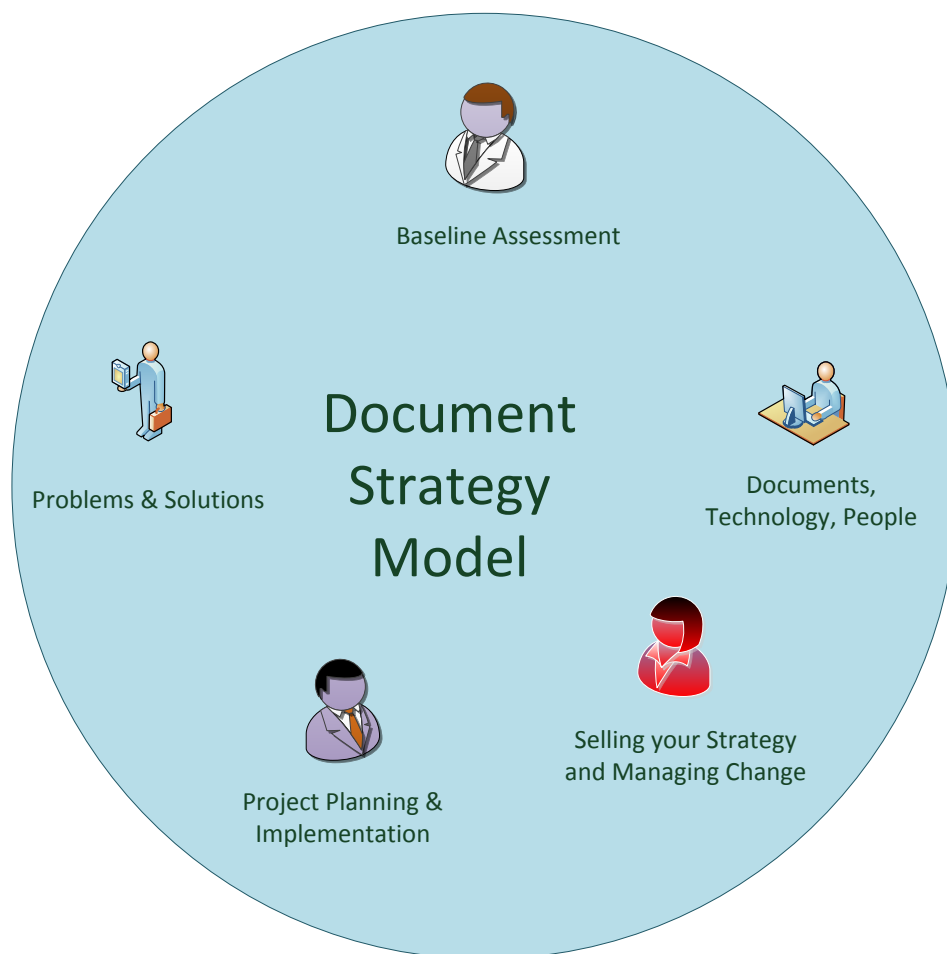
- Decreasing effort
- Increasing productivity
- Reducing labour (i.e. headcount). (Craine 2000, 13.)

In case of misleading, inaccurate or obsolete documents (or lack of documentation), what happens to the internal processes? Workers will make mistakes, waste time for looking for information and need advice from co-workers (increasing effort), or re-working their tasks (decrease productivity), and eventually more people will be needed to keep the business running (increasing headcount). Most of the company's strategies are often focused on processing data. That means more focusing on technology than on communication. Therefore the document strategy should be more about how to achieve the objectives the firm. (Craine 2000, 13-14.)

Craine (2000, 15-17) points out that when starting to create a document strategy, one needs to build a document strategy model. The characteristics of this creation process are the following:

- Comprehensive, yet manageable: the strategy need to be thorough enough not to leave anything important out, but at the same time manageable enough to be easily followed.
- Linked to company goals: if the strategy does not help with the goals mentioned in the previous paragraph, is it useful?
- Clearly demonstrated measurements: measuring and demonstrating improvement is critical for a successful strategy.
- Addresses corporate culture: the strategy needs to be supported by others in the organisation, so it needs to reflect your company’s culture.
- Facilitates implementation and evaluates results: even the best strategies are of little value, if executed non-effectively. It needs to trigger specific actions and then be measured to see its true value.

Craine (2000, 17-21) forms the document strategy model as one approach that helps to create a document strategy for the company (see picture 5).



Picture 5. Document strategy model (Craine 2000, 21.)

Craine's model (Craine 2000, 17-21) is not intended to be linear, but all different parts often overlap each other. It is at its best when retailed to one's own situation, organisation or requirement, and it is only meant to help to provide focus, avoid pitfalls and save time and energy. The document Strategy Model consists of the following parts:

- **Baseline Assessment.** Define where you are and where you need to go. This should give you a baseline about the purpose and direction of your organisation, different needs, pressures and constraints you manage, and finally the hard numbers that can measure how well you succeed in all this.
- **Documents, Technology and People.** Which documents are most vital for your organisation? What technology is used to create them? Who are the people who use and maintain these documents?
- **Problems and Solutions.** The document strategy should provide solutions to the problems in your current processes. This means you must first define the problems that exist, and then think about solutions to fix them.
- **Selling your Strategy and Managing Change.** Your efforts with the new strategy are not likely to be successful without support from your co-workers and decision-makers. Speak their language and create a solid business case to make it easier for them to buy your ideas. Also managing the change in processes that come along with your new ideas is much easier to handle when all key people have already bought those ideas.
- **Project Planning and Implementation.** You need to combine your assessments, analysis and planning together and create a clear project plan who everybody can understand, and then implement it accordingly. Don't be afraid to challenge your assumptions, test your solutions and demonstrate how well you did!

3.3.1 Baseline Assessment

Craine (2000, 22-31) advises to start assessing the baseline with three steps: understanding which key business needs, pressures and constraints you need to satisfy and manage, examining the objectives and strategies that define your company business,

and assimilating your organisation's mission and vision. Understanding the needs can be done by

- hard numbers (operating budgets, administrative costs, desired customer satisfaction etc; find statistics that measure corporate performance)
- competitive pressures (what are your strengths and weaknesses compared to those of your competitors, both internal and external)
- operational pressures (how well your organisation face the pressures of conducting everyday business, and how well it performs against the average of all other corporate organisations)
- constraints, requirements and expectations (most firms must deal with laws and regulations from authorities, not to mention other mandatory or otherwise required rules, both domestic and international).

Examining the objectives and strategies helps you to determine your direction when creating your own document strategy. Document strategy has to be in line with them and help achieve them. Assimilating your organisation's mission and vision are in the same position; they help you to understand how those could benefit from your own documentation strategy. When you have examined all these things you should be ready to define the position of your future strategy. Where it sits in the organisation and how big area it will cover. (Craine 2000, 31-39.)

3.3.2 Documents, Technology and People

Craine (2000, 40-63) points out that the next step is to understand what documents are important, how they are produced and who cares about how they perform. Identify the vital few documents in your organisation, decide what technologies and processes are used to produce and store them, who are the people who create or maintain them (and on the other hand, need them). You can then do the same with less important documents, if needed. In this stage it is good to think about the document lifecycle as well.

3.3.3 Problems and Solutions

When you have defined your documentation resources, starting point and destination, it's time to find out how to get there. According to Craine (2000, 64-98), problems need to be found and solved. It can be done through the following four steps:

- creating a flow chart (which shows the document's way from the beginning to end)
- evaluating the document process
- defining problems and their causes
- selecting solutions and planning actions accordingly.

3.3.4 Selling your Strategy and Managing Change

According to Craine (2000, 99-137) selling your strategy could easily be the most difficult task to face, but without support and resources no plan can survive far. At this point you should already have all the key ingredients to convince the management. The idea is to show how the whole organisation can benefit from your plans in terms of measurable results. Remember to avoid any professional jargon and speak the language that your audience understands. They might not be as enthusiastic about the technical details as you are. And when you finally get your plans approved, it's time to put it into action and manage the change. Inspire others, remember the corporate culture and prepare for the resistance, and this phase should go easier.

3.3.5 Project Planning and Implementation

Craine (2000, 138-157) points out that no strategy will be successful without an effective execution. Plan your change carefully and make it a project. That helps everyone involved to understand who is doing what and when, you to monitor your project and everyone to keep track.

3.4 Document management

When you have a good idea of how something should be done, you put it into a document. Without a document the idea is not:

- Approved
- Defined
- Agreed to be used by anybody else
- Updated and reviewed against its dependencies to other ideas (Robitaille 2005, 5).

According to Robitaille (2005, 14-18) quality procedures are the ones easy to use when conducting a document management model. They are conventional and everybody has become familiar with them. This has some advantages of consistence and thoroughness. The other easy way to conduct a document management model is to use work instructions. Sometimes they are all that is needed. On the other hand, strategic plans are the basis of everything, as they define the organisation's goals. Also document management model should be created with different strategies as a framework.

Denise Robitaille (2005, 25-31) reminds that the documentation system is the responsibility of many people. In big organisations there could be several persons to do the same task, on the other hand a small company might have only one person to take care of several tasks. She describes the tasks (or roles) of the document management like this:

- Owner: a document needs an owner, somebody who is responsible of the document's existence.
- Author: this task is responsible for writing the document.
- Coordinator: a coordinator usually manages the documentation infrastructure and creates the necessary interface between other roles and the process owners.
- Custodian/Librarian: this role is responsible for taking care of storing and preserving the document.

- Reviser/Editor/Reviewer/Approver: when the document has been created, it will need some changes within its lifetime. This role will be responsible for the changes, updates and revisions.
- User: somebody who uses the document; could be internal or external.
- Outsourcing: responsible for all documents that are developed outside the company. These should be treated within the same standards as the ones developed inside the company.
- Communicator/Distributor/Trainer/Facilitator: basically anybody who knows there's something wrong with the document. This role needs to understand that its responsibility is to communicate its findings to some other role.

Robitaille (2005, 45-56) points out that one document always have several stakeholders with varying degrees of responsibility. To consider a document as controlled or managed, it usually needs to meet the following criteria:

- Its version status must be known
- Its approval must be apparent
- It must be protected against destruction, damage, unauthorised revision and unintended use
- Its life cycle is defined and obsolete documents maintained
- Its access is restricted to people who actually need it
- It has a review and approval process in place.

Sylvia Feldman is a corporate writer at Optical Image Technology and she has written several articles about document management. Sylvia points out (Docfinity 2014) that as unique as everybody's business processes are, there are some standards that are universal when it comes to document management:

- 1. Digitize the documents—ideally at the point of entry.** Making all documents available electronically is a big step towards better document management.
- 2. Categorize the documents.** Finding the documents when you need them is a challenge. When it comes to bigger systems, a categorization strategy is crucial to effective retrieval. Though it sounds simple, there's an underlying complexity. It is important to have a good understanding of the business processes so categorising can

be done effectively, identify all types of documents that run the business processes, take into consideration all departments that use the information in the documents and define the criteria that people use to retrieve documents. And if a document type is needed that was not accounted for, a good strategy for processing exceptions is needed.

3. Ensure security. In a business environment most of the content that drives the business processes is irreplaceable. Security is a necessity. It pays off to look for a system that lets to apply permissions to designated groups of users according to department, role, or job function. It also should have the ability to limit access of individual files to specific users and limit who is able to view, edit, and delete documents. Audit logs should enable to spot evidence of tampering by unauthorized personnel.

4. Automate retention/disposition strategies. Documents have a life span. It's imperative that they are not destroyed when they can still be used, nor should they be kept after they have no use anymore.

5. Implement a disaster recovery plan. An electronic document management system won't protect your physical assets in the event of flood, fire, or other natural disaster, but it can enable business continuity under the worst of circumstances.

3.5 Summary of theoretical review

It looks like a lot of books has been written about how to manage data when using some software system, but trying to find a pure theory about document management turned out to be more challenging. Lots of different vendors have their own theories, but educational material about the matter is very hard to find. Proper studies about the subject were not to be found. Though the theoretical review stayed very thin, the subject of a documentation strategy from Crane was useful.

4 Empirical case study

Point R&D has not really had a proper documentation strategy or processes before. The main goal in this empirical phase is to create a model of documentation added into R&D processes. The lack of some of the documentation causes problems to both R&D and other stakeholders. Some documents are in place, but they are outdated and that also causes problems.

4.1 Document strategy for Point R&D

As told in the previous chapter, Kevin Craine (2000, 1-166) has developed a document strategy model. This model was used to create a document strategy for Point R&D department. As the Point doesn't have written strategies, it was hard to draw from company strategy and it is not therefore the best possible, but at least it can be used as a baseline before other strategies are created.

Verifone's strategy for its business is "To connect our terminals and solutions into our secure, payment-as-a-service platform capable of hosting Verifone and 3rd party developed commerce enablement applications". This was used as a guideline for Point R&D documentation strategy.

The documentation strategy for Point R&D was created by using Crane's model:

- **Baseline assessment.** After the discussions with Point R&D's Development Manager Jari Forstadius (15.10.2014), QA Manager Henri Huhtamäki (16.10.2014) and the Director of Services for Nordics and Baltics Svein Ove Karstensen (30.10.2014) it became obvious that the lack of some documentation doesn't make R&D look very professional. It is also slowing down other stakeholders' work, as the information about changes in the Sales Connector software never reaches all the right people that need it. Point is in a lucky situation being a market leader in Nordics and Baltics, and there is not much competition yet, but if it wants to expand to other countries, good documentation will be needed without a doubt. Point's clients are its main source of success and a lack of communication (e.g. outdated manuals) will cost it real money. The

guides are also used by Point Key Account Managers and Customer Service, so also internally the pressure was on. All mandatory documentation, like the regulated PCI DSS and Financial Supervisory Authority documents are up-to-date and complete and decided to be dropped from any strategies, as they are more on Security Department's responsibility.

- **Documents, technology and people.** As many people in the company thought they couldn't do their job properly without adequate documentation, the most vital documents were identified to be
 - Release notes
 - Guide for *Sales Connector* Client (used by the clients)
 - Guide for *TCS Management* (used by Point personnel to manage the companies and terminals)
 - Guide for *eCommerce Management* (used by Point personnel to manage eCommerce companies).

Changes into all these above mentioned software should be reported in release notes, and all the software guides are used every day, which makes it important to keep them up-to-date all times.

- **Problems and solutions.** As the R&D processes will be described during this thesis project, it would be handy to add the documentation in appropriate places in the process. The changed processes can then be explained to the developers and testers as it is likely to cause some changes to their working methods and work routines.
- **Selling your strategy and managing change.** This phase in planning the strategy was the easiest one to do, as the whole documentation idea came from the company management and they were giving their total support. Managing the change among the developers and testers might prove to be more difficult task, but on the other hand they are used to work in agile environment and that everything changes all the time. And as they use the documentation as well, they surely will see the benefits.
- **Project planning and implementation.** Project plan stays short, as this project is a one woman show (with backup and support from all technical management).

In the end the outcome of document strategy wanted to keep in the highest possible level at this point. The project of developing a proper documentation strategy for R&D decided to leave for later, when Point's integration into Verifone and its own internal systems will be implemented in year 2015. So the short version of overall documentation strategy for R&D is this:

To deliver high quality, accurate and up-to-date documentation for payment-as-a-service software known as Sales Connector.

4.2 GAP analyses of Sales Connector

Verifone, who owns Point, has selected Sales Connector as one of their main products on the Payment as a Service (PaaS) concept. Sales Connector has been developed at Point Finland and therefore the majority of the development happens in Finland. Finnish R&D has a growing role in Verifone Corporation and is changing fast. The documentation side has never been consistent, as the case is in most companies that have started small and then been growing fast. During the thesis process the author found out that Verifone has ordered a third party report about gaps in Sales Connector. Documentation has its own part in the report and it was utilised during the process.

The GAP report (HCL Technologies 2014, 31) states the following:

- Whenever there is a new release for Sales Connector, the release notes from the development team are either cryptic or non-existent.
- The user manuals and help documents are not updated based on the new release and/or the documents are not readily available to the support teams. This creates a lot of problems for the support analysts. Since the release notes / documentation are not created / updated, the support analysts will not be in a position to identify, if an issue is due the release. They will not know the new features or components affected by the release
- The analysts will have to do a complete research on the release or reach out to the development team which leads to loss of precious time, which could have been used to resolve the issue.

Based on the gaps above the GAP report gives a recommendation of what can be done to close these gaps (HCL Technologies 2014, 33):

- **Release Notes:**
 - Release notes should be delivered for the development teams.
 - Release notes should be detailed enough to cover both functional features and technical details.
 - The project should create templates for the release notes so that they are consistent every single time. The template should be discussed and agreed upon with stakeholders like 1st or 2nd level support.
- **Help / User Manuals:**
 - User manual and supporting documentation should be updated with every release by the project team.
 - The latest documentation should be shared with the stakeholders and should be readily available for them.
 - The project team should update the documentation based on the feedback received.

The GAP report also stated (HCL Technologies 2014, 26) that requisite technical documents like design document (higher and lower level design documents) and release notes should be created. These artifacts help to bring the new developers in the team to speed and all the developers to carry out effective impact analysis in case of changes to the existing components. The documents should be stored in a central repository for the entire team to access.

4.3 Focusing to the most urgently needed documents

When reading the whole GAP analysis report and following the interviews with R&D's Development Manager (Forstadius, 15.10.2014), QA Manager (Huhtamäki, 16.10.2014) and the Director of Services for Nordics and Baltics (Karstensen, 30.10.2014) it became clear that the most crucial thing is to get a fast solution for two major problems: release notes documentation and updating the changes into software user manuals. All other documents are not that important and most of them are maintained in an acceptable manner already. It was decided to concentrate on these two

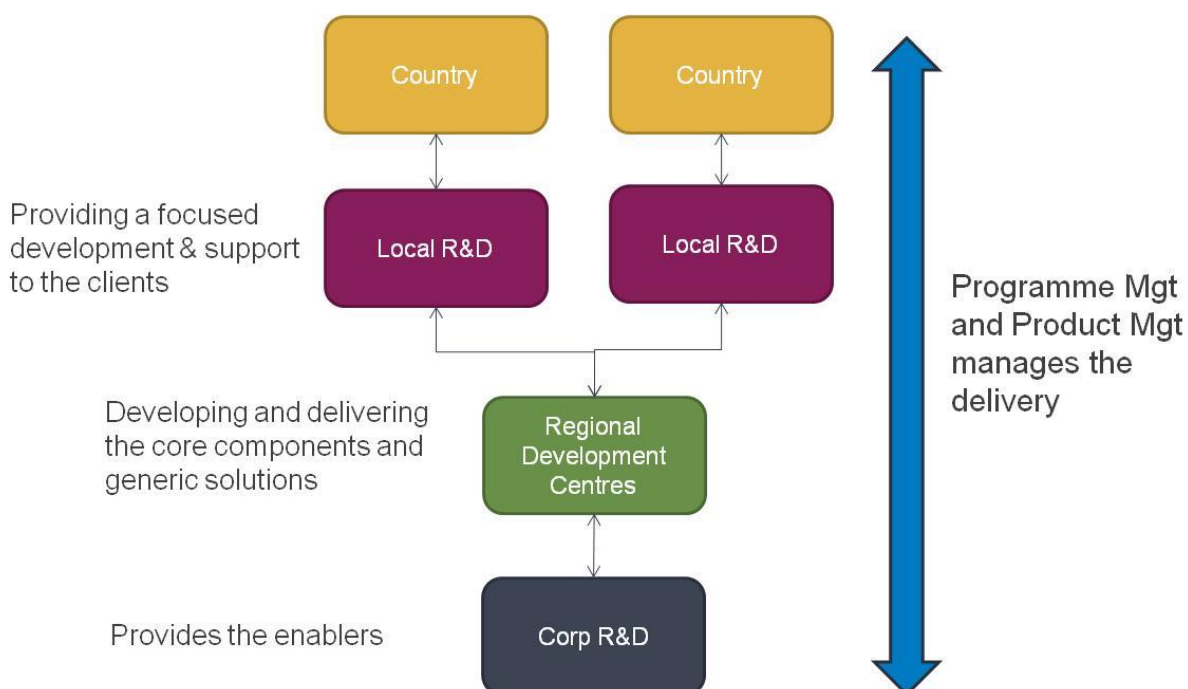
projects. If the release notes are good and contain enough information, it might be a good idea to send them to everybody at Point Finland and to selected parties in Nordics and Baltics. They will forward the report to other countries if needed.

4.4 Current Point R&D processes

In order to add any documentation management into Point R&D processes, they need to be defined first. The processes are in place, but the documentation of them was not too explaining. The work was started by creating or enhancing the pictures of the current processes. **Please note that some of the process charts are shown only in appendices and cleared confidential.**

4.4.1 Point R&D organisation and scrum method

Point R&D is mainly located in Finland. All the developers are divided into groups (Core Team, Finnish Team, Swedish Team etc.), but some of the team members might sit in a different country. The latest organisation is described in the picture 6.

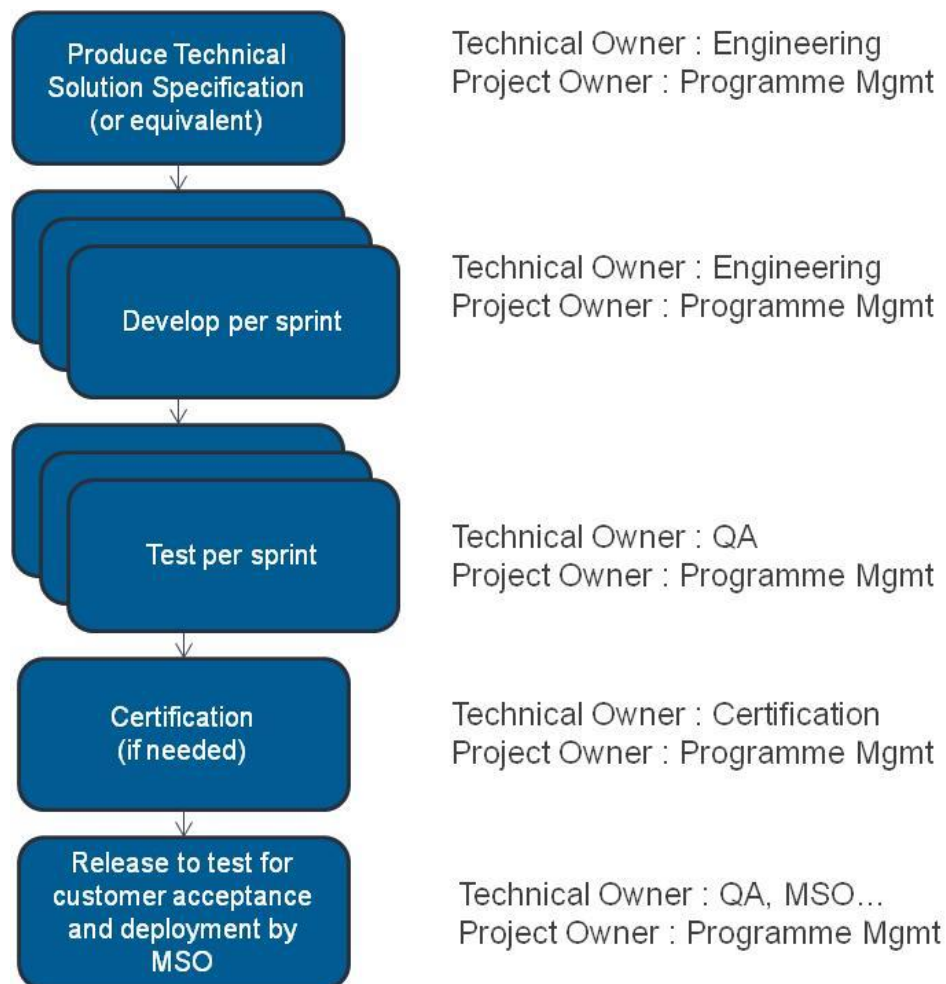


Picture 6. Point R&D organisation (Karstensen, 30.10.2014.)

Verifone corporate R&D provides the enablers to the regional development centres. Those centres work with the core components and generic solutions. Point R&D is a

regional centre and it has its own core team to develop and deliver these solutions generally. In Finland there are also developers that are devoted to country teams, which provide focused development and support to the clients. The picture's purple box "local R&D" contains developers and testers partly in Finland and partly in that particular country. The teams are therefore cross border teams. For example the team that concentrates only for Norway can have developers sitting in Finland, Norway and Latvia. The whole process is managed by programme and product management.

Scrum and sprint methods are used. They are explained in the next chapter. In picture 7 is explained the high level method of the development system at Point R&D.



Picture 7. Point R&D high level method with Scrum (Karstensen, 30.10.2014.)

Throughout the the whole process the Project Owner is programme management, but the technical owner varies according to the stage of the process. First the technical specifications for a new or developed feature are produced. Then the feature is devel-

oped in a sprint, and after that tested in a sprint. If it needs a certification, it will be added and then a release candidate of the software including all developed features will be sent to Quality Assurance for acceptance testing.

4.4.2 Point R&D development process

Point R&D uses Scrum method in its development and testing. Scrum is a project management reference frame or context commonly used in agile development. In Scrum one or more Scrum Teams are used. In a Scrum Team there is always a Product Owner, Development Team and Scrum Master. The core of Scrum method is Sprint, up to a month long period that delivers a release version of software. Sprints always have the same length and a new sprint starts immediately when the current one ends. (Wikipedia 2014.)

Point R&D development process is explained in appendix 1 (Karstensen, 30.10.2014). Only the green boxes are part of actual R&D department, but also the processes before and after are needed to fully understand the whole process. As the picture shows, a preparative process starts sometimes several weeks before development and is usually on-going, so it has no starting or ending point. The development process (the sprint itself) is always four weeks including the development and testing. The deployment process happens in the following four weeks after the sprint.

Process before development (blue boxes that are in product mangament's responsibility):

- New functionality, improvements and maintenance needs (features) are defined and the specifications for them are defined
- All features are collected to Jira (issue tracking software used at Point)
- Features are grouped into stories, which are bigger entireties including similar features
- Stories are prioritised per country. If a particular story is rejected, it will go back to back log list to be developed later
- When the prioritised stories are approved, the process moves to development.

Actual development process (green boxes that are in developer's responsibility):

- The stories are reviewed by Scrum Masters, security responsables, architect, development, Quality Assurance people and the Gateway IT people
- A list of priorities are reorganised if needed, otherwise the sprint planning can start
- Available resources and capacity is assigned to all teams
- The committed stories are divided to the correct Scrum Teams according to which countries they are needed for (or Core Team in case of general changes)
- The actual coding and minor testing is done
- New release branches are released. They are smaller entities (just some stories together), not the whole new version of software
- All branches go through integration testing
- The finished brances are combined together to a release candidate, which is then tested as a whole in Quality Assurance. This phase is iterative, so the coding is done until QA Team is happy for the final release candidate
- PCI code review is done to the final release candidate
- Test report is created for CAB (Change Advisory Board) meeting.

Process after development (red boxes that are in gateway IT's responsibility):

- When CAB meeting has evaluated all the changes and approved the release candidate to be released to production, the deployment process starts
- Deployment to production is done to all data centres in Europe by the Gateway IT Team.

The iterative process and the cycles of several processes in more details can be shown in appendix 2. The picture has all the same functions than the appendix 1, but its structure is different; it shows one whole R&D release process plus part of the previous and part of the following processes. In this picture it can be seen how the processes are ongoing; when one sprint stops, the next one starts.

4.4.3 Bug fixing process

Included into the sprint is also bug fixing. Bugs are reported by Product Owners, developers themselves, Key Account Managers, clients, 1st and 2nd line support, or basi-

cally anybody who finds a feature in Point software that doesn't work how it should. Bug fixing is done throughout the sprint, but the first three weeks it only has limited time spent to it. The fourth week of sprint is basically mostly bug fixing, as testing often reveals them. The bug fixing project is described in appendix 3.

When a bug (malfunctioning feature) is reported in Jira, the bug is assessed by the Scrum Master and he then assigns it to a developer that has the best skills and time to work with it. The developer first gets an overview about the fault and makes sure it really is a bug and not a new feature. In case of a new feature, the Jira ticket is returned to general story back log. Otherwise the bug is analysed and gathered more information if needed. The bug might need to be repeated in a test environment in order to gain more information. If it's unrepeatably, it is closed. If it can be repeated, the solution for it is developed. If the solution requires a new feature, the ticket is again changed from bug to new feature and sent back to the general back log. If the solution can be done by using the existing features, the problem is fixed. Next the developer needs to evaluate whether the fix is related graphical user interface, in which case it needs to be verified in test environment. When all this is done (if needed), the unit test cases are created and the the solution is verified that it really fixed the original problem. If the similar bugs are found in Jira, also they are checked in case the solution fixes them, too. Then the changes are committed and pushed into needed branches, where the fix is targeted and all newer branches up to the master branch. The bug is then resolved in Jira and the original reporter notified about what has been done.

When the process is ended, it will start all over again, as the bug and minor enhancement process is ongoing. Bugs are of course considered less important than stories, but there are always quite a lot of bugs that can be fixed during the Scrum process.

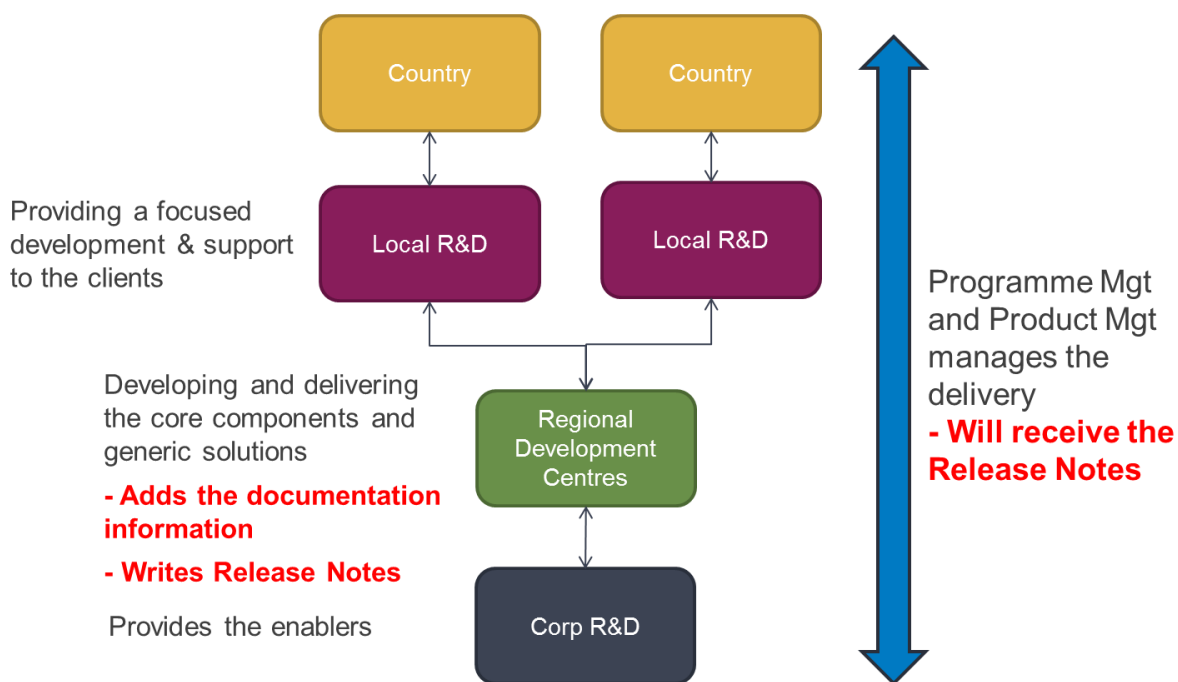
4.5 Point R&D processes with documentation added

After describing the processes, the documentation points were added to the same pictures as in previous chapter 4.4. Karstensen (30.10.2014) pointed out many good suggestions of how the documentation could be done and in which form. All changes concerning added documentation are marked in red in the pictures. The users of the

future documentation were consulted during the process to better meet their requirements. **Please note that some of the process charts are shown only in appendices and cleared confidential.**

4.5.1 Point R&D organisation and scrum method – documentation added

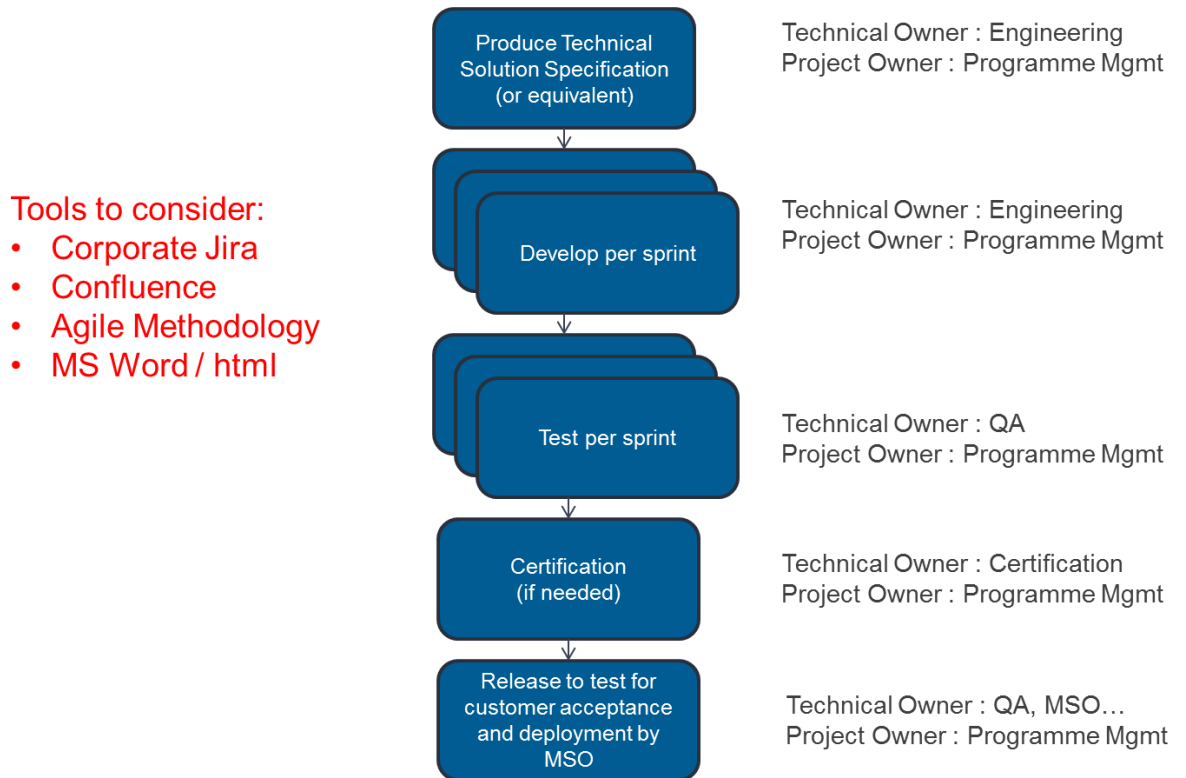
Picture 8 shows how the documentation is added to the higher level organisational chart. It is in the responsibility of the regional development centres to check that the documentation is in place. If it is not, they need to either add the needed information or ask the local R&D to add it. Regional development department is also responsible of creating the actual release notes and make sure it is received by all people who need them, in time. At least programme and product managements are among the recipients.



1

Picture 8. Point R&D organisation with documentation

In picture 9 next page is described the high level method of the development system at Point R&D. The actual documentation is not added into this picture, but some methods of how the documentation can be executed.



Picture 9. Point R&D high level method with Scrum and with documentation methods

The tools of how to execute the documentation in Scrum method was discussed with Karstensen (30.10.2014). The best tools would be to use

- Atlassian Jira for finding all the stories and bugfixes that are listed in release notes
- Atlassian Confluence (which is a wiki type of solution used for Point intranet) to store and access the ready documents
- Agile methodology should be used throughout the documentation to clarify all the terms to different recipients
- MicroSoft Word can be helped to extract the stories from Jira and then to upload them to the release notes report.

4.5.2 Point R&D development process – documentation added

Appendices 4 and 5 describe the same development Scrum process, but from a little different perspective. Documentation was added into the both pictures using the same numbers in the same phases of the process.

In both pictures the points of where the actual documentation data is prepared has been numbered to the right parts of the process. Those points are the same in both pictures and they are:

1. In the beginning of the sprint when the story candidates are evaluated and prioritised, the stories should be scrutinised against the specifications. They should be clear and the short abbreviation about the new feature should be added.
2. In sprint planning the Scrum master should check that all the abbreviations are in place. This abbreviation will be used in release notes and it will be read by several technical but also non-technical people.
3. When the actual coding has been done, the developer need to think about whether the GUI (Graphical User Interface) is changing or not. In case there are changes, it needs to be marked clearly as the GUI changes with proper screenshots and functionality descriptions are needed in later phase.
4. The last phase of each sprint is test report. This needs to be sent to the person who makes the release notes. Test report is checked against the information from Jira tickets to make sure that all new features and corrections are known.
5. When the CAB meeting has approved the release candidate and its test report for deployment to the production, the release notes are written and the GUI changes updated to all correct manuals, guides and other documents.

4.5.3 Bug fixing process – documentation added

Bug fixing process is quite straight forward. The only change needed (see appendix 6) to add the documentation into the process is when the actual fix has been done. There is a phase after that to consider if GUI change is needed. If yes, the fix is verified against GUI in test environment. The description and possible screen shots will be added to the Jira ticket at this point. If the GUI change is not needed, the unit tests will be created for verifying the change. The descriptions about the fix and what it changes will be added to the Jira ticket.

4.6 Summary

The actual work was started by gathering the information from Point intranet, from its managers through interviews and general discussions with other stakeholders. Then a

general R&D documentation strategy was created. After that the processes were described, and then the documentation was added into the process charts. The case study was used throughout the work as planned. Gap report was used to verify the already found documentation focus points. In the end most of the objectives were achieved.

5 Discussion and conclusions

Trying to create a document management model for Point R&D was at first like trying to build a house on the sand. It's hard without solid foundation. As was shown in the frame of reference, usually document management is conducted from existing company policies, like Quality Policy, IT Policy or Governance Policy. Point has grown so fast that these policies are not yet in place.

On the other hand, why to build a solid house if a trailer with wheels under is more appropriate? Having a thin organisation makes things quick and flexible; decisions are done fast and nobody needs to struggle with red tape. Changing the point of view and using a different approach for the document management model made the work advance in faster phase.

5.1 Research method

Case study was selected as a research method in the thesis. This was used along the whole process and it proved to be a good choice. As it was proved in table one, the applied research method was more useful compared to so-called traditional academic research. An academic research approach would have much more inflexible and not necessarily given all the needed information just for this research.

5.2 Practical experiences during execution

One of the big challenges was the disappearing of the main people. In the original list of experts to use during the study were two named people, but they both have since left the company completely. The author's superior was meant to help with the process, but the superior was changed in the middle of the process. Luckily the author's

colleagues and managers were professionals and willing to help with the thesis. In the end this challenge slowed down the process, but never stopped the progress.

Gap report that was given to the author in the middle of the process was extremely helpful during the thesis. Without it a larger questionnaire survey would have been a must to find out to which documents to concentrate in the end. Gap report helped to verify the earlier findings (through interviews and author's own speculation) that the release notes and updating the guides processes were the most important things to work with.

5.3 Summary about research problem, objectives and questions and results

The original research problem was a lack of documentation process in Point R&D. Two most problematical subjects were found out to be release notes and a process for updating the documents, and it was decided to concentrate on those two. The results solved the problem when it comes to those two subjects and the project can be seen successful.

The objectives were also fulfilled, as:

- The process charts to describe the current processes were created
- The process charts where documentation was added to existing processes, were created
- A model to accurately inform the changes into the software was created and
- A system to ensure the automatic updating of existing guides was created.

As a result from all of the above, R&D is able to produce good quality documents to the personnel, its clients and other stakeholders.

Project research questions were answered, as now the author has a clearer picture of what is included in good document management and also a model needed to document changes well in R&D was created. The implementation of this process was not done, but the author has better means now to make it happen in a near future. As the document users were consulted during the process, it is believed that their require-

ments are met the best possible way in the current situation. Point is going to take all the models and reporting and documentation systems into use in a near future.

In author's opinion the result of the research was successful and the objectives more or less fulfilled. The author thought her role was big in a whole research process, but she is the only technical writer in the company, so it was known before and not a surprise. The bonus outcome from it was the R&D documentation strategy, which was not in the original plan. During the literature research it became clear that this kind of strategy is needed and with the help of Craine's book it is fairly easy to make.

All the process charts created or enhanced along this research give a guideline to the future documentation processes and how to implement them. Now the documentation can be more easily considered to be added even when the new processes are built. It is possible to use the models also within other departments, as their situation is not better than R&D's. This way the target organisation will benefit from this research also in the future.

5.4 Proposals for further research

As the evaluation of the results is not yet done because of the lack of implementation, the evaluation was done by a quick interview of the managers about the plans. They gave a couraging feedback and the implementation will be done in a near future. The author suggests the implementation to be done simply by educating the developers about in which stages of their work processes the needed information should be added. That information is then used when creating release notes and a list of changes affecting GUI. Everything else will be done by the author, so separate implementation is not needed.

To get a proper evaluation for the process the author recommends a survey among the developers, management and the document end users. This will not be just an evaluation but also an enhancement questionnaire, as the end users will probably give suggestions of how to better the existing reports. This is not good to be done immediately after the implementation, but maybe after a couple of months.

5.5 Learning process during thesis

The first thing I learned was that there is not that much research or books written about the subject of documentation. Most of the material I found was a certain vendors' descriptions of how their software product (document management solution) was good when executing a documentation management. Nobody seemed to concentrate a higher level documentation management theory itself.

During the process I finally learned the idea of a case study. The whole chapter of research approaches and methods were somehow very hard to understand and cleared only towards the end of the process. It was relieving to find out after the discussions with my fellow students that I was not the only one finding that part hard. Perhaps academic circles could clarify these methods, their differences and how to use them in practice? Or at least find a unanimous understanding about them. These things would, of course, become clearer to me if I needed to use them more than just occasionally.

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