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# COMPARISON OF CONTENT MANAGEMENT SYSTEMS FOR AN INDUSTRIAL COMPANY

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# SISÄLLÖNHALLINTAJÄRJESTELMIEN VERTAILU TEOLLISUUSYRITYKSELLE

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Tämä opinnäytetyö toteutettiin Metso Minerals Oy:lle, joka toimittaa maailmanlaajuisesti ratkaisuja, laitteita ja palveluja kiven ja mineraalien käsittelyyn. Opinnäytetyön tarkoituksena oli vertailla eri sisällönhallintajärjestelmiä ja löytää niistä sopivin ratkaisu kohdeyritykselle. Lisäksi tavoitteena oli tutkia sisällönhallintajärjestelmän kustannushyötyjä yleisellä tasolla. Tutkimus suoritettiin syksyn 2014 ja alkuvuoden 2015 välisenä aikana.

Tutkimuksen teoreettisessa osassa käsiteltiin teknistä dokumentointia; missä sitä käytetään ja miten sisällönhallinta on olennainen osa sitä. Lisäksi teoreettisessa osassa käsiteltiin sisällönhallintajärjestelmää, sekä mitä etuja ja kustannushyötyjä se voi tarjota. Teoreettinen osa nojautui vahvasti ammattikirjallisuuteen, sekä alan ammattilaisten tietoihin.

Tutkimuksen empiirinen osa koostui kahdesta tutkimuksesta. Alustava tutkimus toteutettiin käyttämällä puolistrukturoituja haastatteluita, joiden tarkoituksena oli tutkia yrityksen tarpeet ja vaatimukset koskien sisällönhallintajärjestelmää. Näiden pohjalta ohjelmiston valintakriteerit luotiin. Alustavan tutkimuksen pohjalta voitiin todeta, että nykyisessä dokumentointiprosessissa on parantamisen varaa, sekä että kohdeyrityksellä on suhteellisen paljon vaatimuksia uudelle ohjelmistolle. Päätutkimuksen tavoitteet perustuivat täysin alustavasta tutkimuksesta kerättyihin tietoihin ja siinä tutkittiin ja vertailtiin markkinoilla tarjolla olevia sisällönhallintajärjestelmiä.

Lopputuloksena esitellään kohdeyritykselle parhaiten soveltuva ohjelmistoratkaisu, sekä sisällönhallintajärjestelmän kustannushyödyt. Tulokset osoittivat, että soveltuvin ohjelmisto vastasi suurelta osin kohdeyrityksen tarpeisiin, sillä se pystyy hyvin vastaamaan dokumentoinnin haasteisiin ja tärkeimpänä, se pystyy parantamaan dokumentointiprosessia, nopeuttamaan työtehoa ja vähentämään kustannuksia. Lisäksi kustannus-hyötyanalyysi antoi useita syitä uuden ohjelmiston hankkimiselle. Jatkumona tälle tutkimukselle tekijä antoi suosituksia siitä, miten tätä projektia voitaisiin kehittää tulevaisuudessa.

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This thesis was conducted for Metso Minerals Inc., which is a global supplier of solutions, equipment and services for rock and mineral processing. The purpose of the thesis was to compare different Content Management System solutions and to find the most suitable solution for the case company, as well as examine the cost-benefits of a Content Management System in general. The study was conducted between autumn 2014 and early 2015.

The topics discussed in the theoretical part of the thesis include the issues of technical documentation; where it is used and how the content management is an essential part of it. The theoretical part also deals with Content Management System, and the advantages and cost-benefits it can provide. The theoretical part relied heavily on professional literature and the knowledge of professionals.

The empirical part of the thesis consisted of two researches. The preliminary research was conducted by using semi-structured interviews which aimed to study the needs and requirements of the case company regarding the software. The criteria for the software selection were created based on this information. As an outcome of the preliminary research it can be noted that there is a place for improvement in the current documentation process and also that the case company has quite a lot of requirements for the new software. The objectives of the main research were fully based on the information gathered from the preliminary research. The main research data was gathered and a variety of Content Management System solutions available in the market were compared.

The result introduced the most suitable software solution for the case company, as well as the cost-benefits of a Content Management System in general. The results showed that the most suitable software solution responded to a large extent to the case company's needs as it is able to respond well to the challenges of the documentation, and most importantly, it is able to improve the documentation process, accelerate work efficiency and reduce costs. In addition, the cost-benefit analysis gave several reasons for the acquisition of a new software solution. As a continuum to this project, the author gave recommendations on how this project could be developed in the future.

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# ABBREVIATIONS / TERMINOLOGY

| | |
|---|---|
| CM | Content Management |
| CMS | Content Management System |
| DITA | Darwin Information Typing Architecture |
| IT | Information Technology |
| PDF | Portable Document Format |
| PLM | Product Lifecycle Management |
| SCORM | Sharable Content Object Reference Model |
| STE | Simplified Technical English |
| XML | Extensible Markup Language |

# 1 INTRODUCTION

Content management is one of the key issues in today’s technical documentation. Documentation volumes have increased due to grown variants and versions, and many departments inside companies produce technical documentation. The broader the documentation is, the more difficult its management comes. Also customers have begun to expect that the documentation is to be more extensive and available in multiple ways, so that the information is available at anytime and anywhere. For these reasons, it is important for a company to be up to date with the latest management systems in order to make the content management of the documentation as easy as possible.

The purpose of this thesis is to compare different Content Management System (CMS) solutions available in the market and to find the most suitable one for the case company in order it to accelerate work efficiency and reduce costs. In addition, the study highlights the advantages and cost-benefits of the CMS. The thesis is conducted for Metso Minerals Inc. through project-based research.

The theoretical part gives an overview of the technical documentation, content management and CMS. Moreover, it goes through today's challenges and trends, as well as what benefits CMS could bring. The empirical part begins with the preliminary research which aims to study the needs of the case company concerning the new software. After this, the main research studies the software solutions that were offered for the case company. As the result, the most suitable software is found by comparing the features of the software based on the requirements from the preliminary research, along with cost-benefit analysis. The conceptual framework describes the fundamental steps in the project.

I am convinced this thesis will help the case company to improve its documentation process by its better management and appearance.

# 2 THE PURPOSE OF THE STUDY AND THE CONCEPTUAL FRAMEWORK

## 2.1 The purpose of the study

Technical documentation covers the information of the entire product life cycle and therefore is as important as the product itself. In the developing world, it is important for a company to be up to date with the available software solutions. CMS is the latest way to generate technical documentation in order to bring out the most modern and sophisticated appearance what can be achieved. Hence, the purpose of this study is to explore a variety of CMS solutions and to find the most suitable one for the case company. The study aims at improving the technical documentation process of the case company. The knowledge acquired in the research process is a good foundation for the company's intention to purchase new software.

## 2.2 The objectives of the study

Continuum for the purpose, the objective is to compare different CMS solutions based on the requirements from the case company. While making the research, must be remembered that the goal is to find a solution that provides integrated enterprise-wide appearance of the documentation, thus taking into account the needs of the other business units in different countries, in addition to Finland. Since the thesis is done through project-based research, the case company offered a thesis work scope from their point of view as follows:

- Comparison of CMS features
    - Study features of CMS's available in the market
    - Pinpoint differences relevant to departments, technology centers and production of material

- The company needs comparison
    - Define CMS features needed for the company's content management processes

    - Compare the company's needs to system features studied in phase 1 and rank systems for the best fit to needs
    - Ensure that the solution has potential to add necessary integrations to other company's Information Technology (IT) systems in the future

- CMS cost-benefit analysis
    - Calculations to make go or not go decision

(Laine & Lindgren, personal communication on 14.8.2014)

## 2.3 Research questions

The main research question is:

- *What is the most suitable CMS solution for the case company?*

Sub-questions related to main question are the following:

- *What technical documentation is and what is required?*
- *What is CMS?*
- *What software solutions there are available on the market?*
- *What does the case company require from the new software?*
- *What are the cost benefits of CMS?*

The research is limited to the different CMSs on the market that are being offered for the case company by software suppliers. The aim is to select the most suitable ones of these CMSs and to compare them with each other.

## 2.4 The conceptual framework

According to Business Dictionary, the conceptual framework can be defined as "a theoretical structure of assumptions, principles, and rules that holds together the ideas comprising a broad concept" (Website of the Business Dictionary 2014). The conceptual framework describes the logical structure frame that guides the progression

of the study. The conceptual framework is based on the key concepts and relationships which underlie the preparation and presentation of the final analysis and conclusions. (Hirsjärvi, et al. … 2000, 131.)

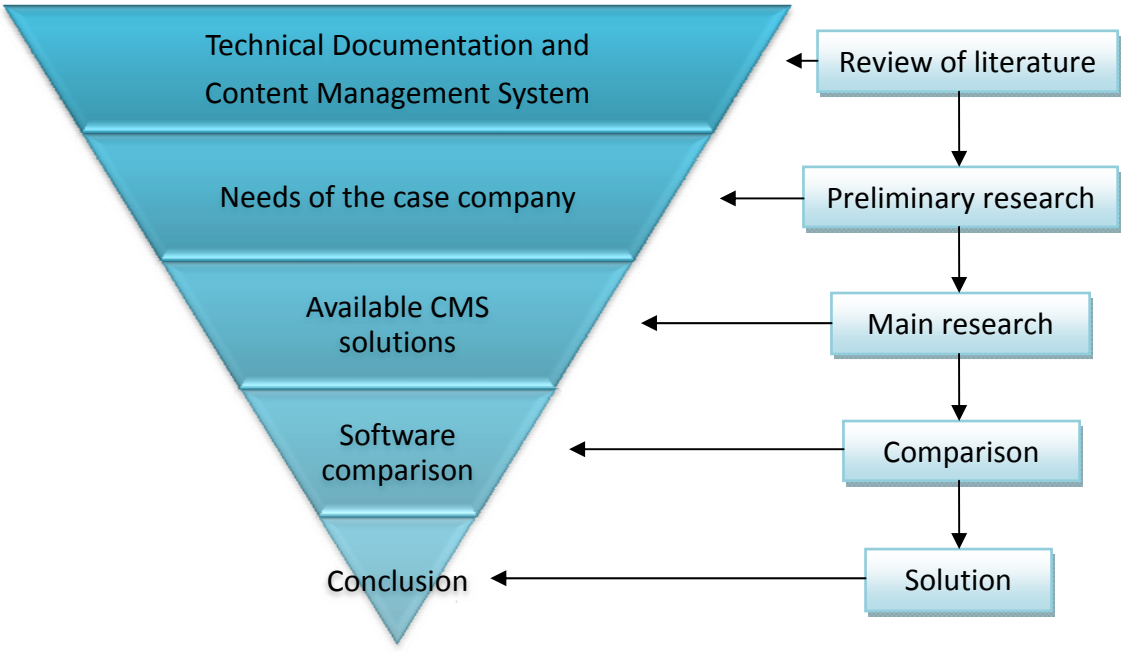


Figure 1. Conceptual framework (Hirsjärvi, et al. … 2000, 131)

The conceptual framework of the research (Figure 1) is a short map to guide the data collection that includes the review of literature, research, comparison and solutions. It shows the links between the existing knowledge and research goals. The first part of the research is to study the review of the literature to understand the theoretical part of the topic. After the theory is studied, it is time to contract the research with finding out the needs of the company with the preliminary research. The next step is to do the main research by studying the available CMS solutions. The comparison part rounds up all the parts studied earlier and the final part makes the solution which is introduced as an action recommendation.

# 3 METSO CORPORATION

In 1999, the merger of the two companies, Valmet Corporation and Rauma Corporation, created one technology industry company, Metso Corporation, which is public listed company and its shares are listed on the Helsinki Stock Exchange, NASDAQ OMX Helsinki, Finland. The biggest shareholders of Metso are Cevian Capital, an international investment company, with 13.8% of share capital and Solidium Oy, a Finnish state owned investment company, with 11.7% of share capital. (Website of the Metso 2014.)

Metso's core customer industries are mining, oil and gas, as well as aggregates and it has a strong global market position in all of these industries. It is also a global market leader in its business areas, which are Mining and Construction segment, and Automation segment. Mining and Construction segment consists of Processing Solutions, Crushing and Screening Equipment and Services business lines, and Automation segment consists of Process Automation Systems, Flow Control and Services business lines. (Website of the Metso 2014.)

Metso has over 270 units in more than 50 countries on six continents, and it employs approximately 16,000 professionals. 28% of the employees work in Finland and the company has customers in over 100 countries. Metso's current CEO and Chairman of the Executive Board is Matti Kähkönen, who works in the Helsinki office in Finland. He is responsible for the management of Metso's businesses in accordance with the Finnish Companies Act, corporate governance rules and the instructions given by the Board. (Website of the Metso 2014.)

Picture 1. Metso Lokotrack® LT106 (Website of the Metso 2014)

In January 2014, Metso's mobile crushing plant Lokotrack® LT106 (Picture 1) received an honorable mention in the Fennia Prize 2014 design competition. (Website of the Metso 2014.)

## 3.1 Metso Corporation's organizational change

In October 2013, Metso Corporation held an Extraordinary General Meeting (EGM) in Helsinki, Finland, which started a new chapter in the history of Metso. The EGM approved the plan for partial demerger and decided to demerge Metso into two companies. After the split-up, Pulp, Paper and Power business was transferred to new company, Valmet Corporation, while Mining and Construction business as well as Automation business remained as a part of Metso. (Intranet of the Metso 2014.)

Completion of the demerger was registered in December 31, 2013, when all the assets, debts, and liabilities relating to Pulp, Paper and Power business were transferred to the new company. After the split-up, Valmet became a fully independent public listed company. It began the share trading transaction in January 2, 2014 and Metso's shareholders received shares of Valmet 1:1. (Intranet of the Metso 2014.)

In the report, released in early 2014, Metso's President and CEO Matti Kähkönen said that he sees the split-up as an important step for the future. From his point of

view, in this way Metso is able to focus its resources more effectively to serving its customers in the mining and construction industry, and react more quickly to new tendencies of customers and markets. (Intranet of the Metso 2014.)

## 3.2 Strategy – vision, mission, values and leadership principles

In July 31, 2014, Metso announced its new strategy and operating model. The company's goal is to drive growth in its businesses and strengthen its financial performance and create more value. Growth targets will be done through operating in three business areas which are services, minerals and flow control. Strategy will be implemented through must-wins initiatives which are services and technology offering, strengthen market areas, operational excellence, and talent and leadership development. (Intranet of the Metso 2014.)

*The vision*, the ultimate goal, is to *Working as One to be Number One*, meaning that the company encourages each other to achieve the best result with working together within all bonding parties, in order to be the best in creating value for its stakeholders. (Intranet of the Metso 2014.)

*The mission* is to contribute towards building a *more sustainable world*. The company helps its customers to process natural resources and recycle materials. (Intranet of the Metso 2014.)

*The values*, which guides in daily operations and delivers the company's purpose, are *driving customer success, seeking innovation, performing together and respecting each other*. These values guide daily operations with internal and external stakeholders along with the company's Code of Conduct. (Intranet of the Metso 2014.)

The leadership principles are *show the way forward, to build inspiration and trust, drive results, and develop and coach*. These principles are the company's shared point of view which make a *Metso leader*. (Intranet of the Metso 2014.)

## 3.3 Sustainability

Sustainability is part of Metso's strategy as well and the company is working all the time with integrating sustainability in its daily business operations. The sustainability strategy is distributed into four focus areas as follows:

- *Metso People*: To give priority to the well-being, health and safety of the individuals, as well as to give equal opportunities and diversity.

- *Metso Environment*: Improvements in energy, material efficiency and water consumption, as well as reducing emissions, the amount of waste and environmental accidents.

- *Society*: Aspire to act as a responsible corporate citizen to support sustainable development in the communities as well as sponsoring and donating local projects in science, research and education, environmental protection and youth activities.

- *Marketplace*: To provide sustainable technology and solutions and to develop a transparent and responsible supply chain management.

(Website of the Metso 2014)

## 3.4 Financial figures

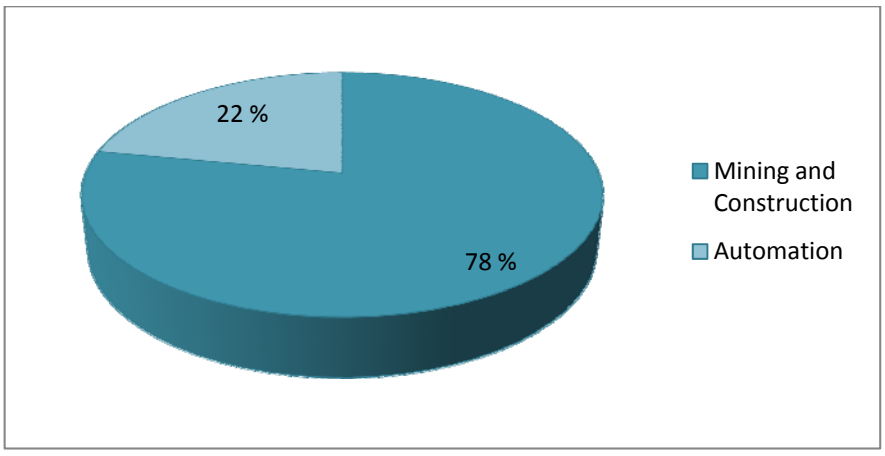


Figure 2. Net sales by segments (Intranet of the Metso 2014)

Metso's net sales (Figure 2) in 2013 were EUR 3,858 billion, of which Mining and Construction produced 78% and Automation 22%. Services business totaled EUR 1,976 billion, which was 51% of the total net sales. In terms of net sales, United States, Brazil, China, Australia and Russia were the biggest countries in 2013. The table below (Table 1) shows the Metso's key figures as they are presented in the Financial Statements 2013. The key figures from the period 2012-2013 describe the continuing operations. (Official statistics of Metso: Financial Statements 2013.)

Table 1. Key figures (Official statistics of Metso: Financial Statements 2013)

| EUR million | 2013 | 2012 | Change % |
|---|---|---|---|
| **Orders received** | 3,709 | 4,215 | - 12 |
| **Orders received of services business** | 2,038 | 2,153 | - 5 |
| **% of orders received** | 55 | 51 | |
| **Order backlog** | 1,927 | 2,324 | - 17 |
| **Net sales** | 3,858 | 4,282 | - 10 |
| **Net sales of services business** | 1,976 | 2,072 | - 5 |
| **% of net sales** | 51 | 48 | |
| **Earnings before interests, tax and amortization (EBITA) and non-recurring items** | 496 | 486 | 2 |
| **% of net sales** | 12.8 | 11.4 | |
| **Earnings per share, EUR** | 1.59 | 1.71 | - 7 |
| **Free cash flow (incl. discontinued operations)** | 224 | 257 | - 13 |
| **Return on capital employed (ROCE) before taxes, %** | 18.6 | 21.2 | |
| **Equity to asset ratio, %** | 36.9 | 39.1 | |
| **Net gearing, %** | 41.6 | 28.4 | |

At the same time when Metso announced its new strategy, it also released new financial targets with an aim to have profitable growth with strong results as follows:

- Net sales growth exceeding market growth
- EBITA margin above 15% within three years
- Return on capital employed (ROCE) before taxes of at least 30%
- Dividend at least 50% of earnings per share

(Website of the Metso 2014)

### 3.5 Mining and Construction business segment

Mining and Construction business supplies technology, processes, equipment and related services to aggregates production, construction, mining and minerals processing. In particular in Metso Minerals Inc., the business lines are Processing Solutions, Crushing and Screening Equipment and Services. Customers consist of mining industry, construction industry; quarries and contractors, scrap yards, waste treatment plants and recycling. The business lines employ approximately 11 700 employees and net sales in 2013 were EUR 3,070 billion. For Finns, the Swedish company Sandvik AB may be considered as the best known competitor in the construction industry and Outotec Oyj in the mining industry. (Intranet of the Metso 2014.)

Due to the demerger, also Mining and Construction business' operating model was revised in March 2014. The revision aims to improving the ability to achieve results. The biggest change was related to the former three market areas sharing into twelve market areas, the aim of this was to serve the company's customers better and faster. In order to achieve the aims, the company implements structural changes as well as practice related changes accordingly to the following five themes: *organization, growth focus, performance culture, people and capabilities, as well as cost competitiveness*. (Intranet of the Metso 2014.)

## 4 TECHNICAL DOCUMENTATION

Technical documentation is product related data and information which describes how a product operates. Technical documents, which are made by the manufacturer, are, for example, user instructions, operating instructions, installation instructions, spare parts catalogues and maintenance logbooks. Training documents can be described as manuals used for educational purposes. Technical documentation consists of all documents which are generated during the product life cycle. (Cameron 2011, 2; Website of the Transcom 2014.)

According to Insurance Company Pohjola, user documentation is a part of the product which creates an important image of the product itself. User documentation presents the intended use and operation, and also individual information of the product. User documentation also includes instructions for the installation or assembly, service, and for example, the connections in the electricity network and its safe disposal. The more complex is the product, the more comprehensive the operating instructions will easily form. In a case like this, the user documentation must be built into manageable sections. Safety of the products is taken into account in assessing the product itself, its intended use, the information given, operating instructions and attached warning labels. Well done user documentation maximizes the benefits of the product and it leads to right, safe, efficient and comfortable use. User documentation of the product instructs the correct use of the product easily and quickly. (Website of the Pohjola 2014.)

Technical documentation of a product is often referred as user assistance made for end user and as well for administrator, service and maintenance technician. It must be kept in mind that the buyer of the product is not always also the user. The user documentation is a part of a whole sale process of a product and must be defined as an important part of the product delivery. (Websites of the Pohjola & Transcom 2014.)

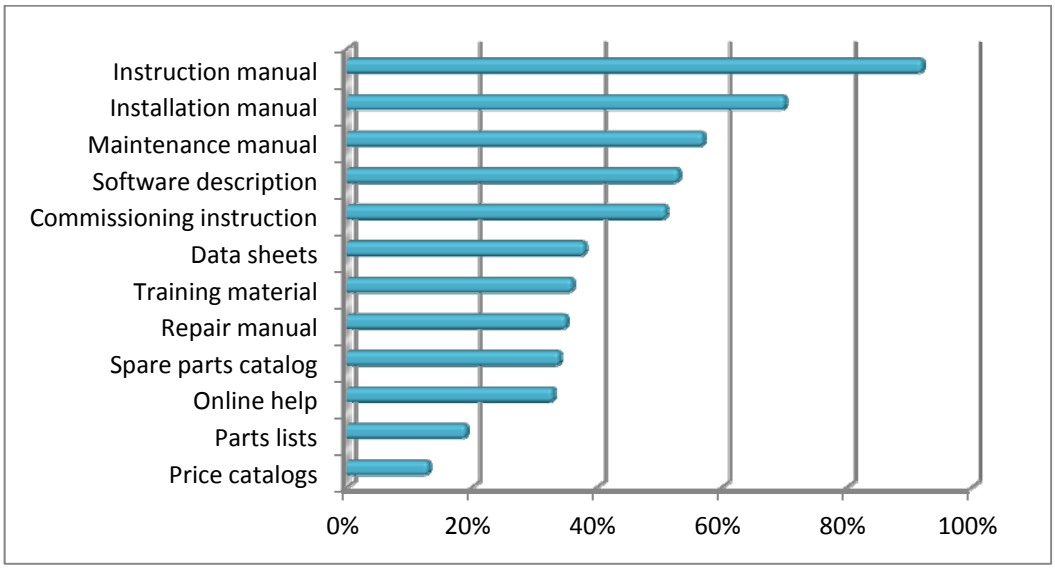


Figure 3. Requirements: Type of information products in Technical Communication (Website of the European Association for Technical Communication 2014)

In 2009, European Association for Technical Communication – tekom Europe e.V. published an extensive CMS study which dealt with the use, experiences and requirements of the CMS. Twenty-six (26) users and software providers participated in the study. One of the main topics was the requirements regarding the information products. The results of that part of the study (Figure 3) show clearly that the most important technical documentation in use is an instruction manual. After this, the next most important are an installation manual, maintenance manual and commissioning instructions. For other required documents, the need is about at the same level. The new study is in the making, so the previous study is used in this thesis. (Website of the European Association for Technical Communication 2014.)

The International Organization for Standardization (ISO) has developed and published a series of standards related to technical product documentation. These standards are covered by International Classification for Standards (ICS), which is a way of classifying standards into different fields, e.g. documentation. ICS 01.110 includes, for example, rules for preparation of user guides, manuals and product specifications. (ICS 01.110.)

## 4.1 Content Management

Content management (CM) is a process for collecting, managing and publishing content. The collection is done by creating or acquiring information from existing sources and compiled into system by editing and dividing it into components. Depending on the source, the information may need to be converted to a master format, such as Extensible Markup Language (XML). XML is a markup language which was designed to describe data which is both human and machine-readable. Then a repository is created which consists of database records and/or content components and administrative data. Then the content is made available by extracting components out of the repository and by creating targeted publications, such as printable or online documents. The publications consist of accurately arranged components. (Boiko 2005, 72; Cameron 2011, 7-9.)

The concept of data was invented as it is much easier to perceive than a lot of information. It is a small piece of information that people collect, connect together in data records and store in databases. Information means all the common forms of recorded communication including text, sound, images, motion and computer files (e.g. spreadsheets and slide shows). Humans are mandatory in the process of creating the information and a lot of work is needed to create content, so unlike data, it does not naturally come from distinct little snippets. While collecting information to the data, a person can control the work to the computer by using statuses, and then the computer can perform a large part of the work. Usefulness of data and the richness of information creates content. Raw information becomes content when a usable form has been given to it and it is intended for some purpose. The value of content is based on its usable forms. As an example, we can use the following: The title of this chapter is a piece of data, and all the titles and headings together are a piece of information called a table of contents. When this information is included in the book, it is called a piece of content. (Boiko 2005, 7-12.)

Structure is a set of relationships within the pieces of content. Well-structured content has the following features: well-defined categories in each content type, content segments are in manageable components, each content component is divided further into a set of parts and each element relates to other elements. Well-structured content base is well-organized. Well-defined categories enable the standardization of the creation and use of the content. Divided content components are possible to track individually. If all components are stored within the same structure, it is possible to create fast and efficient storage and retrieval system which automatically delivers desired content into publication. Structure is the key to managing content, but the style of the structure, which is needed, depends on the needs of particular use. Structure enables components to fit together into unified framework. It can be stated that if you control the structure, you control the content and its publication. (Boiko 2005, 21-24.)

Effective CM is much more than a management of the content, for which it is perceived often. CM is a tool which enables person to control over the creation and distribution of information and it helps to get the right information to the right person on the right time. It is a method of identifying all content requirements, creating struc-

tured content for reuse, managing that content, and gathering content on demand to meet the customer's needs. For the companies, the role of CM is significant. The important aspects from different views what CM does for companies are the following:

- Distributes the value
- Balances organizational forces
- Combines content-related disciplines
- Collects, manages and publishes information
- Is a technical infrastructure

(Boiko 2005, 41-66; Caruana, et al. … 2010, 5)

## 4.2 Content Management System

CMS is a coherent and complex system that helps a person to collect and manage the selected entities and publish them into a right format. It offers generally well-structured way to manage large amount of information by providing a centrally managed system for displaying the content. CMS's content reuse is one of its key benefits and the software is widely used when content is repeated in several documents and publications. A good point is that the content still remains under the control of the company which makes the modifications simple and fast. Frame of CMS is divided into three functions; the collection system, the management system and the publishing system. (Eden 2006, 5 – 7.)

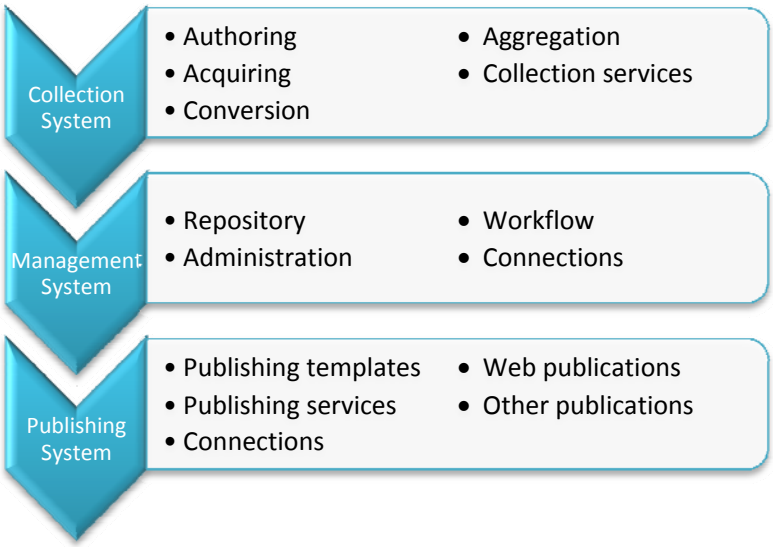


Figure 4: Overview of a Content Management System (Boiko 2005, 86)

The illustration (Figure 4) shows the main functions of CMS throughout the collection, management and publishing life cycle as follows: First, the information runs through a collection system and it turns into content components. Then the management system stores these components in the repository. The last, the publication system pulls the components out of the management system, and turns them into publications. (Boiko 2005, 86.)

### 4.2.1 Collection system

Before the content is ready for publishing, CMS collection system is responsible for all processes that take place prior to the publication is ready. It turns raw information into well-organized content components and the process includes the following functions. (Boiko 2005, 87.)

*Authoring* is a process of creating content from a scratch. It is a manual process and it requires the full power of human resources and proprietary authoring tools, which are called text editors. Technical writer's task is to translate the technical documentation into more readable form. The process consists of creation and revision, where the author drafts and revises the work until it is ready for use. CMS helps the authoring process by providing authoring tools (full applications or extensions), use of ready-made content components, predetermined templates, and workflow, status and version control. (Boiko 2005, 87-88.)

*Acquiring* is a partly or fully automated process of collecting information which was not originally created in CMS. Authored information can be described as low volume but high-quality, while acquired information is generally high volume but low quality. (Boiko 2005, 89-91.)

*Conversion* is a process where the binary format is converted to the structure of CMS. The process consists of three steps; removing unneeded information and unwanted navigation, changing the information format to the format that the CMS supports, and making the information structure. (Boiko 2005, 92-93.)

*Aggregating* is a process which brings all the information sources into one structure by editing the content and dividing it into components. The process is done through editorial processing, segmentation processing and metatorial processing. (Boiko 2005, 93-99.)

*Collection services* do the collection process by transferring the components directly into the CMS repository. Transfer can be done one at a time or in a bulk. After the author submits the information, system creates a database record in the repository to store the content components. A good collection system shows the effectiveness of the CMS. (Boiko 2005, 99.)

### 4.2.2 Management system

The CMS management system is responsible for the storage of content components and other tools. The management system consists of the repository, workflow and administration facilities. It shows the details about the content, how well utilized the contents are, how the components are used in publications, which content is unused or ready for removal and also who has access and to what content. (Boiko 2005, 100.) To be able to provide these capabilities, the management system includes:

*Repository* is the main piece of the management system. Repository is the set of databases, files, and control and configuration files that store the content components and any other data. As stated earlier, all the components come into the repository from the collection services and the publishing service extract them. The information created by the software is stored as a content component, while files (e.g. spreadsheets) which are intended for use in their existing format are stored as documents, alias files. (Boiko 2005, 100-103.)

*Administration* is a system responsible for adding parameters and structure, and it affects all the parts of the software. In the collection system, administration includes staff configuration for access rights, metatorial configuration for metadata, and system configuration for structure and workflows. In the management system, administration performs tasks including user maintenance and permissions, backup and

achieving. In the publishing system, administration ensures that the software is working according to imposed plan. (Boiko 2005, 103.)

*Workflow* is responsible for coordinating, scheduling, and controlling the schedules and tasks. In the collection system, workflows are made for collection, creation, aggregation tasks. Customized workflow can be made, for example, for a process which involves creation, review and approval tasks. In the management system, workflow is made for administrative tasks (e.g. backup and achieving). In the publishing system, workflow with the publication cycles ensures that the publications are the best possible. (Boiko 2005, 105; Caruana, et al. … 2010, 57.)

*Connections* are made so that the company can connect the CMS to its various infrastructure and data systems. This function is made to able the information become accessible through enhanced systems, thus it prevents recreating of the information. Two-way connection enables a user to modify the content and post back to the outside source. (Boiko 2005, 105-106; Caruana, et al. … 2010, 57.)

### 4.2.3 Publishing system

The end purpose of a CMS is to create publications of various formats. The CMS publishing system is responsible for pulling out the content components and other resources, and automatically creating publications out of them. (Boiko 2005, 106.) It includes the following functions.

*Publishing templates* are files that guide the creation of publications from the content in the repository and *publishing services* is an application which creates the publications. (Boiko 2005, 106-108.)

*Connections* in the publishing system are the same ones mentioned in the previous paragraph. This function in publishing system enables the user to select files from another system to be a part of the publication. (Boiko 2005, 108-109.)

*Web and other publications* allow the user to decide the publishing platform. Web publications (e.g. internet, intranet and extranet) are the most widely used publications in the CMS. Other publications, which are not designed for web, include print publications (e.g. Portable Document Format, also known as PDF), electronic publications (e.g. CD-ROM), and syndications (e.g. XML). (Boiko 2005, 109-111.)

## 4.3 Today's challenges

Today's challenges come from the fact that if companies were asked why they may need a system to manage their documentation, they are likely to say "because we have too much" (Boiko 2005, 129). Companies have multiple productions silos (e.g. training and eLearning, engineer software development, technical publications, quality and customer support) and they all make their own processes. This leads to a situation where similar content is created over and over again in different locations and standards and consistency is difficult to maintain. The content is useful only if it is found easily. When the content cannot be found, writers recreate similar content continuously and users may use the wrong one. Searching for the right information takes time and the content is often copied and pasted from one document to another. Then two different versions need to be up to date and controlled, which multiplies the possibility of human errors and inconsistencies when a high dependence is on individuals. To sum up, having a lot of content that cannot be found, organized, or used effectively is simply a waste of time. The overall situation today can be described as follows:

- 95% of all manual production in non-database environment
- 80 – 90% information not reused
- 100% layout work unnecessary
- 40 – 60% editing time wasted on searching for content
- 30 – 50% translation costs unnecessary

(Oja 2014; Stroes 2014)

## 4.4 Today's trends

Today's trend is shifting from Engineering-to-Order (ETO) to Configure-to-Order (CTO). ETO approach means that the product is designed and manufactured based on specific customer requirements. Customers work closely with companies throughout the entire design and manufacturing process to ensure that their needs are fulfilled. Today's trend, CTO approach, means that the customer defines the configuration of the product during the order phase and the vendor builds that configuration upon receipt of the order. This system is ideal process model that provides mass customization and quick response time to fulfill the order. The reasons for CTO approach are shortening the delivery time, reducing cost, ability of scaling up production and lowering stock. However, this approach causes more variants and versions, lower production volumes and shorter delivery and production cycles. Here we can note the importance of speeding up the creation of documentation. (Korpi 2014; Website of the Author-it Software Corporation 2014.)

Earlier user documentation consisted only of an instruction manual or online help. Today, users have begun to expect that the standard user documentation consists of more extensive material, including, for example, instruction manuals, spare parts catalogues, video tutorials and online material. Material is also assumed to be available in hard copies and electronic format, so that the information is available at anytime and anywhere. This leads to a situation where the company must provide the information in multiple ways. New trend "Think global, deliver local" reveals to the fact that people do not have the same demands but they vary between differences in cultures and attitudes, and also in local market conditions and regulations. This causes more languages, product differentiations and multi-disciplinary teams in different time zones and cultures. For technical documentation producers, these new trends mean more of everything: documents, variations, versions, updates, languages, publication formats and regulations, but with less time, people and money. In this situation, it is therefore important to think about reuse. (Korpi 2014; Website of the Author-it Software Corporation 2014.)

## 4.5 Advantages of Content Management System

CMS enables the user to create a high-quality multi-language content without requiring much technical or programming knowledge. The system is great for creating, editing and publishing large amount of content which has multiple purposes of use. CMS has also been created to give the user as much control of the content as possible and the content is easily discoverable. The following are the different advantages of the system. (Websites of the Siemens & Quinstreet Enterprise 2014.)

CMS accelerates time-to-market by modernizing the documentation processes. Changes or updates to the content components are fast to do, and due to CMS templates, all the related content will be updated in real-time. Also multiple product variations are supported by the content reuse. Publishing to multiple formats as fast as possible while the appearance remains the same is important for modern companies and it creates value. The diversity of publishing benefits the company as the software is able to provide more branding, target groups, languages, variants and media. These advantages improve customer service and make the working with the customers smoother. The use of CMS lowers the operating costs as it uses automated workflows and templates. Also reuse of the content and removed duplication errors improves operational efficiency. (Korpi 2014; Oja 2014; Website of the Siemens 2014.)

Productivity can be improved by collaborations with different business units. As the content is shared across business units, it improves accuracy and quality by linking, for example, engineering and documentation departments. With real-time collaboration, changes in the content can be planned and verified fast before publishing. CMS integrates processes and it is easier to develop joint projects through the software by using collaboration between business units. (Caruana, et al. … 2010, 6; Oja 2014; Website of the Siemens 2014.)

Translation costs may be possible to be cut up to 70%, when using reused content components and when only the updated content is translated. CMS also creates better translation process control when tracking of the translation work is easy and there are no overlapping translation costs. This really creates huge cost savings for multi-

national companies who need translation services continuously. (Korpi 2014; Oja 2014; Website of the Siemens 2014.)

Security is an important issue for companies and CMS ensures full security and complete audit history. Audit history shows what changes have been done, when it has happened and who was and is responsible for those activities. Permission-based access ensures that all sensitive information can only be modified and reviewed appropriately. (Caruana, et al. … 2010, 6; Korpi 2014; Oja 2014; Websites of the Siemens & Quinstreet Enterprise 2014.)

# 5 METHODOLOGY

## 5.1 Research methods

The research method of the study was qualitative. In the qualitative research, the author's aim was to observe the material, not to test a theory, and author relied more on her own perception than measuring a data. The research strategy of this study was a case study, where detailed information about the individual case was collected and examined in its surroundings. The data was collected through interviews and document examination. (Hirsjärvi, et al. … 2000, 125-126, 155.) The preliminary research was examined by using face-to-face, semi-structured interviews and material provided by the case company. The main research was examined by using the material from the meetings and material of the software provided by the suppliers. It can be noted, that the methods of the main part of the research were predetermined due to fact that the objectives of the study were fairly strictly defined by the case company.

## 5.2 Semi-structured interview

A semi-structured interview is a qualitative research method of inquiry which is measured by the quality of something rather than its quantity. It approaches to depth qualitative interviewing with particular themes designated by the interviewer. Semi-

structured interview can be defined as a conversation with decided meaning planned in advance. A semi-structured interview does not limit interviewee to answer only to predetermined questions but allows interviewee to discuss and raise issues that may have not been considered by the interviewer. The findings from the semi-structured interviews are based on the interviewer's notes and the number of interviewees is low, so the normal sample practice and the calculated estimates are not suitable. Therefore, the most important part of the interviews is to find the right people as interviewees. (Hirsjärvi, et al. … 2000, 197.)

The author has a preliminary understanding of the topic as she has worked as a trainee in the documentation department in the past. Therefore it can be assumed that the author has found the interviewees that are the most relevant people and able to give the widest view of the topic and the answers which author has seen the most important. The interviewees consisted of managers, documentarians, training personnel and IT personnel which all were somehow connected to the topic and could give a good opinion from their field of know-how. (Metsämuuronen 2011, 47-48.)

The aim was to study internal factors of the research and the result of this part was to understand the case company's needs concerning the topic. This part can be seen as a conducive research of which aim was to give action recommendations for the main research. Themes were planned from documentarian point of view and how the author has seen the importance of the issues. Body of the interviews was made in one piece in which changes were made to according to the interviewee (Appendix 1). Interviews were held in Tampere, Finland, during autumn 2014.

## 5.3 Validity and reliability of the study

The data was processed and analyzed by using a pre-determined processing logic. Concerning the preliminary research, by comparing the answers, the author observed the interviews' unity, thus interpretations could be generalized into the entire summary. From the reliability's point of view can be stated that the ratability of the analysis came true and all the interviewees had an opportunity to follow the process and criticize it if necessary. Creditability refers to the fact that the research interpretations

are really made according to described methods. From validity's point of view, it can be stated that the data covers the studied event and the data was collected according to the chosen research method. Interviews were held with different people from the same organization and the collected data is equivalent to an existing theory and it can refine and improve it. In this way the author fulfilled the need for the research to provide internal validity. (Hirsjärvi, et al. … 2000, 216-218; Metsämuuronen 2011, 51, 60.)

The main research was based on the information given by the software suppliers, thus reliability was confirmed by the fact that random information could not be used in the research, but all the results were based directly on to the existing information. This also confirms the validity, as the research was done through the data which cannot be misunderstood. (Hirsjärvi, et al. … 2000, 216-218; Metsämuuronen 2011, 51, 60.)

# 6 PRELIMINARY RESEARCH: THE NEEDS OF THE CASE COMPANY

The author interviewed eight people who were documentarians, training coordinator and managers in different departments, comprising documentation, training, IT and product safety, and they all gave their expert opinions from their own field of know-how. As stated earlier, the interviewees had unanimous view of the matter, which is why the summary could be made in general level, without contradictions in the statements. A broader summary of the interviews can be found in Appendix 2. The interviewees stated that the new software is an advantage to the company and improves the company's performance and the level of quality of the documentation and it can create more interactive processes between departments. It also brings out more cost-effective and simpler way to create the documentation and it also contributes more compatibility with various programs.

## 6.1 Desired benefits and achievements

The interviewees stated that from the quality and process point of view, the new software should lighten the processes by providing better management of the layouts and ease the maintenance of the documents, thus give better appearance through consistent manuals. This means better version control so that the newest information will always be in the place, easily found and always updated. From translation point of view, the use of a term bank should enable the use of several translators while keeping the uniform appearance. Internally the new software should reduce expenses, eliminate intermediaries, speed up the schedules, uniform results and externally raise the level of quality.

From training, maintenance and risk analysis point of view, it should be possible to publish, for example, tables, lists and worksheets separately. These documents should include technical information which is hidden from the customer, but visible for the case company or authorities. All this information should be possible to collect automatically straight from the product manual and possible to use in all possible material. Also diagrams should be directly linked to the material without changes. When selecting the software, following should be taken into account; features as a priority, after that license and maintenance costs, and the last the global approach.

## 6.2 Current situation

It can be said in general terms that the case company is facing the same challenges in today's documentation than other companies. As the amount of documents has grown enormously, it has a number of effects. Same content is written many times and layout varies, therefore, the quality may not be the best possible. Also translation process is time consuming because all manuals are not in a structured format. At the moment the material is collected mostly manually which is time consuming. Potential automated functions could save time in this case. From maintenance and risk analysis point of view, the listings (e.g. Excel sheets) should be also possible to make more structured way, thus save the creation time.

## 6.3 Technological environment and its factors

The interviewees stated that it is important that the new software is compatible with other software, for example with the product lifecycle management (PLM) software, as those are in great use in the case company, now and in the future. The possibility to add multimedia content (e.g. videos) to explain a security process should be good to have in general manuals as well as in the training documents. From training material point of view, service should be in the cloud and a license should be floating which can be transferred to another user, as specialists and training material producers around the world are making training material only time by time. When it comes to the producing the training material, PowerPoint or suchlike should be able to provide functions as follows: speaker notes, marking over the image by pushing a button and a link which includes either video file or PDF file which is possible to click open. In addition, it is important to clarify who implements the new version of the software and database and its management, including the access right management.

## 6.4 Requirements

The main focus of the research is the features required by the case company as they are the essential parts of the new software. Following features are the main requirements at the same time when they are the base of the purchase intention of the new software.

- Term management tool
- Review tool
- Approval chain + archive mark ups
- Language version management and language memory
- Publishing formats
    - Formats: PDF, PowerPoint or suchlike (for training), e-publishing
    - SCORM (web-based educational technology)
- Part publication possibility
    - Ability to select the protective measure; e.g. Warning!
    - Ability to select the paragraph, heading, task etc.

- An external manual should be able to be exported into CMS
- Image functions: adding, reuse and quality options
- Editor's features must be specified
    - Text editor
    - Darwin Information Typing Architecture (DITA) possibility
- Access right management
- Online login for occasional users
- Comprehensive user training, maintenance and consultation
- Optional: Simplified Technical English (STE)

In addition, one of the main requirements is the migration of the existing, currently widely used manuals, into the format of the new software. This issue and its costs must be determined accurately.

## 6.5 Social and cultural environment and its factors

The other documentation departments of the case company, in addition to Finland's department, are very interested in the matter as well. From their point of view, the software should offer the same possibilities for all departments and also possibility of using a cloud service. A good addition would be that the software's interface is possible to use in language of the country the software is used in.

## 6.6 Economic factors

As stated earlier, features are the top priority within the migration of current manuals and its costs and extensive user training. When it comes to the emerging risks, interviewees stated the following: Supplier's base for operations and support network world-wide and possibility of bankruptcy, problems with the software when it is mandatory to be able to produce manuals and the software links between third parties are all risks which need to be taken into account. Also implementation, migration and the period of transition can cause difficulties since the work is made partly by automatic commands and partly by human resources. One of the biggest risks is hidden costs if all the costs involved are not understood, thus they can increase unexpectedly

high. This is all about that the company understands the risks exist and is aware of them and ready for them.

### 6.7 Additional questions in case of appearing

The interviewees wanted to add the following: In relation to the creation of content, warnings and suchlike should have standard appearance throughout the modules. Also, it is good to clarify how the creation of spare parts catalogues works in the software, in case the software is going to be used for producing those as well in the future. It should be possible that the spare part pictures could be exported to CMS directly from PLM software.

## 7 MAIN RESEARCH: CONTENT MANAGEMENT SYSTEMS

The approach of the main research was fully based on the obtained information of the preliminary research. The requirements and desired benefits of the case company were the starting point for the examination of the software. As stated earlier, the research was limited to the software solutions in the market that were offered to the case company. From the initial study it was discovered a clear distinction between the various software, which is why the author chose four the most suitable ones for a more accurate investigation. It was obvious that the excluded software did not meet the needs of the case company as much as needed; therefore a more detailed study of them was not essential. The findings of the main research can be found in Appendices 3, 4 and 5. The research studied six areas of each software solutions where in some of the areas contained detailed specifications. These areas were the following:

As the software solutions are offered by different companies, it was essential to study the general information of the companies and the software. The research included the companies' main services, personnel, operations in Finland and abroad, and also the other companies that the companies use as references.

The program's user interface and its functions were the most important research topic. The author studied the user interface in general, its master language and compatibility with other software. The functions were studied including review tool, workflow, term management tool, image functions, plug-ins and extensions, STE and text editor. The software's publication possibilities and part publication opportunities were also an important part of the research area. The possibilities of importing an external manual into the CMS were studied as well as online log-in possibilities, the access right management, requirements in CMS, management of new versions, and whether the software is possible to get in cloud and/or on-premises service.

Translation functions, translation memory and version management, including the services offered from the software provider, were studied in detail due to the translations being in very large part of the documentation process. It was essential to find out if the software can offer a model of translation process which would facilitate and accelerate the processes of the case company.

Moreover, the possibility of creating spare parts catalogue and its functions was studied briefly in case the software is going to be used to produce those as well. User training, maintenance and consultation, also company’s other units around the world taken into account, were also studied, as they play an important role in the daily work. As the company has a large amount of existing documentation and it is to be transferred to the future software, migration based on the needs of the case company concerning its existing materials was studied in terms of the software provider’s know-how and working method of the matter, as well as its costs.

# 8 COMPARISON OF THE CONTENT MANAGEMENT SYSTEMS

Table 2. Comparison of the CMSs features

| Feature | Software 1 | Software 2 | Software 3 | Software 4 |
|---|---|---|---|---|
| Globalism | ★★★ | ★★ | N/A | ★★ |
| User interface | ★★★ | ★★ | ★★ | ★★ |
| Compatibility with other programs | ★★ | ★★ | ★★ | ★★ |
| Workflow / Review tool / Approval chain | ★★★ | ★ | ★★★ | ★ |
| Term management tool | ★★★ | ★★ | ★★ | ★★★ |
| Simplified Technical English (STE) | ★★★ | ★★★ | - | ★★★ |
| Publication | ★★★ | ★ | ★★★ | ★★ |
| Publication of a part of the content | ★★★ | ★★★ | ★★★ | ★★ |
| PowerPoint or suchlike for the training | ★★★ | ★ | ★★★ | N/A |
| External manuals | ★★★ | ★★★ | ★★★ | ★★ |
| Image functions | ★★★ | ★★★ | ★★★ | ★★ |
| Text editor | ★★ | ★★★ | ★★ | ★★★ |
| Cloud service / On-Premises | ★★★ | ★ | N/A | ★★★ |
| Floating license & online login | ★★★ | ★★ | ★★ | ★★ |
| Access rights management | ★★★ | ★★★ | ★★★ | ★★★ |
| Master Language | ★ | ★★★ | ★★★ | ★★ |
| Maintenance and consultation | ★★★ | ★★★ | N/A | ★★ |
| Translation | ★★★ | ★★ | ★★★ | ★★ |
| Translation memory | ★★★ | ★★ | ★★ | ★★ |
| Spare parts catalogue | N/A | ★★ | ★★★ | ★★ |
| Comprehensive user training | ★★★ | ★★★ | N/A | N/A |
| Support service in Finland / abroad | ★★★ | ★★ | N/A | N/A |
| Migration | ★★★ | ★ | ★★★ | ★★★ |

- Unsatisfactory ★ Moderate ★★ Good ★★★ Excellent

Table 2 shows the scoring of the software included in the comparison in terms of twenty-three (23) features. The comparison was fully based on the information collected from different software. There was no space for wrong interpretations as the comparison was based entirely on the facts. As stated earlier, the four most suitable software solutions were selected under accurate investigation and therefore it was found out that all of them fared relatively well in general with their many good characteristics, due to the fact that these had been initially found to be good software in the research made. However, the study discovered differences between the software and two of the four were chosen to be the most appropriate. The most suitable software (software 1) responded to a large extent to the case company's needs, and is therefore very possible to be the new software of the case company. The research resulted the following:

The software 1, which was selected as the most suitable, met a lot of the company's needs and requirements. The software is well advanced, all widely-sensitive software which serves customers in many different fields respectable. The translation services provided by the company are also well suited for business needs. The second-best performer, software 3, was also very comprehensive and took into account a series of matters and therefore offered a good correspondence for business purposes. Even though all the relevant information was not available, this software is also definitely the kind of which should be kept in mind. The two of the worst fared software, software 2 and 4, did not provide equivalence to the needs of the case company as much as was expected, and the features were not as wide as in other software. These software solutions were also good, but not as extensive as may be required at this stage. The solutions in question lacked some essential functions and it can be assumed that those solutions have not been developed to be as comprehensive as the best performing ones. The following describes more precisely, which were the features of the software the ranking was chosen according to.

***Software 1*** provider is a multi-national company, and together with the company that owns the software they are world leaders in their business fields and able to offer an extensive user training and technical support in different countries worldwide, as well as country-specific contacts. Their references were also well-known market leaders.

The software did very well in all areas when it comes to the user interface and the features of the software. It has a visual interface and good compatibility with other software and the company is building a specific PLM software connector as well. The software offers review tool with very good tracking and functions, and it is possible to log in via internet. Workflow is extremely flexible and it can be used as default or configured. The software also provides a patented interactive authoring memory with a very strong and intelligent search mechanism, which detects the existing content and translations made for it. Publication is made easy and it is possible to publish a broad range of publications for different purposes. For training material, the software offers an HTML-based slide show presentations and PowerPoint. Also a part of the content can be published and importing an external manual from almost any format is easy.

Image creation and storage takes place outside the program, but an image is easy to import to the software in which case it retains in its original resolution. In this way the software ensures that the linking and reuse is easy. A large number of specifications are available in the software (e.g. functions, plug-ins and extensions) so that the software corresponds to all the requirements of the case company. The software uses its own text editor which is why this feature did not receive full points. However, the software allows the importing and exporting DITA format, so therefore the text editor is not the determining factor in the scoring.

The software is available in the cloud and on-premises, in which case the case company shall be free to select the desired service. Floating license for the occasional user is also possible and administrator rights can be done for certain users and all the users can have their own folder permissions. The limitation of the software is that at the moment it has only one master language which is English and also that Photoshop and Illustrator are required in addition to the software. However, these features are not really in high importance, so the author does not see them very relevant, at that the new upcoming version will include additional features, for example, HTML5 as a default output and possibility of two master languages.

The company offers its own translation portal with many good advantages (e.g. no need to leave the software environment). In addition, the company offers different

translation service options for the case company which makes possible to select different translation agencies. The software has translation memories which are possible to import and export and they work in real-time and only the edited content is translated.

The software offers a function for spare parts catalogues, which however was not extensively studied in this research. Yet, the short demo of the function showed that it is a good function and very suitable for the use of the case company. Migration is one of the company's best know-how and import process can convert a wide range of file types. The migration can be done at one time or in small sections, depending on the case company's desire. The company also offers a way where large document sets can be processed by batches.

In relation to ***software 3***, some of the relevant information was not available during the study as the author did not have a single point of contact in the company. The biggest matters that could not be found out were the company's services around the world, maintenance and consulting, and support service in Finland and abroad. Still the software was chosen to be the second-best performer due to the following factors. The software provider company is ranked among the best of creation documentation and the software has a large number of users. The company’s references include market leaders and the case company’s Central European department as well.

The software did quite well when it comes to the user interface and the features of the software. The software offers wide range of functions and information regarding created files, including revision history. The release cycle and workflow with automatic procedures have very good functions and it is possible to do the proofreading via internet. The software also provides authoring assistance with terminology and sentence databases during a text creation. The user interface did not get full points as it is not as visual as it could be, but still it is clear and the functions are divided on the screen and can be saved as a workspace. The software offers connections to ERP, PLM and SAP systems, but these have not been clearly defined. The software offers a broad range of publications ready for use, including PowerPoint. One of the best features is that the software displays warnings, variety of tables, maintenance modules and prepared risk assessment with many functions thus software can be used in a

wide range of publications. It also enables importing of external manual from all common file formats.

The software has integrated image and media management for organizing all popular formats and their language variants. The software offers many add-ons and two text editors; one of them is software's own text editor which is why it did not get full points. Text editor is however based on well classified editor and in addition, the software has an opportunity of the use of DITA. Database and archive are located in the workstation or in a server directory in the network and all services can also be run in a virtualized environment. Administration rights are predetermined and administrator can define user and group rights and also user rights for customers if desired. The interface is available in English, German and French.

The software organizes the translations of all objects in the form of language variants and it offers different export types (e.g. urgent translation) with all of common formats. The software supports all translation memory systems which can work with XML data. It also holds translation statistics for every translation project and language neutral objects are never exported for translation. In addition, the software offers a simple translation tool especially for in-house translation.

The software offers bi-directional spare parts catalogues which enables the user to jump from a spare part to the linked documentation and vice versa. Parts lists, spare part descriptions, models or drawings can be automatically added to the software or updated via the comparison process. It also offers parts list based publishing which is based on ordered parts lists. The software offers migration function for the mass import of a large quantity of external documents into the software. Automatic functions are ready set to prevent wrongly marked files from being imported and different languages of the same content are created as language variants.

***Software 2*** provider has well-known market leaders as references but it has operations only in two countries and it is focused on full-service PLM system primarily. However, the company that owns the software is well-known multi-national company which has a large number of users. Companies together ensure user training and support around the world.

The software's user interface is close to Microsoft Office and it has embedded functions with Microsoft Office applications and also integrations with different software. It connects the product structure and the manual thus it is possible to use CAT data in the visualization easily. The software offers term base add-on with good functions. However, the approval and review cycle works through email and comments are to be written in PDF, which is not the best possible way when the task is not integrated in the software. Publication of a part of the content is made easy with selection rules and external manual is possible to import into the software from almost any format. Although the software can publish a variety of 2D, 3D and HTML publications, still its publications are limited to neutral formats. All the rest are possible to create, but they do not exist as default options.

Image functions are well developed and a lot of images from the same product can be made for different purposes. Interactive animations can be added to a function description and individual changes are also possible to make. The software offers good possibilities to choose a text editor among well classified editors in the market, including DITA possibility.

The software is intended for use in workstation and it requires client installation. Online login for occasional users is possible, but the content creation is not possible via internet. Administrator manages the software at the system level and access management can be based on variety of rules. The software enables the master language to be any, and the content is translated to the same language afterwards.

The software does not offer automatic functions related to the translation, but the files are sent to the translation agency via email by the user as well the software does not offer integrated translation memories but add-ons are handled outside of the software. The software offers 2D and 3D spare parts catalogues from the existing data in the software. It also enables 3D based animations and spare part catalogues. The company offers migration process, including conversion, design and implementation; however, the main responsibility lies on the case company.

***Software 4*** provider has multi-national operations and it provides a wide range of solutions related to technical documentation. The company has multiple market lead-

ers as references and it arranges user training in required countries but the content of the training has not been defined.

The software is based on another CMS solution. The user interface is clear, and it has integrations into many software solutions, but some of them are still in project phase. The company provides their own term management method, which is highly developed to meet the high-quality English content standards. The new version of the software includes release cycle with many functions, but still the review is done with PDF files via email. The biggest drawback of the software is the workflow which has not been developed. The software enables publishing of variety of publications including part publication, but still there are some shortages. External manuals are possible to import into the software, but the configuration must be done in the beginning.

Image function is easy and the image is created and then added to the text. The company offers another solution for technical illustrations. The software uses its own text editor, but it is also possible to choose from other well classified text editors. In addition, the company offers a wide range of solutions for different needs. The software is available in cloud and on-premises and it is possible to use the cloud and then change it to on-premises and also floating license is possible. Administrator defines the user settings based on group rights and restrictions. The content is possible to create in any language, but the interface is available in English and German.

The software offers integrated translation service with several languages but the function is manual process and the document is sent to translation agency via email. The software also offers additional function for in-house translation. Translation memory is handled outside the software. The company offers translation services as well, with experts' know-how, sophisticated translation management tools and simplified language techniques.

The company offers other service for producing spare parts catalogues. It is highly developed for creating, producing and distributing spare part information and it is possible to integrate into various software solutions. The service offers an online application for spare part information as well as printed catalogues. The company of-

fers migration service where planning takes place in cooperation with the companies and then the actual migration process is handled by the company.

As a conclusion, the software, which corresponds very well to the case company's needs, was found. In addition, the research was able to provide alternative option as well, in case the case company wants to investigate more precisely the software at issue. As a result, it can be said that the best corresponding software is a good choice for the case company as it is comprehensive, able to create synergy between departments including documentation, training, maintenance and product safety, and allows the production of materials in the context of which the case company has defined. It is good to reiterate that because the software is already comprehensive and complete, thus it is possible to accelerate development time and lower building costs by avoiding the need to create custom software. Hence, it is possible to focus directly on the user training and migration, and then to the business processes and their incorporation.

# 9 COST-BENEFIT ANALYSIS

During the research it was noted that any one of the software options would bring cost savings to the case company regardless of the chosen software. Hence, this chapter examines the cost benefits of the CMS in general. In order to be able to reduce costs in the future it is important to take these matters into account. The cost savings are an important reason to invest in the new software, although the initial cost may seem quite high. More detailed calculations applying to the case company can be found in Appendix 6. Today’s challenges and the overall situation of documentation, as well as today’s trends were studied in chapters 4.3 and 4.4, and the following chapter 4.5 studied the advantages of CMS. This information provides a good basis for the acquisition of the new software. However, the cost benefits presented in the following subchapters are also worth mentioning. The estimated percentages have been taken from the information collected and then harmonized. (Korpi 2014; Oja 2014)

## 9.1 Direct and Indirect Cost Savings

***Work intensification and improvement in quality***

- Content is easy to find and maintenance is effective (maintained in only one place for various publications)
- Content is shared across business units
- No formatting requirement after the implementation
- Brand changes for all the documentation possible to make within a day
- Reduced inefficient review meetings
- Reduced time of approval cycle
- Reduced human and process errors by using less manual activity by 90% (prevents possible litigations and compensations)
- Reduced manual preparation time by 40 to 60%
- Reduced maintenance work of images with the images' reuse by 80%
- Reduced layout modifications of publications by 100%
- Increased real-time collaboration
- Increased production volume by 50%
- Increased productivity due to reusability and repurposing of content by 80%
- Increased cost savings in the creation of operation and maintenance information up to 60%
- Increased the appearance and integrity of the documentation by 90% when production of the content and the layout work is differentiated

(Korpi 2014; Oja 2014)

***Other benefits***

- Content is under the company's management
- Full security and complete audit history (global legal liability, safety and compliance addressed quickly)
- Reusability of content supports quick mergers and acquisitions
- Reduced support costs as IT involvement is minimal (the only need is for security and for occasional SQL database support)
- Reduce the need to invest in specialized software development skills (either internally or via consultants)

(Korpi 2014; Oja 2014)

## 9.2 Revenue Drivers

- Up to 25% faster time to market multi-lingual content
- Improved operating margins with quick acquisition and material launch
- Increased quality, consistency and accuracy of documentation (COPQ)
- Increased sales due to localized content being available sooner
- Increased customer value with sophisticated documentation
- Increased business growth with included spare part information

(Korpi 2014; Oja 2014)

## 9.3 Translation Benefits

- Content is translated only once
- Only modified topics are translated
- Reduced costs of translations by 50 – 70%
- Reduced layout modifications by 100%
- Increased translation management and version management
- Increased the speed of language updates
- Decreased in word count up to 40% resulting in cost savings in translation and localization by using STE

(Korpi 2014; Oja 2014)

In conclusion, the Return on Investment (ROI) measures the relative profitability of capital invested by the company. In this instance, the Return on Investment is based on the following four areas:

- ❖ Efficiency in processes
- ❖ Faster review and approval cycle
- ❖ Reduced labor costs
- ❖ Reduced translation and localization costs

It should be taken into consideration that an investment of this magnitude, which ties up the capital of the company, but will not make a profit within the financial year,

can create problems in the estimation of key figures during the first few years of development. (Korpi 2014; Oja 2014; Website of the Solution Matrix Ltd 2014.)

# 10 CONCLUSION AND RECOMMENDATIONS

Referring to the entire study, the following chapter summarizes all the investigated matters during the study and reveals what the author has learned from the previous chapters. It also explains how the study objectives were met. The information of the case company is based on its situation and the organizational structure in the autumn 2014. Changes emerged after did not affect to the study.

The purpose of this thesis was to compare different CMS solutions and to find the most suitable one for the case company. The study also obtained information of the advantages and cost-benefits of CMS. The main reasons for the study were accelerating work efficiency and reducing costs and it was conducted through project-based research. In the beginning of the study, the theoretical part gave an overview of technical documentation, content management and CMS. It also helped the reader to understand today's challenges and trends as well as what advantages CMS solution can bring. It can be noted, that CMS is the most sophisticated tool for creating technical documentation as it will modernize the entire documentation process.

The empirical part consisted of two parts; preliminary research and main research. The preliminary research was examined by using semi-structured interviews and it gathered the information from the case company's side. The objectives of the main research were based on that information and the main research was examined by using the material from the meetings and suppliers.

The preliminary research resulted in the following. During the examination of current situation of the documentation, it was obvious that there is a great need for development. Moreover, it was discovered that the company has a relatively large number of requirements for the new software. These requirements could be divided

into the following areas: user interface and its functions, translation, spare parts catalogue, user training, maintenance, consultation and migration of current manuals.

The main research was fully based on the obtained information from the preliminary research. Four the most suitable software solutions were chosen for more accurate investigation. The comparison resulted in that two of the four software solutions were chosen to be the most appropriate. The study did not cause any inconsistencies as these software solutions responded to a large extend to the company's needs. It can therefore be concluded that the software corresponding to the requirements was found, and the author was able to provide the answer to the main question: *What is the most suitable CMS solution for the case company?*

In addition to finding the most suitable software, it was essential to study the cost-benefits of CMS. Cost-benefit analysis provided a good basis for the acquisition of the new software. The chapter was divided into three areas: direct and indirect cost-savings, revenue drivers and translation benefits. By summarizing the chapter in question, the Return on Investment was based on the following four areas: Efficiency in processes, faster review and approval cycle, reduced labor costs and reduced translation and localization costs.

As the final conclusion, the study resulted in the following. In the developing world, it is important for a company to be up to date with the latest software solutions. As the documentation is one of the company's core competences and not worth to outsource, it is advisable to have a software that meets today's needs. This thesis provided a well suited CMS solution choice for the case company as well as cost-benefit analysis of CMS in general.

*Recommendations*

The author would like to give recommendation to the case company on how the project could continue. Once the company has made the decision to acquire the software, the author recommends building a test environment of the software, where an appropriate number of the company's documentation files would be transferred into.

By testing the software in practice, the company could ensure the functionality in practice, as well as the perfect suitability for the company.

Moreover, the author would like to give suggestions for further research. The author recommends the people in the project to study the book called *Content Management Bible, 2nd edition*, written by Bob Boiko. Boiko is a former technical documentation specialist, CMSs implementation leader and now CMS strategy consultant. He gives a unique mix of practical experience, explanations and advices. In the part *Doing Content Management Projects*, which is the most directed to the managers who are in charge of a content project, he addresses the process which is exactly in the order in which everyone should undertake any CMS project. The book can be found in libraries. Also, I would recommend the people in the project to look at the studies made about CMS by European Association for Technical Communication – tekom Europe e.V. so that they remain up to date concerning the CMS discussions. Studies can be found on http://www.technical-communication.org.

*Self-assessment and final words*

The topic of the thesis came to be an essential matter in documentation department during my trainee period. As I had learned from my work that the documentation is in need of reform, I became highly interested in the matter. The opportunity to make this thesis for the case company through project-based research was offered to me in late summer 2014. From my point of view, the project was really interesting from the beginning to the end and it was a huge learning experience for me. It taught me a lot of new about the subject as well as about the corporate world.

I would do this project again, or alternatively I would like to do this kind of project in the future as well. This project raised my knowledge highly of the matter in question and also that I now understand that I am capable, and most of all, eager to do this kind of projects in the future also. I am very pleased in my own invest in the case and I sincerely believe that the both parties, me as well as the company, achieved the desired goals.

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APPENDIX 1

# ***Semi-structured interview***

Themes will be modified according to the interviewee

***General***

Defines the interviewee's relationship with the topic and the importance of the topic for the interviewee

***Desired benefits and achievements***

Defines interviewees own opinion of the achievements and expectations (The company as a whole, daily work and writing and translation process)

***Current situation***

Defines the current situation of the documentation

***Technological environment and its factors***

Defines the company's information technology needs

***Requirements***

Defines the critical factors from the most important to the least important (The company as a whole and documentation department)

***Social and cultural environment and its factors***

Defines the needs and influences of the company's different locations

***Economic factors***

Defines the importance of costs and personnel

***Additional questions in case of appearing***