

Implementation of an Integrated Inventory Management System

Carpelan Cosmetics Finland Oy

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BACHELOR'S THESIS

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Abstract

This thesis investigates the implementation of an integrated inventory management system. The purpose of the thesis is to produce a recommendation of a system that can integrate with the case companies existing systems and provide integrated inventory management possibilities. An investigation into approaches and systems was conducted to fulfill the end-goal.

The approach to the methodology in the thesis was to use qualitative research methods. Trial and error, and interviews to name a few are key research methods used to shape a result. The alternatives found are presented in the thesis, as well as the final recommendation. Comparisons between the alternatives at hand were conducted, and a suitable solution considering all requirements was produced.

Both the approach and system choice are affected by several factors. Considering the company's requirements and wishes is vital for the implementation of a suitable proposal. The alternatives at hand need to be carefully compiled and compared. Furthermore, the approach of the implementation is of importance to safeguard current company operations and minimize risks. Based on the findings in this thesis the Netvisor ERP system was recommended since it fulfills the requirements and needs of the case company.

Language: English

Key words: inventory management, integration, order management

EXAMENSARBETE

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Abstrakt

Detta examensarbete undersöker förverkligandet av ett integrerat lagerhållningssystem. Syftet med examensarbetet är att producera en rekommendation för ett system som kan integreras med existerande system i det uppdragsgivande företaget och samtidigt ge möjligheter för integrerad lagerhållning. En undersökning i tillvägagångssätt samt eventuella system genomfördes för att uppfylla det slutliga målet.

Tillvägagångssättet för metodiken var att använda kvalitativa undersökningsmetoder. Försök och misstag samt intervjuer var några viktiga undersökningsmetoder som användes för att forma resultatet. De funna alternativen presenteras i examensarbetet, samt den slutliga rekommendationen. Jämförelser mellan alternativen till hands gjordes, samt en slutlig lösning producerades som beaktar alla krav.

Både tillvägagångssättet och systemvalet påverkas av ett flertal faktorer. Företagets krav och önskemål bör beaktas och är avgörande för förverkligandet av ett lämpligt förslag. Alternativen till hands bör noggrant sammanställas och jämföras. Förutom detta är tillvägagångssättet för förverkligandet viktigt för att kunna säkerställa företagets nuvarande verksamhet och förminska risker. Baserat på fynden i detta examensarbete rekommenderades ERP systemet Netvisor eftersom det uppfyller kraven och behoven från uppdragsgivande företaget.

Språk: engelska

Nyckelord: lagerhantering, integration, orderhantering

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Tiivistelmä

Tämä opinnäytetyö tutkii integroidun varastohallintajärjestelmän toimeenpanoa. Opinnäytetyön päämäärä on tuottaa suositus järjestelmästä, jonka voi integroida työn tilaajayrityksen nykyisiin järjestelmiin samalla kuin se tuottaa mahdollisuuksia integroituun varastohallintaan. Lähestymistapoja ja järjestelmiä tutkittiin saavuttaakseen lopputavoitteen.

Lähestymistapa menettelytapoihin opinnäytetyössä oli käyttää kvalitatiivisia tutkimusmenetelmiä. Yritys ja erehdys, sekä haastatteluja olivat tärkeitä käytetyt menetelmät tuloksen saavuttamiseksi. Löydetyt vaihtoehdot esitetään opinnäytetyössä, kuten myös lopullinen suositus. Vaihtoehtoja vertailtiin ja sopiva ratkaisu saavutettiin harkiten kaikkia vaatimuksia.

Sekä menetelmiin että järjestelmiin vaikuttaa moni tekijä. Yrityksen vaatimukset ja toiveet ovat ratkaisevat sopivan ratkaisun toimeenpanoon. Vaihtoehdot on huolellisesti koottava ja vertailtava. Lisäksi toimeenpanomenetelmä on ratkaiseva yrityksen toiminnan suojaukseen ja riskien vähentämiseen. Löydöksen perusteella suositukseksi muodostui Netvisor ERP koska se täyttää työn tilaajan vaatimukset ja tarpeet.

Kieli: englanti

Avainsanat: varastohallinta, integraatio, tilaushallinta

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List of Abbreviations

API = Application Programming Interface

BOM = Bill of Material

CCF = Carpelan Cosmetics Finland

CEO = Chief Executive Officer

CRM = Customer Relationships Management

ERP = Enterprise Resource Planning

GTIN = Global Trade Item Number

ID = Identifier

MRP = Material Requirements Planning

POS = Point of Sale

SKU = Stock Keeping Unit

SME = Small and Medium-sized Enterprises

USA = United States of America

1 Introduction

This thesis is written by request of Carpelan Cosmetics Finland and processes the implementation of an integrated inventory management system, this to reduce the number of unfulfilled orders and provide improvements to the existing inventory management processes.

The thesis maps the different alternatives, approaches, and eventual system differences that needs to be considered for a successful integration. An integrated inventory management system is something that positively affects both statistics over fulfilled orders, but also customer satisfaction.

Contact with the company was arranged in the autumn of 2022 regarding thesis work, and after a company visit containing a survey of the location and the at the time used systems, this thesis came to life.

1.1 Background

Carpelan Cosmetics Finland delivers products to warehouses, grocery store chains, pharmacies, beauty-salons, hair-salons, wholesalers, and private consumers. The private customers are primarily served through the online store. Bigger clients use their own systems, or other ways of ordering that the supplier, in this case Carpelan Cosmetics Finland are expected to use.

What is missing in the current order- and delivery management is an extended integrated inventory management system. In today's world it is of large importance that the statistics over fulfilled orders are next to none. Warehouses and large grocery store chains have the possibilities to choose from a large number of suppliers, they also have large influence over delivery terms and pricing. This means that smaller companies such as Carpelan Cosmetics Finland need to do their very best, to have the possibility to continue supplying these big warehouses and grocery store chains with their products, without needing to lower their prices or agree to less inferior delivery terms.

It is now in Carpelan Cosmetics Finland's best interest to improve the current fulfillment statistics, and the first step is as suggested an integrated inventory management system.

1.2 Purpose

The purpose of this thesis was to investigate the possibilities for an integrated inventory management system. The inventory management system should be possible to integrate with existing systems while offering features that can be expected of such systems today. Inventory and sales statistics on for example product level that could tell sales figures based on the decrease in inventory balance.

The information that was processed in the investigation was mainly coming from employees at the company, some information also from the suppliers of the different systems that were used at the time. Any information searching was conducted mainly using the Internet. Trial-and-error is a key method in this thesis, since accurate information or experiences that are adequately case specific is not viably available. Testing and validation of alternatives are conducted to the extent they allow.

The result was a recommendation on how Carpelan Cosmetics Finland should implement an integrated inventory management system, also how it should work in practice. Based on a matrix of possible, working solutions that satisfy the requirements. If time permits implementation and testing of the result.

1.3 Delimitation

Due to Carpelan Cosmetics Finland being suppliers to many different types of clients, there are several different systems they need to use. The scope included two different systems, which needed to work together in an integrated inventory management system.

The implementation of the result was also defined as an investigation, but if time permitted a few products could be inserted into the system for the purpose of testing the inventory management system. It could be assumed that if one product functions as needed, the others will as well since the attributes are the same.

The recommended solution should either be a combination of E-Commerce and inventory management, or an ERP system that simultaneously can take care of other business needs other than inventory management while at the same time combining the at use systems or platforms.

The scope of investigation is limited to information attainable on its own without requirement to involve sales representatives or ask for quotations on systems due the additional steps it imposes on the process for both parties.

1.4 Disposition

The first chapter presents the background, purpose, and delimitation of the thesis. Additionally, it introduces the reader to the thesis subject and what the thesis processes.

The second chapter introduces Carpelan Cosmetics Finland as a company. In addition, it introduces CCF methods of sales, and the present inventory management situation.

The third chapter presents the relevant theory used in this thesis. The theory chapter contains all theoretical pillars on which the conduction of the thesis is based.

The fourth chapter contains the methodology used in this thesis. Every type of method is presented both in theory and in practice. The way-of-working and processes are described, and the entire process is visualized both in text and in pictures.

The fifth chapter presents the result or conclusion of the thesis. The result or conclusion is the end-goal of the whole process and is based on all existing material before this chapter in the thesis.

The sixth chapter discusses the thesis. Initially, the thesis result, and after this the thesis in general. Furthermore, it contains the authors thank you to important people involved in the thesis.

2 Carpelan Cosmetics Finland

Carpelan Cosmetics Finland which are active within the beauty industry was founded in the year 2003 by Jutta Carpelan. The company started on a small scale in the owner's house and has with time grown to a company with 5 employees and a turnover of 499,000€ in the year of 2021. Carpelan Cosmetics Finland started by importing products from the international beauty brand Youngblood in the year of 2002 when the first contract was signed. In the year of 2012 the company evolved to its current company form, a stock corporation. The company has its headquarters and warehouse in Kevlax, Korsholm, they also have a hair-salon within the same company named Salon Carpelan Cosmetics which also is in the same building.

The company mainly functions as an importer and wholesaler of many international brands within the beauty industry. Large, known brands are for example Youngblood, E.I.f, and Tweezerman, all from the United States of America or USA. In recent years the demand for low-price beauty products has risen, and in response to the demand the company started selling several large brands such as Uroda, BI-ES, and Lovely all originating in Poland.

Besides of business-to-business trading, private consumers can also buy products through the online store, or the physical store in Kevlax.



The logo for Showstopper is a solid black rectangular box. Inside the box, the word 'SHOWSTOPPER' is written in a white, bold, all-caps, sans-serif font.

Figure 1 - Carpelan Cosmetics Finland and Showstopper logos (Carpelan Cosmetics Finland, 2023)

2.1 Methods of Sales

This sub-chapter contains internal information.

2.2 Present Inventory Management Systems

This sub-chapter contains internal information.

3 Theory

This chapter contains relevant theory for the thesis subject. Mainly gathered from literature study, case studies, and studying online sources for experiences and expertise within this field. The chapter also contains reflections of the theory upon the current thesis subject, to allow for an understanding of the whole process of the thesis. The chapter processes inventory management as a core business component, additionally different possible procedures are processed.

3.1 Inventory Management

Inventory management is a key component in the assembly of core business functions. Inventory management as a whole dates back to the beginning of humanity, while the concept in theory stays the same, the tools and ways of working has developed from primitive methods to tools built upon for example artificial intelligence. IBM defines inventory management as a critical part of the supply chain, which main goal is to have the right products in the right place at the right time (IBM, 2023). Since inventory can be a companies most valuable asset, as in this case, it is vital that the inventory is managed in a profit-inducing way while ensuing the day-to-day operations flow as effortlessly as it can. For a product-selling company with no actual manufacturing the inventory management process is a bit less involving. The want-to-know facts in a selling business include mainly the stock levels and product specific statistics as most sold product, least sold product, updated product, obsolete products, and so on.

Inventory management as a technology started with the evolution of bar codes. It started with the launch of the Universal Product Code or UPC in April 1973 by IBM. Bar codes had been invented earlier in other forms and designs, but the technology was too expensive at the time. While bar codes in themselves were useful, the full potential was available in the 1980s when personal computers became more affordable and widespread. Inventory control computer software were developed in the 1980s and allowed businesses to streamline and revolutionize the logistics process. (Dolinsky, 2023)

The first inventory management systems were proprietary, meaning that the companies that created them created them for themselves and their own usage and specifications.

This led to the development and no sooner than later software developed for the masses were available for purchase for any company interested (Hopstack, 2022).

Inventory management systems today can be found in many different business applications today. Ranging from E-Commerce platforms to ERP systems. Independent or semi-integrated systems are also available. (Uzialko, 2023) The next few chapters will process the different platforms where inventory management is possible for the case in point.

3.2 Inventory Management in Companies Today

In this chapter inventory management as a business function is investigated from the point-of-view of how it is built up or used. The matter will be presented from a practical standpoint. How is inventory management implemented in practice in companies today?

Inventory management has moved from a manual type of business function management to a digital or in some cases automated type. Due to the older manual methods involving humans and thus allowing the possibility of human errors, the need of computerised software handling the matter has grown. There are multiple ways of ensuring the stock of a company is kept at an optimal level. (Rickerby, 2022)

Methods used today include a multitude of software that can be used for inventory management, both basic and advanced. One possibility is to use spreadsheets for keeping track of the inventory. Spreadsheets allow for conducting a better stock take and the possibility to identify where improvements can be made regarding for example product performance. (Rickerby, 2022) One example of such a spreadsheet software is Excel by Microsoft.

An effective software or tool for management of multiple business functions including inventory management is enterprise resource systems or ERP systems. ERP systems combine multiple business function overviews into one and allows for a flow of data between them. The combinations of business functions can range from inventory management and accounting to procurement and supply chain management. (Rickerby, 2022)

Further tools for inventory management is E-Commerce platforms and the functionalities built in or configurable into them. One e-commerce platform allowing connection with inventory management is WordPress. (WordPress, 2023) This platform will be further discussed later in this chapter.

3.3 Enterprise Resource Planning Systems

Enterprise resource planning, or ERP is a system that collects, processes, and automates business information and processes to allow users to work towards a centralised database. ERP as a concept came into life first in the form of Material resource planning, or MRP. This was designed for manufacturing companies, and by time has developed into systems accessible, and usable for almost anyone. (McCue, 2022)

Explaining ERP shortly, it builds upon different modules used for different business core functions. These modules are fed information, which then can be communicated to, and from different modules into others. The data is contained in a central database, which is used as a foundation for the information viewed in the different modules. (McCue, 2022)

The modules can be operated by different departments, for example purchasing and warehouse. Allowing both to co-operate within one system to process an items route from initial purchase to delivery and warehousing.

Today ERP systems are run either locally on a server or servers, or in the cloud. When a company finds that excel spreadsheets or non-integrated separated systems are hindering growth or inhibits information sharing within the company, ERP systems are the way to go forwards (McCue, 2022).

3.3.1 Approaches to Building an ERP System

There are several ways to approach an ERP system procurement and implementation. Existing and future users of ERP systems have different needs to be catered for and thus there are several different ways to implement an ERP system, but also different types of ERP systems. The primary ways of building an ERP solution are the following. (McCue, 2022)

One option is to purchase software from different vendors which individually cater for all requirements. This allows for customization but requires more initial work and integration.

Purchasing individual software for each core business function and then connecting them with an integrated and centralized database results in an ERP system. For smaller and mid-sized companies this might be a bit too large to chew, due to the required sizable resources within departments handling Information Technology. (McCue, 2022)

Purchasing ERP components from different vendors is sometimes called building “best-of-breed” ERP systems. Procurement of the best individual modules or components result in a need of integration which can be expensive and challenging, but not impossible. This type of approach is mainly used for niche products and needs. (Miller, 2019)

Another option would be to procure a unified system from one vendor, allowing for a pre-integrated system that is designed to work with all the modules from the beginning. The implementation of an ERP system of this type also allows for easier implementation due to the common user interfaces for all the users. (McCue, 2022)

Single-vendor ERP systems are easier to maintain due to the common user interface and the common architecture. Due to the ERP originating from one vendor only, support can be better since the needed experts can be found under one roof. (Miller, 2019)

The last option represented is developing an ERP system in-house. This can be the perfect solution for many but requires an understanding of the whole process that is needed for this to become successful. Since developing ERP systems is not the core competency for companies contemplating undertakings like this, the required resources and investments in many cases might outweigh the result. Support for in-house solutions is in-house and getting support from other instances is not an option unless it builds on some commonly used architecture. (Canes, 2023)

3.3.2 Approaches to Implementing an ERP System

Selecting the correct way of implementing an ERP system is both important for reducing errors in implementation, but also to ensure costs stay within reasonable amounts. The choice of the implementation process must suit the existing equipment. Failing in this department results in waste of money since the software purchased can not be used. (Srivastava, 2020)

Deploying the chosen ERP system company wide at once is one way to go about it. Setting a company wide go-live date and deploying it all at a chosen time allows for a lower cost of deployment and less training of users. Planning of the deployment is required since all functions are to be transferred and ready to go almost instantly. The margin of error is small, and the risks are higher due to any changes being irreversible. (Srivastava, 2020)

Phasing the system out, one core business function at a time is another way of implementing a new ERP system. This allows for a higher margin of error than the previous approach, and the implementation of one part may allow easier implementation of others if there are subsequent errors or issues that arise. It also allows for less pressure on the implementation responsible administrators. Disadvantages of this approach is mainly regarding time since it takes longer to implement, and the end users may feel taxed since changes are made more often. Synchronisation issues between information may also arise since there is both new and old systems at use. (Srivastava, 2020)

Implementing the new system while running the old systems in parallel is a way of minimizing risks in the implementation process since the old systems can be relied on in case of errors with the new system. The disadvantages of using two systems in parallel is mainly synchronisation issues and higher costs due to the need of relying on experts throughout the process. Issues in inserting data might also be of question due to two systems being ran at once. Advantages in going this route are the lower risks associated with parallel implementation, the users can also learn the new system in conjunction with using the old system. (Srivastava, 2020)

The choice of methodology of the ERP system implementation is to be determined based on the companies experience and resources for the project. For any in-experienced end-users and administrators, a turn-key solution with high involvement by the vendor is recommended since they can build the system and advice the to-be users as they advance. (Ultra Consultants, 2023)

3.3.3 Implementation of an ERP System in a Small Company

An investigation of current and past implementations of others regarding ERP systems in small and medium sized companies, abbreviated SME companies, was conducted to base the feasibility of implementing such a solution. Several similar cases were investigated and

used for guidance in the question, mainly from the standpoint of what is important to investigate, analyse, and conclude. The solution proposed in the case of an ERP system would likely differ since it needs to be done on a case-to-case basis, however the procedures can be used from another case if suitable.

The first case investigated presented an investigation into the implementation of an ERP system for a SME company with production, emphasizing inventory management.

Several options of subscription type ERP system services were investigated, benchmarked, and analyzed. The tools recommended for use were proposed due to their reliability, low down time, and security to name a few. The proposed ERP systems were based on questionnaires and interviews with employees of the company to find out what attributes, characteristics, and product features were needed or wished to be available. (Shah, 2021)

From the range of ERP systems, the author proposed, it had at the time not been chosen if the company would adopt and implement any of the systems. The systems proposed were found to be compliant with set attributes especially emphasizing inventory management. (Shah, 2021)

This case underlined the need for proper investigation of the companies needs before determining which end to start at. Basing the investigation on customer needs, requirements, and wishes is to be regarded as a suitable approach. There are likely available several suitable options from this point on, but further investigation into other impactful factors is needed.

Another case further underlining the need to tailor the solution based on the case companies or customers needs and requirements presented an investigation into two different ERP software and their suitability for the case. According to A. Orlow a conclusion could be drawn by conducting a deep analysis and investigation of the proposed ERP systems and how they fit in with the case companies' requirements, needs, and wishes. Using a list of requirements supplied by the case company, contacts were made to suppliers of ERP systems for them to estimate or determine if their solution was suitable based on the provided requirements list. (Orlow, 2018)

Further the author conducted internet research in the form of company websites, reviews, discussions, and other forms of information finding (Orlow, 2018). From this it can be

gathered that the wider the picture you are able produce, the more likely it is possible to suggest a suitable solution for any case in hand.

The author had determined that in theory both investigated systems would be suitable, but it would require even deeper analysis and possibly even implementation to even be able to determine if it works in practice. It was also determined that suppliers answered loosely to several questions, not actually answering them deeply enough to make a conclusion on that part of the scope. Any usability or utility was generalized and thus required further research in the form of actual product reviews or inputs supplied by users of said ERP systems to be able to build a better picture of the system. (Orlow, 2018)

Implementation of an ERP system in a SME company is not an easy task as can be seen from the cases above. It requires a large amount of research, and the requirements need to be explained and concretized to a large extent to minimize the possibility of errors in the choice of solution.

3.4 E-Commerce Platforms

Inventory management as part of e-commerce is an ever-growing combination of core business components. Due to the large growth in e-commerce the platforms used for the e-commerce interfaces contain a large offering of built-in or configurable options that allow for expansion within the set frameworks. One example of this that is connected to the case is WordPress allowing inventory management with plug-ins or add-ons, so called extensions (WordPress, 2023).

3.4.1 WordPress

Carpelan Cosmetics Finland's online store is built upon the platform WordPress. This is a rather widely used platform for smaller online stores, where importance lies within user-friendliness and possibilities for adaptation and modification. WordPress is one of the most popular platforms for online stores and websites. According to the official WordPress website 42% of the "web" is built using WordPress. They have customers ranging from bloggers to Fortune 500 companies, for example the online news site CNN uses WordPress. (WordPress, 2023)

Since adaptation and modification is important for the users of this platform, there are a lot of options for doing this. Mainly due to the possibility to use third party components or add-ons called plug-ins. There is a large library of so-called plug-ins that contains everything from creating an entirely multi-lingual site to visual modifications and themes. (Fitzgerald, 2022)

The current site is optioned with a basic WordPress originated built-in inventory management system. The system allows for some basic inventory management and stock keeping, not to forget a useful range of product attributes. It is lacking basic inventory statistics though, and there is an ever-growing problem with false product reviews that mainly can be classed as spam or phishing attempts.

Due to the large library of plug-ins, there is a possibility that there exists objectively better or more feature-filled components that could be taken into use in this case, thus creating the possibility to use the integrated inventory management component for application wide use within the company. More on this subject later.

An important aspect within today's society is consumer and corporate security. Customer information is under no circumstances to be knowingly or unknowingly put into the wrong hands (Bicknell, 2023). Any important information that could contain business secrets or important strategic information is also to be kept secure. This is where the usage of the WordPress platform becomes two-pronged.

According to an open-source security whitepaper last updated by Patchstack in early 2023 the security of the WordPress platform can be lacking depending on configuration. The whitepaper highlights especially the plug-in usage to be dangerous if not used and maintained correctly, and any outdated or abandoned components might pose serious security concerns. Patchstack's statistics contain numbers of recorded confirmed bugs security bugs, and the number for 2022 was 4528 confirmed bugs. It was found that 26% of the total number of security bugs never received any fix, this to the date of the study. It is however suggested that further use of WordPress generally is safe and the general trend within the WordPress community is going in the right direction, safety concerns are tested and fixed much more widely than before and the awareness has grown significantly. (Patchstack, 2023)

3.4.2 WordPress Combined with Inventory Management

WordPress offers the utmost basic inventory management component with product descriptions, product attributes, stock-levels, back-order, and customer purchase thresholds using no additional plug-ins or extensions. Additional expansion capabilities within the platform allows for second- or third-party plug-ins that widen the capabilities of the original platform.

3.4.3 Using WooCommerce for Inventory Management

WooCommerce is a widely used plug-in for widening the e-commerce feature availability (Duò, 2022). It is in many cases the base plug-in for any WordPress user that uses the platform for e-commerce of any form. This plug-in is already in use in the case companies' e-commerce platform as it stands.

WooCommerce allows for the possibility to track inventory and stock as a built-in feature. The feature-base is possible to expand further with additional plug-ins to the WooCommerce plug-in. WooCommerce is free and allows for decent but simple inventory management features. The main disadvantages range from not really being suited for manufacturing companies and there is no possibility to track stock in different locations. (Duò, 2022) The aforementioned disadvantages are in this case not applicable since CCF operates in one location and do not manufacture anything.

WooCommerce built-in features are usable from the get-go and allow the user to implement basic inventory management without any frills. A selection of features below:

- Stock-level notifications
- Out of stock notifications and hides product from online store
- Stock quantity and display
- Product attributes, SKU, descriptions, measurements
- Bulk or individual stock management
- Stock status reports

The basics of inventory management are available. It is also possible to export the inventory data to other systems. Using WooCommerce as base for other plug-ins that work in conjunction with this is the way to go if any more features are required. The author of the blog post referenced recommended certain plug-ins for widening the WooCommerce feature-base (Duò, 2022).

3.4.4 Plug-Ins for Advanced Features

WooCommerce in conjunction with a few well-chosen plugins becomes a more powerful tool. Building an inventory management system for E-Commerce in the WordPress platform might seem like a volatile solution, since maintaining functionality relies entirely on second- or third-party suppliers of plug-ins that may or may not update their work further. Further noting the possibility of integration issues between plug-ins (Morin, 2023). The next sections present features that can be added using plug-ins, many plug-ins may allow this, and this is a selection of examples.

Katana is a plug-in that allows advanced inventory management features to be integrated into the WooCommerce plug-in in WordPress, while at the same time allowing integration to hundreds of other platforms and business tools. Katana also supplies an API so any user can make their own integration. Katana allows for syncing between the WordPress platform with its own system. (Duò, 2022)

Katana offers multiple features, the application seems to be aimed at manufacturing companies. Katana's product feature catalogue states that powerful and simple features are offered, in conjunction with a supplier that offers support and integration help. Katana's most important features are the following:

- Live inventory management
- MRP – Material requirements planning
- Cloud accounting
- Production planning
- Purchase order management

- Sales order insights

Using Katana in conjunction with WooCommerce widens the feature range. Katana further offers a 14-day trial period for feature testing (Katana, 2023).

The next plugin is Atum Inventory Management. Atum is a development of the features WooCommerce offers and allows the user a free advanced e-commerce inventory management solution. Atum also offers paid premium add-ons to the plug-in that further add functionalities to the original plug-in. (Duò, 2022)

Atum offers multiple features that are not available in the WooCommerce stock plug-in. The additional Atum features to the WooCommerce feature list is the following:

- Supplier data
- Purchase orders for external orders
- Inbound stock
- Sales statistics
- Advanced product and information search
- Editing displayed dashboard items
- Product locations

Atum is free of charge and can be implemented at any time. Further premium plug-ins, if need be, require payment. Atum offers integration to an extent (Stock Management Labs, 2023).

Furthermore, there are possibly many more plug-ins that may or may not be suitable. The above list of plug-ins exists to showcase the possibilities with plug-ins and is not as such a base for any drawing any conclusions. To the extent of this thesis any plug-ins with smaller support bases or less users will not be investigated due to the volatility in functionality and reliability they may induce.

3.5 Spreadsheet Software for Inventory Management

Using digital spreadsheets as an inventory management software is a method that may apply for recently began operations or smaller companies. The most prominent spreadsheet software used for this type of inventory management is Excel by Microsoft. Spreadsheets allow for basic logging of inventory information. (Henry, 2021)

3.5.1 Approaching and implementing Spreadsheet Inventory Management

As Excel by Microsoft is the most prominent spreadsheet software, this will be investigated only. Excel allows the user to shape, construct and maintain the chosen way of implementation entirely, and the result of the process is heavily user dependant. The approaches to building an inventory management solution using Excel will be presented next.

One approach is building an elementary Excel spreadsheet inventory management system. The structure is built with product categories as columns, and products can be added with any attributes needed from SKUs to batches. The range of attributes possible is vast, and the detail of the system depends entirely on the user. The quantities can be adjusted with each sale allowing for elementary inventory keeping. (Henry, 2021)

Another approach is using more advanced methods within the Excel spreadsheet software. Visual Basic for Applications, or VBA, allows the user to write commands to automate a range of functions. The spreadsheet inventory management system can contain for example stockkeeping, quotation creation and inventory tracking on top of all basic product attributes. (Nguyen, 2020)

The solution created by T. Nguyen involved creating a dashboard in the spreadsheet which accommodated all the functions required. It allowed for creating bill of materials or BOMs, orders, components, quotations, delivery notes, and order identifiers. The BOM function allowed for cost calculation using pre-defined formulas and each BOM was unique and combined with an order since the products were made according to customer requests. (Nguyen, 2020)

The stockkeeping was conducted using a master data sheet containing product information and quantities. Further back-ups were made automatically allowing for a safer operation in

case of issues. The author had also implemented safety stock level notifications and restock level considering lead time. Orders were created based on the BOM and allowed for removal of stock from the stockkeeping at the time the order was created. (Nguyen, 2020)

Using Excel for inventory management allows for basic, or more advanced solutions depending on requirements. The addition of VBA allows for partly automating simple functions of the solution (Nguyen, 2020). Excel as inventory management is often considered limiting, and growth hindering from a certain point on (Henry, 2021).

4 Methodology

This chapter contains the explanations of which types of empirical methods were used in this thesis, and how these were used to make sure the result was accurate and satisfactory. Since the case in hand requires a tailored solution, there are no exactly identical cases or experiences conducted or experienced by someone else. The wished upon integration of two different systems, to be used in conjunction by the inventory management system, is not standard procedure. This type of work required qualitative research in the form of trial-and-error, interviews with competent employees within the company, literature review, case studies, and Internet research. Further, the chapter processes the courses of action taken when conducting the thesis and shaping the result.

4.1 Determination of Procedure

The whole process began in conjunction with the thesis being commissioned. The planning of the thesis work started with a meeting where the current inventory management, inventory layout, inventory amount, and inventory attributes were discussed. It was determined that the large quantity of products do not necessary require an advanced system to handle them, due to the mostly very similar attributes.

The next topic became the order management systems, and the online store, all of which are necessary and vital for the company and may not be exchanged under any circumstances at this point in time. One of the systems is also required by customers of the company.

The procedure was quickly determined to mainly be built upon trial and error. There are many ways of conducting this, but there may not be many ways it will do what is expected, what is wished upon, or even work in the end at all. Due to the current usage of systems that are different in most aspects, there will likely be some sort of compromise that must be found by the person conducting the work in the first place.

The information gathered searching the Internet will be used as a guideline. There are many possible issues that can arise when trying to build something upon online systems that can be updated or changed as often as every day. With the guidelines it is possible to avoid common problems for example concerning safety of the system.

4.2 Trial-and-Error

Trial-and-error are elementary parts of science in which knowledge and experience is acquired (Meer, 2020). While trial and error may not be the most scientific method as such, it allows cases where information is neither certain, nor available to move forward. The end goal of most of trial-and-error cases is not to re-invent the wheel, more so finding a solution or sometimes a compromise. Imminent need of solutions and cost-saving allows for more primitive methods to be used, such as trial-and-error.

In this case trial-and-error was used to find out the limits, and possibilities of the systems used today in Carpelan Cosmetics Finland. Using this it was determined what the systems allow the user to build and maintain in the form of to the system, external build-ups. The combination-usage of different systems impose multiple restrictions mainly in the department of possible results, and thus again repeating the need of finding the solution that work in practice.

Testing of possible solutions was conducted in the following way. Firstly, the WordPress platform was investigated, and any integration possibilities were tested in the sense that what happens when you try to export or import data to and from the WordPress platform. A similar exercise was conducted with Golli, resulting in information of the limits imposed of the existing software and what can be integrated with them. More on these later in the chapter.

Investigating the possibilities within Golli resulted in the finding that it in theory may be connected into any system that works with a certain protocol. Furthermore, they offer the possibility to connect to an ERP system called Netvisor (GS1, 2023). Netvisor is a cloud-based ERP system that depending on subscription type allows for different types of functions, the most premium one includes inventory management (Netvisor, 2023a).

Trying to extract and import data using spreadsheet-based interactions into Golli resulted in failure. While Golli maintains some product attributes, the stock-levels of products are not possible to track. This means that Golli in itself offers no way of inventory management, and its features has possibly been misunderstood a bit by the company. Golli only keeps track of product attributes for the customers use from a logistics point of view, and additionally allows for label printing and order confirmations and such for the supplier.

WordPress integration was found to be a possibility in many ways. By extracting and importing data it came clear that using spreadsheet-based inventory management was one possible way of doing it. The formatting of data was of importance since the data was non-functioning multiple times due to user-input errors. Further by investigating plug-ins and what they allow it became clearer that ERP systems were also possible to integrate with WordPress, most of which wanted WooCommerce as a base plug-in. Stand-alone plug-ins as Katana could be deemed not suitable by standard, since by testing it showed that it requires using a tailor-made API to be able to connect it to Golli.

Different types of ERP systems were tested on a specification basis, allowing for finding suitable system vendors that both satisfy requirements but also require a reasonable amount of resources from the customer, both in terms of time but also investment. This in practice disallowed big system vendors like SAP or Oracle due to both cost but also the difficulty to take into use by themselves.

The theoretical part of the solution finding allows far more possible solutions and compromises than the practical part, underlining the importance of practical understanding of the systems and the phase of testing and validating.

4.3 Reviewing Case Studies

Reviewing past case studies is a method that allows for information searching and restriction finding for practical solutions. Case study is a research strategy for comparing and understanding practical information from a limited number of different sources. Case study is also often considered lacking in the objectivity, and thus required some carefulness (Rowley, 2002).

In this thesis the review of different case studies was done to build a picture of what has been done before, why has someone done this, and the limits of any type of solutions. There are several similar cases that have been conducted in the past that are documented and contain information or findings that allow future readers to avoid common mishaps and work out a tailored solution based on common facts.

With the review of case studies the different alternatives and implementations for other types of systems than what exists in the company was found. Using this information, the

list of alternatives could be extended to include a separate ERP system which in the past was not deemed as a possibility.

Case studies gave an insight into how other SME companies conducted this type of system implementations. At first ERP systems seemed too far away both in terms of skill needed for implementation, but also cost. The case studies showed that this was not always true, and today there are multitudes of ERP systems that both allow easy integration, and at a reasonable price.

4.4 Internet Research and Literature Review

Internet research allows the researcher to find mostly free information within the whole range of internet-based resources. The Internet allows users to leverage their ability to find, share, and manage information (Rathinasabapathy, Rajendran, Arumugam, & Raj, 2010). The user base of the internet is approximately 5,16 billion people (Petrosyan, 2023). A large number of users results in a wide range of information, by any means larger than any library, journal, or other means of information-storages.

The Internet is allowing users to find almost all information available in the whole world. It may be used consciously, emphasising the importance of source-criticism by the user when conducting Internet research for any purpose. Reputable sources offer trustworthy, accurate, and correct information more often than sources that could be defined as questionable. Due diligence and risk-assessment is to be conducted when using information available, and editable by in theory anyone.

For this thesis Internet research was needed for building a picture of what is possible, and what parts of the systems can be modified, mainly the WordPress platform, to allow for the ideal inventory management system. WordPress plug-ins require some research to make sure they are updated, relevant, and secure to use.

Internet research was also used to find other cases where information might be applicable and usable to this case. Literature study was used for research of relevant theory for the thesis in the form of software information, different types of approaches and implementations, and current or past user experiences.

By conducting Internet research and literature review the different alternatives to integrations came clear. Reading system and integration vendor websites allowed for an overview of what exact ERP Systems integrated with WordPress and Golli, or one of them. Furthermore, what integrations Golli, or WordPress offer with for instance ERP systems. The different at first possible scenarios could be drastically reduced by taking part of the information the different vendors listed, and further any common issues or integration examples by reading blog post and similar types of internet material.

The ERP systems listed as alternatives were found by using internet research and cross-referencing initial requirements with what Finnish ERP software or systems there are available. The vendors online sites offer critical information in the consideration making and allows for taking part of information on the different offerings.

Additionally, any Finnish systems suitable for the case in point could be found using internet research. Comparisons between systems exist widely and some conclusions and indications can be drawn from online sales and marketing material found online on the vendors or other related sites.

4.5 Semi-structured Interviews

Short, semi-structured interviews were conducted to be able to take part of any information that has been taken part of before within CCF. Semi-structured interviews are exploratory interviews where they generally follow a protocol determined before the meeting, but still allow room for discovery and place for discussion further than the predetermined protocol (Magaldi & Berler, 2020). The users of the existing systems know how the systems work well, and while they might not know all the technicalities, the interviews still allow the interviewee to take part of information that might not be found on its own. An aspect important to this task is that these systems have been sold to the company, and thus there might be useful information mentioned in past sales pitches and available sales information or brochures that could be useful for the work in this thesis.

The semi-structured interviews consisted of the following questions.

1. Have you found any integration possibilities in the systems while using them?
2. How were past system implemented, by yourself or by a second / third party?

3. Is there sales material available from when the systems were offered to you?
4. Do you remember any mention of integrational abilities from the sellers of the systems?

It must be mentioned that the interviews consisted of questions related to the past and might thus not result in accurate answers. The information is still relevant to some extent and can be used while trying to find possible solutions as a support.

Non-structured interviews were in the form of meetings and discussions related or unrelated to the thesis work. Meetings were regularly taken part of and the occasional visit.

4.5.1 Interviews

The semi-structured interviews resulted in information on past topics and finding of the company that allows for the author to shape the result further. The interviews were conducted with three employees of the company all of which have different job descriptions and roles but interact in most of the company's software solutions and software procurements. The roles or job descriptions are listed below.

- CEO or Chief Executive Officer
- Brand Manager
- Warehouse Manager

Interviews were thus conducted with 3 key users. The following sub-chapters present the interview results, the sub-chapters are structured according to employee thus allowing for an understanding of each employee's views of the interview subjects.

4.5.2 Interview with Chief Executive Officer

Following the order of the interview questions. The first question touched the subject of integration possibilities that have been found by the user while using them. The CEO stated that regarding WordPress, which was used daily, they have in the past investigated plug-ins for the built in inventory management system and the already implemented WooCommerce plug-in. The investigation resulted in no implementations since the

certainty of function or safety was not on an acceptable level at that point in time. The company had recently taken WordPress into use and the users were already busy with maintaining other aspects within the platform the CEO said. Integration possibilities with Golli had not been investigated by the CEO at that time, Golli was considered more difficult to integrate.

Past systems were implemented mostly by externals according to the CEO. For example, the WordPress site was built by a thesis worker and the maintenance and upkeep of the WordPress site is handled by external hosting companies. Golli was implemented by the company itself as it did not require any more than a subscription purchase and online login.

Sales material as such did not exist anymore according to the CEO since the choices of systems were not based on suppliers offering systems, but rather the company contacting the suppliers for procurement and implementation. The suppliers have neither mentioned integration possibilities outside the explanation of the possibilities with WordPress plug-ins.

4.5.3 Interview with Brand Manager

The interview with the brand manager followed the same order as the previous interview with the CEO. According to the brand manager integration possibilities with the systems were found mainly in the WordPress department, similarly to what the CEO stated. The brand manager was involved as a supervisor in the thesis work which was conducted earlier and resulted in the WordPress site and thus had been informed about the possibilities with plug-ins. The earlier thesis was limited to essential plug-ins and had as such not processed more in depth and specific plug-ins according to the brand manager.

One interesting note by the brand manager came up, Golli supposedly had an inventory management system of sorts that might allow for spreadsheet files from Excel by Microsoft to be imported into the system. It was a bit uncertain, but the employee remembered such a feature from using it. This will be further investigated later in the thesis.

Questions 2, 3, and 4 resulted in the same answers as from the CEO. WordPress was implemented by a thesis worker and Golli required no real implementation, rather just log-

in. Any sales material was not available as far as the brand manager knew. Integrations were not as such discussed with suppliers since the procurement decision had already been made and formalities and costs were mainly discussed.

4.5.4 Interview with Warehouse Manager

According to the Warehouse Manager the integration possibilities found using the software or platforms are wide, but hard to define. How to define what in practice functions and does not impact other platform functionalities was deemed difficult and thus any further investigations had not been made until this thesis.

Further regarding Golli the warehouse manager stated that with use it was found implications that Golli allowed integration with certain ERP systems to the extent that orders and such syncs between the different entities. WordPress was not as familiar to the warehouse manager as the other employees interviewed and thus any information about this platform was not available.

Implementation of the system in use was in line with what the other employees stated, externals maintained the system requiring such and Golli was taken into use as any other online platform. Regarding sales material and sales information, the warehouse manager had no information either.

4.5.5 Result of Interviews

The interview resulted in a few pieces of information that will have an impact on the conduction and result of the thesis. Mainly the information regarding Golli and its supposed possibilities to integrate with ERP systems. Below is a summarization of the information received deemed useful.

- Golli might integrate with ERP systems

The possibilities of Golli allowing spreadsheet-based inventory management were false as found out earlier, but it further underlined the possibilities with ERP system integration. The subsequential interview questions that did not result in the above specified useful information point could be seen as unnecessary since they did not in themselves result in

any information useable. Further the interview might have been more fruitful if conducted as a group interview and not individual due to the repeat of answers to some questions.

4.6 Elements that Influence the Choice and Shaping of the Result

There are certain elements that influence the choice and shaping of the solution in this case. The information of the issues has been gathered from various discussions with Carpelan Cosmetics Finland employees. The elements are either advantageous to cater for from a legal, or the businesses day-to-day, point of view. This chapter list some case specific elements that require attention when shaping and choosing the result of the thesis.

4.6.1 Support

In case the result requires significant implementation or integration beyond package key-in-hand solutions, support is likely required. From CCF point-of-view adequate, swift, and local support is of high value due to possible endangerment or exposure to non-functioning systems during the integration phase making deliveries and order management difficult or impossible.

If the solution falls under the specifications here, it should be provided by a Finnish company offering a solution for SME companies. Taking a bite too large to chew in the sense of implementing a solution intended for large companies is to be avoided.

4.6.2 Inventory

Inventory is a legal requirement to conduct as a company in Finland. Inventory is defined by law in the following acts. Inventory as per its definition is legislatively defined in accordance with the Finnish Account law Chapter 4 section 4 Act (30.12.1997/1336) with the updated subsection (30.12.2014/1306). (Accounting Act 1336/1997, 2023b)

“Stocks comprise goods intender for sale or other transfer or consumption as such or after processing. Financial assets comprise cash, accounts receivable and other liquid assets temporarily in some other form.”

Further definitions of the matter are found in the Finnish taxation of business income law Chapter 2 section 10 Act (1968/360). (Laki Elinkeinotulon Verottamisesta 1968/360, 2023)

This act has not been translated into English at this date, so it is as follows in Finnish:

“Vaihto-omaisuutta ovat elinkeinotoiminnassa sellaisinaan tai jalostettuina luovuttavaksi tarkoitettut kauppatavarat, raaka-aineet, puolivalmisteet ja muut hyödykkeet sekä elinkeinotoiminnassa kulutettaviksi tarkoitettut poltto- ja voiteluaineet ja muut tarvikkeet.”

Inventory is in practice a requirement, since accounting and taxation stipulate that the change of value in current assets is to be declared in both the tax-report as in the balance sheets. While inventory management systems in themselves are vaguely connected to this, they provide useful information when conducting inventory. Mainly due to the required accuracy of the inventory. The accuracy required of the inventory is defined in the Finnish Account law Chapter 3 section 2 and 2 a, Act (30.12.1997/1336) with the updated subsection (29.12.2016/1376) (Accounting Act 1336/1997, 2023a).

“The financial statements shall give a true and fair view of the reporting entity’s result of operations and financial position in accordance with the principle of materiality in light of the nature and the extent of operations of the reporting entity.”

“A matter disclosed in the financial statements is deemed material where its omission or misstatement could reasonably be expected to influence decisions that users make on the basis of the financial statements. Even if a matter in itself were immaterial, the assessment of materiality shall be targeted on the whole if there are many similar matters.”

This is called the materiality principle (Accounting Act 1336/1997, 2023b). The definitions imply that accuracy is of importance, and thus inventory management systems become interesting tools for keeping track of accurate stock amounts. Saving time and effort, and thus money, is possible using an inventory management system in this matter. While you may not trust the accuracy of the systems stock-values alone, they can be used as reference for manual counting for instance (Sirkiä, 2019).

4.6.3 Product Batches and Batch Codes

Beauty products are in most cases manufactured in batch-production. This means that products are manufactured in groups, based on for example date of production. (Two Teachers, 2023). Every product has as such a batch code or reference. This can later be used for tracking of products, and in cases of recalls or safety concerns a batch code can be used to find the products with issues.

In Finland it is common that the whole supply chain records the batch codes, and the involved parties can thus keep track of the products from the manufacturer to the shelves in the stores. Inventory management systems are advantageous when keeping track of these batch codes. Manually keeping track of these can be labour intense, and this is usually not ideal for a task that does not produce anything.

For importers and wholesalers batch codes are vital both for inventory control but also damage control in case of issues. Parties in hold of products that require action based on batch code can be found without issue and the present own stock can be maintained acted upon. In companies with more than a few products a system for keeping track of batch codes is advantageous due to the large number of different batches arriving each time product is ordered.

4.6.4 Product Weight and Delivery Packaging

For automated warehouses that many larger customers use, the product weight and delivery packaging are vital information. The automation has very small tolerances, and any shift in either weight or packaging type will become problematic.

The on-going shift into environmentally friendly packaging results in a constant change of the product attributes required for these products. Therefore, the circumstances require meticulous weighing and measuring of the products. Recording the data with an inventory management system allows for a fuller range of accurate product attributes.

4.6.5 Expiry Dates

Beauty products usually carry expiry dates. All products do not require this, but especially within the European Union it is mandatory that products carry expiry dates when needed. The European Union has defined the expiry date requirement as following. Regulation (EC)

1223/2009 updated in 2022 states that products that expire in less than 30 months in an un-opened state require the mention of an expiry date. Products that last more than 30 months un-opened shall instead contain a date that implies a safe-usage period when opened. (Commission Regulation (EC) No 1223/2009, 2022)

Hypermarkets, departments stores, and beauty stores who carry these kinds of products may demand notice of the expiry dates in conjunction with delivery of the products. This is to make sure no products that are delivered are expired, or close to expiration. Products close to expiration require that they are sold quickly since they can not be sold past the expiry date, which is not in the vendors best interests.

From the suppliers perspective it is problematic delivering expired or close to expired product. The suppliers reputation might be affected and returns processes cost money. The sale is also lost if the customer needs to return the product.

Since the products can be manufactured in many different batches, there will be many different expiry dates to keep track off. Combining the recording of batch codes and expiry dates in one software or entity is beneficial in the sense that both codes have similar usages and restraints.

4.6.6 Product Pictures

Combining inventory management with product pictures from marketing is not the most conventional angle of development. Generally, these are kept separate and inventory management software in themselves focus on numbers, statistics, and product attributes. There are a few advantages in possibly keeping them combined.

Manufactures repackage or re-design products occasionally. While the supplier is aware of these changes, the customers might not be unless informed. Due to the advancements in technology many warehouses use automated scanning of products when they arrive in the facilities. Package and product re-design might affect the automated bar-code scanners if the bar-codes are moved or affected in any other way.

Shelfing of the products is also affected if the packaging is completely different. Customers therefore require updated product pictures at the same time the updated products are

delivered. Manually keeping track off the products that are changed and appurtenant products pictures is labour intensive and allow for human errors to take place.

Inventory management software could ideally keep track of products changes, and thus allow employees of the supplier to accurately distribute correct information, pictures and products. Marketing purposes are simultaneously covered and the participants in the supply chain are equally informed and reside on the same page.

4.6.7 Avoidance of Losses in Future Legislative Matters

While an inventory management system would benefit the company in most of the usual areas related to basic inventory management. There is one area that might not seem that obvious. Products that are to-be forbidden to sell. This is usually due to specific ingredients and happens within the beauty-industry every year.

The European Union has legislative parts that regulate ingredients allowed in beauty products, and not to forget local country specific laws and regulations. One recent example of this was the ban of Butylphenyl Methylpropional, also known as Lilial. This ingredient is mainly used in perfumes. It was banned by the European Commission on the 1st of March 2022 in the Omnibus IV act, Regulation (EU) 2021/1902 (Commission Regulation (EU) No 2021/1902, 2021).

The result of this sudden ban of this ingredients usage was that companies selling products containing this ingredient had approximately 4 months from the notice of the ban being commissioned, to it coming into effect. To further complicate matters this meant that the companies had to gather all stock containing this ingredient and have it sold, disregarded, or destroyed. Matters like these require a quick understanding of the current stock levels and values, to which an inventory management system would be helpful for the best possible loss-prevention.

4.7 Processing the Range of Alternatives

The range of alternatives for this case is in theory quite wide, but the list of suitable alternatives shortens when considering the requirements, wishes and further conducting comparisons between offerings. This chapter presents different alternatives, and the process in which the list of alternatives is shortened.

First, the requirements, wishes, and things to consider supplied by CCF are taken into consideration. The list of these project attributes is separated into two groups, requirements, and wish list. The requirements are must haves, and the wish list consists of factors CCF wish the result to consider, feature, or possess.

- Inventory management module or as a system
- Integration with e-commerce, WordPress
- Integration with Golli
- Adequate support for future possible implementation and maintenance
- Reliable, non-volatile solution
- Reasonable cost and effort of implementation and use, though undefined
- Indications of the solution being futureproof
- User-friendliness with a large amount of products
- Fast, or parallel integration possibilities
- If the result is a system or larger implementation, a Finnish vendor needs to be available to consult, or purchase from

This list of requirements is to be fulfilled to the best possible extent. Additionally considering the wish list supplied by CCF.

The wish list can be found below, containing all kinds of attributes, features, and functions that CCF would like the proposed solution to cater for.

- Product attributes ranging from batch codes to product pictures
- Modules extending past inventory management, for example order management, invoicing, and supplier management if it is an ERP system
- Open API or possibilities for modifications and upgrades in case of ERP system
- Forecasting of inventory
- Product level statistics such as most- or least sold product
- User-friendly, not resource demanding in training
- Maintenance offered by multiple vendors if not in-house created or maintained
- Low required level of modifications to existing systems, for example plug-in integration in WordPress

The number or amount of list items on the wish list that needs to be catered for was undefined, but ideally it would cater for most of them, as ever. This chapter presents in theory suitable alternatives that have been compiled and require further processing with the lists of requirements and wishes. The range of alternatives will be presented below, and the following chapters process the viability of each one of them, and whether they are suitable or not considering all the requirements and wishes.

4.7.1 WordPress with or without Golli Integration

The first alternative is utilizing the existing systems, WordPress and Golli, and connecting them with one another, or using WordPress as an inventory management system by itself as a base for inventory management. This would be seen as beneficial in the sense that no additional systems are required besides a possible initial integration between the earlier mentioned systems. Furthermore, the cost for this alternative would likely be small in comparison with for example an ERP system implementation, the initial systems exist and have been or are being paid for in any case by CCF. This alternative might be risky from a

certain perspective, configuring, editing, and testing systems used by CCF daily might allow for disruptions or maintenance breaks which are frowned upon.

This alternative falls short in many aspects. Since Golli offers no inventory management, connecting orders or invoicing to WordPress is either not beneficiary or depending on configuration even possible. WordPress functions as an e-commerce platform and involving orders from customers not on this platform by trying to integrate it with Golli might end up confusing in many aspects. The data or information is in no way connected with using only these two systems, the common denominator is in short product attributes, which is unnecessary to connect since they both exist at the time of the thesis in both systems by themselves. The way to go about this would be to use WordPress as an inventory management system by itself, which as an alternative fall short on the CCF requirement of integration with Golli.

Furthermore, there are no existing WordPress or WooCommerce integrations with Golli. It would require a custom integration and an API from Golli. The labour required to implement this solution is intense, and the result offers no significant advantages over the existing setup. CCF wanted something more, an integrated system resulting in benefits overall, this is not it.

Using WordPress for this would require additional plug-ins. While this could be seen as a low-cost alternative offering easy implementation if research is conducted well on the possibilities with different plug-ins. It would result in a likely volatile solution with uncertainty of futureproofing and usage possibilities in the long run.

While the alternative is not suitable in that sense, a comparison matrix with CCF requirements and WordPress offering is compiled, this allows for an overview of the proposed system performance compared with the requirements.

The requirements matrix can be seen below in figure 2.

WordPress	
Inventory management module or as a system	3
Integration with e-commerce, WordPress	X
Integration with Golli	1
Adequate support for future possible implementation and maintenance	4
Reliable, non-volatile solution	2
Reasonable cost and effort of implementation and use	4
Indications of the solution being futureproof	2
User-friendliness with a large amount of products	3
Fast, or parallel integration possibilities	4
Finnish vendor if system	X
Combined result (average):	2,9

Ranking that determines how the solution would perform in each requirement category:

Ranking: 0-5 (0 = Not at all, 1 = Barely, 2 = Slightly, 3 = Adequate, 4 = Well, 5 = Perfect)

Colour: Follows pattern above ->

0	1	2	3	4	5
---	---	---	---	---	---

In case of "N or Y" = Not measurable other than No or Yes

In case of "X" = Not applicable

Figure 2 – Requirements matrix for WordPress

From the matrix above it can be seen how WordPress performs in comparison with CCF requirements. WordPress offers adequate inventory management possibilities, especially with additional plug-ins. The integration with Golli required a totally custom solution and it could not be said for certain if it offers any benefit in the end.

WordPress has a large user base and many implementation partners, the support available is vast, however the support for plug-ins depends entirely on the developers that have created the plug-ins. This affects the reliability score and indications of the solution futureproof, not to mention the known reliability issues that might arise from using an array of different plug-ins.

Cost and implementation labour is low since the systems are in use already. WordPress inventory management is depending on plug-in user friendly. WooCommerce is easy to use with a large number of products, however the initial labour to insert the products is heavy. Since the systems exist and are in use already in the company, the implementation process is short and depending on Golli integration or not, it can be done in a few weeks depending on the scope of plug-ins.

In addition to the requirements comparison matrix, a similar matrix was done for the CCF wish list and how WordPress performs here, this can be seen below in figure 3.

WordPress	
Product attributes ranging from batch codes to product pictures	3
Modules extending past inventory management (if ERP system)	X
Open API or modification and upgrade possibilities (if ERP system)	X
Forecasting of inventory	3
Product level statistics such as most- or least sold product	3
User-friendly, not resource demanding in training	3
Maintenance offered by multiple vendors, if not in-house created	3
Low required level of modifications with existing systems	4
Combined result (average):	3,2

Ranking that determines how the solution would perform in each requirement category:

Ranking: 0-5 (0 = Not at all, 1 = Barely, 2 = Slightly, 3 = Adequate, 4 = Well, 5 = Perfect)

Colour: Follows pattern above ->

0	1	2	3	4	5
---	---	---	---	---	---

In case of "N or Y" = Not measurable other than No or Yes

Figure 3 – Wish list matrix for WordPress

WordPress performance in regard to the wish list attributes is mediocre. Offering a middle of the board performance on all accounts. This is mainly due to the possibilities with plug-ins. WordPress offers very basic features, that can be extended with an array of plug-ins. The plug-ins require research in themselves, and furthermore compatibility with each other needs to be both investigated and tested. However, WordPress is user-friendly and does not require additional training on a system level. Depending on chosen plug-in the user-friendliness and need of training vary since the features added can be different in this aspect. The modifications required to the existing systems is not very heavy, while plug-ins are easy install, they do require investigation and such which was mentioned earlier, this to make sure the reliability is not affected at the time of implementation. Inserting both scores from the requirement matrix and the wish list matrix results in an average seen below in figure 4.

	WordPress
Requirements result (average):	2,9
Wish list result (average):	3,2
Combined result (average):	3,05

Figure 4 – Comparison matrix of both categories combined

The comparison scores were not satisfactory. Furthermore, the alternative does not offer benefits on the aspects CCF seek to improve. It would be an easy alternative and require less work than the other alternatives at hand, but at a cost. The cost is the loss of Golli integration since this does not make sense to do. Additionally, this alternative does not fit with the initial requirement, of integration the two systems into use together. While it may be possible with a custom integration, there is no real information or data flow between them. Using WordPress in itself or integrated on some level with Golli can be disregarded.

4.7.2 Enterprise Resource Planning Systems

The second alternative is taking an ERP system into use and integrating it with WordPress and Golli which the company uses currently. A well-chosen ERP system would allow for conducting inventory management as well as taking care of other core business functions that could be digitalized and centralized under one roof. Using an ERP system CCF would be able to scale their business further due to the time ultimately saved by not using laborious methods, emphasis on the possibilities created to generate more income by for example focusing on sales when time is not spent on in-effective business processes. The following ERP systems were found using internet research and reading different cases conducted in similar instances. While there are many more suitable ERP systems that could be contemplated on, these 3 satisfied the requirements and wishes of CCF the best. Mainly due to the requirement of local support with the geographical possibility of on-site visits if need be.

Netvisor

Netvisor by Visma is one of the most popular ERP-systems in use today in Finland, and it has over 30000 users currently. Netvisor offers an ERP-system that contains accounting, order management, inventory management, forecasting, and reporting to name a few key features depending on the subscription chosen. (Netvisor, 2023a)

Netvisor is an alternative due to its integration possibilities, mainly with Golli which offers limited capabilities for straight-forward and non-tailored integration. Due to the limited resources in a SME company, it might not always be possible to create a tailored solution or pay someone to create this. The ERP system offers inventory management in its premium package, which is the costliest. (Netvisor, 2023a)

Netvisor allows for integration with WordPress and the plug-in WooCommerce by using an integration service called Flashnode. By using this integration, the invoices, and receipts from orders in the e-commerce platform can be centralized into the ERP system and allow further processing to for example accounting. The stock-levels also synchronise accordingly allowing for a seamless integration in this regard. (Netvisor, 2023b)

Integration between Golli and Netvisor is something Golli markets on their webpage. The interactions between systems follow the same result as with WordPress, the orders synchronize between the two systems and allow for invoices and such to be further processed into accounting within the ERP system. (GS1, 2023)

Support in problems or questions is an important factor, and Netvisor being a local offering with a Visma offices around the country, sufficient support should be available. Further they offer assistance by phone, online-chat, or e-mail which covers the most relevant ways of taking contact.

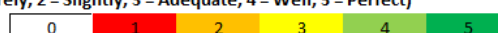
Since both WordPress and Golli integration is something Netvisor offers, it becomes an appropriate alternative to further consider. The following step is to insert it into matrixes that compare the software ability to adequately perform certain tasks or aspects that CCF requires of the system or wish that the system offers. The requirement matrix can be found below in figure 5.

Netvisor ERP System	
Inventory management module or as a system	5
Integration with e-commerce, WordPress	4
Integration with Golli	5
Adequate support for future possible implementation and maintenance	4
Reliable, non-volatile solution	4
Reasonable cost and effort of implementation and use	3
Indications of the solution being futureproof	4
User-friendliness with a large amount of products	4
Fast, or parallel integration possibilities	3
Finnish vendor if system	Y
Combined result (average):	4,0

Ranking that determines how the solution would perform in each requirement category:

Ranking: 0-5 (0 = Not at all, 1 = Barely, 2 = Slightly, 3 = Adequate, 4 = Well, 5 = Perfect)

Colour: Follows pattern above ->



In case of "N or Y" = Not measurable other than No or Yes

Figure 5 - Requirements matrix for Netvisor ERP system

From the requirements matrix it can be seen how well Netvisor suits CCF requirements according to the understanding created of the features and possibilities. Netvisor offers inventory management as a module of the complete ERP system, with advanced features such as forecasting, supplier comparison, and part-automatization in for example inventory-events. Further it integrates well with WordPress, requiring minor work in the integration which is handled with Flashnode. The Golli integration is offered by Golli also, which implies it is a very well supported integration. Since Netvisor offer support in many ways and are quite local the requirement with adequate support is met.

Reliability from a system stand-point is more than adequate with the only drawback being partly involving plug-ins in WordPress. The plug-in is however WooCommerce which in practice is a steppingstone for most e-commerce solutions that are used today and can as such be seen as a reliable alternative. Taking Netvisor into use will be a quite intensive and costly solution due to the integrations and moving the data from all old systems over to the new one, comparing the proposed case to cases conducted by others it seems like it is very usual that the implementation process of an ERP system is both costly and labour intensive.

The Netvisor solution is offered by Visma Software Oy, which is an established software vendor with multiple different solution for all kinds of needs. Visma is a growing company with healthy numbers in terms of turnover and profit, approximately 44.1 million € turnover and 257,000 € profit in the period of 01/2021 to 12/2021 (Finder, 2023a). This indicates that in terms of vendor offering the solution, the system is futureproof. Visma also widely markets the Netvisor ERP system and that indicates both belief in the product as well as a clear market for it (Netvisor, 2023a).

Additionally, Netvisor offers an adequately fast integration. From the Netvisor online site references can be found, and for a company with 35 employees and a turnover of around 13 million €, the integration process took over 3 months (Rumpu, 2021). While this is a larger company than CCF, the number of products is very large in CCF inventory and that will very likely consume a lot of time. Parallel integration is possible since the systems in use at CCF operate on their own, and the downtime from integration will not be very long due to the pre-existing integration offering from both Visma and Golli. Since Netvisor is offered by Visma Solution Oy, a Finnish company, it satisfies the requirement of a local vendor and support completely.

Concluding this part of the investigation shortly, it shows that Netvisor in terms of requirements is a viable solution for CCF to pursue. Its adequacy as a whole is sufficient on basis of the requirements and further implication compiled from CCF.

After comparing the requirements, the wish list is the next item on the list to take into consideration. The wish list allows for an understanding of how the different aspects and features of Netvisor compares with what CCF wishes the solution to offer or feature. The comparison matrix of the wish list can be found below in figure 6.

Netvisor ERP System	
Product attributes ranging from batch codes to product pictures	4
Modules extending past inventory management (if ERP system)	5
Open API or modification and upgrade possibilites (if ERP system)	3
Forecasting of inventory	4
Product level statistics such as most- or least sold product	4
User-friendly, not resource demanding in training	3
Maintenance offered by multiple vendors, if not in-house created	3
Low required level of modifications with existing systems	3
Combined result (average):	3,6

Ranking that determines how the solution would perform in each requirement category:

Ranking: 0-5 (0 = Not at all, 1 = Barely, 2 = Slightly, 3 = Adequate, 4 = Well, 5 = Perfect)

Colour: Follows pattern above ->



In case of "N or Y" = Not measurable other than No or Yes

Figure 6 - Wish list matrix for Netvisor ERP system

From the wish list comparison matrix above, it can be seen that Netvisor complies with the wishes to an extent, not completely satisfying all wishes but in general resulting on a positive level in any case. Netvisor offers a wide range of product attributes, for example product pictures and measurements of packaging. Netvisor being an ERP system it allows for many different modules in adjacence to inventory management, the range of modules extend from invoicing to supplier management. Furthermore, they offer an API to integrating companies, meaning that second- or third-party companies are allowed access to the API to conduct integrations based on the customers needs and requirements.

Forecasting of inventory can be conducted by for example calculating the forecasted inventory order levels based on past sales. Product-level statistics is offered, and calculations based on sales can be conducted. There are also modules that offer calculations of stock-value.

Netvisor will require training in both implementation and using. The range of features is vast, and the integrations with each system will require training to make sure no errors occur. Netvisor offers training material on their support site and further support by e-mail, phone, or online ticket. Maintenance of the platform is offered by Visma Solutions Oy, and integrations are partly conducted by second- or third-party partners. Modifications required to existing solutions are few, but still not to be overlooked. Modifying WordPress and its plug-ins may require some testing and validation before taking into use due to possible problems that may arise when updating or combining new plug-ins with old.

The results from both the requirements and the wish list comparison matrixes were combined, and with that a result of an average from both scores. This to allow an overview of the consensus. The combined comparison matrix is below as figure 7.

	Netvisor ERP System
Requirements result (average):	4,0
Wish list result (average):	3,6
Combined result (average):	3,8

Figure 7 – Comparison matrix of both categories combined

The combined score is a good result, satisfying the customer requirements and wishes on most levels to a well enough extent. A score of 3,8 out of 5 is to be seen as more than adequate considering the different requirements and needs that as a whole are demanding. Netvisor is a very viable alternative based on the investigations to this point.

Lemonsoft

Basically, the following alternative falls under a category which contains ERP systems that do not offer default integration packages for both systems the case company would like to integrate. Which leaves the independent ERP systems, ERP systems with custom integration, or ERP systems that integrate with one system only, like Lemonsoft in this case.

Lemonsoft is a Finnish ERP system offering features aimed for wholesale- or retail companies. Features include inventory management, warehouse management, order

management to name a few. Lemonsoft is an open software, offering integration with third party software or applications with an API. Additionally, Lemonsoft offers a service called LemonHub, which in short allows for pre-created additional modules offered by both Lemonsoft but also other providers. One example of this would be connecting debt collection to the ERP system for unpaid invoices (Lemonsoft, 2023b).

Lemonsoft offer an integration with WordPress by default, thus allowing connecting the present e-commerce platform with inventory management in the ERP system. Connecting Lemonsoft with Golli would require a tailored solution using an API (Lemonsoft, 2023b). Lemonsoft offer integration as part of the procurement of the ERP system, cost, limit, or scope of supply is not entirely transparent and might require further discussions with sales representatives.

Support for both implementation of the system but also general use and maintenance is offered and available at a seemingly low threshold, offering this in the form of e-mail and phone support, further they have a community for Lemonsoft users where information can be found at any time of the day (Lemonsoft, 2023b).

Following this Lemonsoft as a system was inserted into a requirements comparison matrix, same as for Netvisor. The comparison matrix can be found below in figure 8.

Lemosoft ERP System	
Inventory management module or as a system	5
Integration with e-commerce, WordPress	4
Integration with Golli	3
Adequate support for future possible implementation and maintenance	4
Reliable, non-volatile solution	4
Reasonable cost and effort of implementation and use	3
Indications of the solution being futureproof	4
User-friendliness with a large amount of products	4
Fast, or parallel integration possibilities	3
Finnish vendor if system	Y
Combined result (average):	3,8

Ranking that determines how the solution would perform in each requirement category:

Ranking: 0-5 (0 = Not at all, 1 = Barely, 2 = Slightly, 3 = Adequate, 4 = Well, 5 = Perfect)

Colour: Follows pattern above ->



In case of "N or Y" = Not measurable other than No or Yes

Figure 8 – Requirements matrix for Lemonsoft ERP

The results from the comparison matrix for requirements are very similar to the Netvisor matrix. Being two competitors mainly within Finland they offer very similar modules and systems to the market. The main differences found for the modules relevant for this case are within the Golli integration. Lemonsoft offers integration in a similar way as Netvisor, using second- or third-party partners. Lemonsoft further offer a WordPress integration through their platform Lemonshop. The ERP system as a whole offers many different modules, based on marketed features a few more than Netvisor, ranging from quality management to project management. The support level for is on a good level with integration assistance, online tickets, e-mail, phone, and online information bank support. The reliability is similar to Netvisor when looking at the integrations, the integration with Golli is a bit uncertain since there is no concrete information on this precise integration. WordPress integration follows the same pattern as with Netvisor, the integration builds upon the WooCommerce plug-in.

The efforts and investment towards training and implementation is likely slightly higher in Lemonsoft than Netvisor. Lemonsoft looks based on pictures from Lemonsoft online site to be more in detail and offers lots of tailoring of customer needs (Lemonsoft, 2023b). While this is both positive and negative, taking into use a system this large may pose problems for a company not acquainted with this kind of systems.

Lemonsoft Oyj is a growing company with impressive results. In 2021 Lemonsoft had a turnover of 17,4 million € while the profit was 4,4 million € (Finder, 2023b). Lemonsoft is also listed on the stock exchange. This suggests great competitiveness on the market and room for further development and improvement. Lemonsoft is based on this likely a futureproof solution, the whole Lemonsoft offering is constantly improved and developed both in features but also range.

Integration of Lemonsoft is a time-consuming process like with Netvisor, the process might take a total of 3-6 months according to Lemonsoft themselves. Taking the system into use in a smaller company with under 10 users takes generally around 8 days, but the whole integration process as stated above (Lemonsoft, 2023a). Further Lemonsoft is a Finnish vendor with the headquarters in Vaasa close to the CCF premises, this means that the availability for on-site support or other means of support, if needed, is there.

Furthermore, a comparison matrix was made for wishes that CCF have acknowledged. The comparison matrix follows the same model as for Netvisor and thus allows for the same overview of features and attributes. The wish list comparison matrix can be found below in figure 9.

Lemonsoft ERP System	
Product attributes ranging from batch codes to product pictures	4
Modules extending past inventory management (if ERP system)	5
Open API or modification and upgrade possibilities (if ERP system)	3
Forecasting of inventory	4
Product level statistics such as most- or least sold product	4
User-friendly, not resource demanding in training	2
Maintenance offered by multiple vendors, if not in-house created	3
Low required level of modifications with existing systems	3
Combined result (average):	3,5

Ranking that determines how the solution would perform in each requirement category:

Ranking: 0-5 (0 = Not at all, 1 = Barely, 2 = Slightly, 3 = Adequate, 4 = Well, 5 = Perfect)

Colour: Follows pattern above ->

0	1	2	3	4	5
---	---	---	---	---	---

In case of "N or Y" = Not measurable other than No or Yes

Figure 9 – Wish list comparison matrix for Lemonsoft ERP system

The wish list comparison matrix produced similar results to the one conducted for Netvisor. The range of product attributes offered by the inventory management module in Lemonsoft was on the same level as Netvisor, Lemonsoft also highlighted the possibility to track batch codes which is one of the attributes CCF specifically requested. The modules offered by Lemonsoft for widening the ERP system were many, it was possible to connect invoicing, CRM or customer relationships management, and for example reporting with LemonBi.

Lemonsoft offer an API for integration partners similarly to Netvisor. Forecasting in the inventory management system was not mentioned in the inventory management module description, product statistics was available by following the turnover of inventory. The training required for using the system in an appropriate way is likely large both in hours invested but also money invested. It is a vast system with many possibilities, thus requiring intense training for taking into use.

The maintenance offered by Lemonsoft could be deemed suitable since they sell the system themselves, for the integrations partners make the integration and thus maintain them as

well. The number of modifications to existing systems is on the same level as Netvisor, WordPress requires additional work with the plug-ins. Combining the results from the requirements comparison matrix and the wish list comparison matrix resulted in the following in figure 10.

	Lemonsoft ERP System
Requirements result (average):	3,8
Wish list result (average):	3,5
Combined result (average):	3,65

Figure 10 – Combined matrix over both categories for Lemonsoft ERP

The combined matrix over both categories compared resulted in an average of 3,65 out of 5 total. This was slightly lower than the Netvisor number, mainly due to Lemonsoft missing pre-defined Golli integration and a seemingly more demanding training. Lemonsoft is however a viable candidate for the final comparison and choosing of result due to its large number of attributes and features.

4.7.3 Spreadsheet-Based Inventory Management

Building a spreadsheet-based inventory management system is another option. This option would integrate with WordPress in the form of acting as a central data base for product information, stock-levels, batch codes and so on, further requiring manual import into WordPress on a for example daily basis. Advantages with using this method range from user configurability and customization to simple maintenance. The fact that it can be created, configured, and maintained in-house allows for a low-cost implementation but on the other hand limits both the level of automation and available or creatable features.

The first step of the process in determining the viability of the spreadsheet inventory management system was to insert it in the matrix of CCF requirements and wishes. This would imply whether this option is worth pursuing from CCF point of view or not. These matrixes follow the same pattern as the matrixes used in comparing Netvisor and Lemonsoft.

A picture of the comparison matrix can be found below in figure 11.

Spreadsheet Inventory Management System	
Inventory management module or as a system	3
Integration with e-commerce, WordPress	1
Integration with Golli	0
Adequate support for future possible implementation and maintenance	1
Reliable, non-volatile solution	2
Reasonable cost and effort of implementation and use	2
Indications of the solution being futureproof	1
User-friendliness with a large amount of products	2
Fast, or parallel integration possibilities	4
Finnish vendor if system	X
Combined result (average):	1,8

Ranking that determines how the solution would perform in each requirement category:

Ranking: 0-5 (0 = Not at all, 1 = Barely, 2 = Slightly, 3 = Adequate, 4 = Well, 5 = Perfect)

Colour: Follows pattern above ->

0	1	2	3	4	5
---	---	---	---	---	---

In case of "X" = Not applicable

Figure 11 – Spreadsheet inventory management requirements comparison matrix

Above matrix contains both compliance with requirements as well as how well they comply or perform with the requirement, this to allow a broader overview of the compliance within each category. The result of this matrix indicated that the spreadsheet inventory management solution would not fit well with the list of CCF requirements, additionally not being able to comply at all with certain requirements. The ranking of the different solution categories is based on information from users on the internet and what a large amount of different people indicates, further basing it on research and testing of different aspects to be able to come to a reasonable conclusion.

Further, a wish list matrix was made on the same basis as the requirements matrix. The wish list matrix can be found below in figure 12.

Spreadsheet Inventory Management System	
Product attributes ranging from batch codes to product pictures	4
Modules extending past inventory management (if ERP system)	X
Open API or modification and upgrade possibilities (if ERP system)	X
Forecasting of inventory	4
Product level statistics such as most- or least sold product	2
User-friendly, not resource demanding in training	3
Maintenance offered by multiple vendors, if not in-house created	X
Low required level of modifications with existing systems	1
Combined result (average):	2,8

Ranking that determines how the solution would perform in each requirement category:

Ranking: 0-5 (0 = Not at all, 1 = Barely, 2 = Slightly, 3 = Adequate, 4 = Well, 5 = Perfect)

Colour: Follows pattern above ->

0	1	2	3	4	5
---	---	---	---	---	---

In case of "X" = Not applicable

Figure 12 – Spreadsheet inventory management wish list comparison matrix

The wish list comparison matrix followed the same pattern as the requirements matrix. The wish list matrix highlighted that the solution may partly satisfy CCF wishes, but not from all aspects. While product attributes and forecasting are very much available and possible to conduct depending on the implementors skills in the platform, the other departments are lacking or not applicable.

Combining the above averages from both the requirements comparison matrix and the wish list comparison matrix resulted in the following in figure 13 below.

Spreadsheet Inventory Management System	
Requirements result (average):	1,8
Wish list result (average):	2,8
Combined result (average):	2,3

Figure 13 – Combined average for requirements and wish list comparison matrixes

The combined average from above matrix is not a satisfactory result, resulting in an overall score of 2,3 which corresponds to approximately "Slightly" in the adequacy ranking scale.

4.8 Testing and Validation of Findings

Testing and validation of the alternatives is conducted to find any possible issues before recommending a final solution. The testing and validation is conducted in different ways depending of how the existing system, or vendor of a new system allows for this. Netvisor, and spreadsheet-based inventory management could be tested without conducting any sales meetings with vendors, or initial investments.

Netvisor

Netvisor offer a 30-day free trial by signing up on their website if you state which company is interested and the contact information to them (Netvisor, 2023c). CCF provided this info so the testing of the proposal could be tested to see if the proposal suits the requirements.

The information required can be found below in figure 14.

Visma Netvisor

Koekäyttöön alle kahdessa minuutissa

Kokeile veloituksetta 30 päivää. Et tarvitse luottokorttia eikä asennuksia koneelle. Kokeilu ei vaihdu tilaukseksi automaattisesti.

Etunimi * Sukunimi *

Yritys * Puhelin *

Sähköposti * Liikevaihtoluokka *

Suostun siihen, että henkilötietojani käsitellään tunnistamalla kiinnostuksen kohteeni tässä [luovutulla tavalla](#) ja olen tietoinen siitä, että voin peruuttaa suostumukseni milloin tahansa. *

Visma voi lähettää minulle sähköpostia aiheista joihin olen osoittanut kiinnostusta. Voin peruuttaa suostumukseni milloin tahansa.


En ole robotti 



Figure 14 – Netvisor trial sign-in information (Netvisor, 2023c)

After completing the sign-in the site eventually moves to a test version of the Netvisor ERP system with extended features. Since inventory management is the key requirement and background for the whole thesis, this function will receive the most attention. Netvisor had inserted a test-company in the system which allowed for some function testing with numbers and data.

The inventory had many items in it but also allowed for adding items manually by the user testing the system. The layout for inserting products was logically laid out and contained a range of attributes that the user could specify for the product, as GTIN-code, product name, and product code. While some of the product and pricing categories were made for the test company and thus did not exactly meet the criteria CCF would lay out for this system, it allowed for a good overview of the possibilities with Netvisor.

Adding products was easily done, and the first step contained suitable features for CCF, the view can be seen below in figure 15.

Figure 15 – Product insertion view of attributes in Netvisor ERP

The range of attributes showcased is not all the attributes available, but the most basic ones excluding pricing information. Test information was inserted to allow for an overview when the product later is created. The test information has no other function than to allow more proper testing to validate the functions of the system and is not based on anything. The product pricing and measurements attributes that could be inserted were basic but allowed for a foundation of the product to be created. Different accounts for accounting could be specified which is beneficial in case of separate entities within the company.

This can be found below in figure 16.

Figure 16 – Product price and measurements information view in Netvisor ERP

Purchase price for the product could also be stated which can be used to base the future sales price on. With the product added, there was not anything more that could be done in the sense of testing with the inventory.

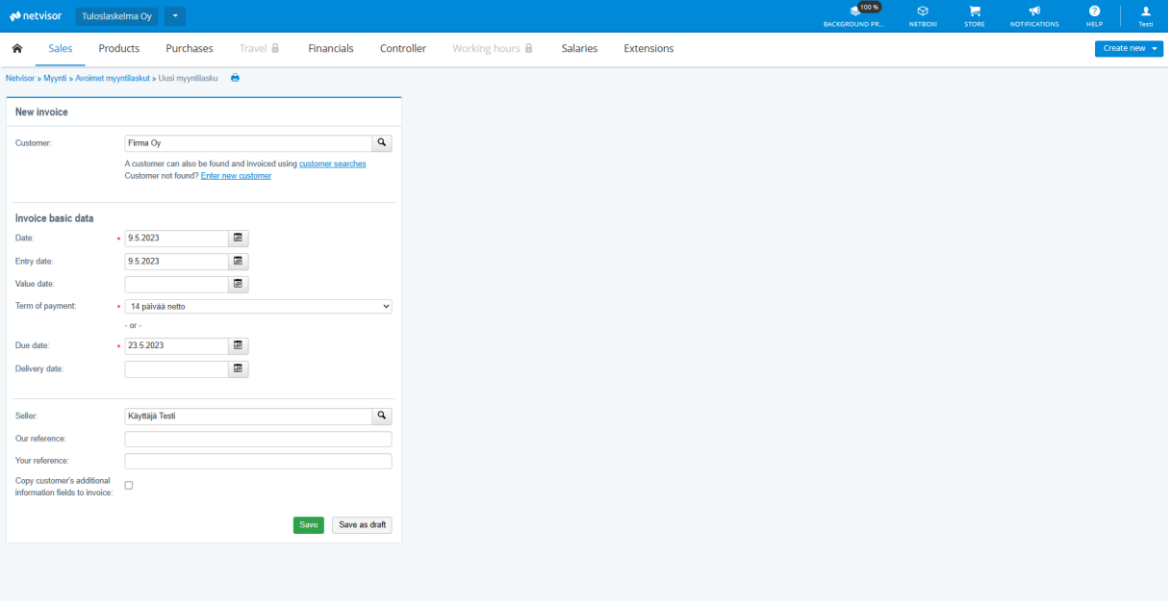
The inventory management part was locked and allowed only for product overview and product insertion without seeing the inventory management functions as stockkeeping and forecasting which Netvisor offers in the full version. Testing of this can not be done without purchasing a license. Below in figure 17, the product overview can be seen.

Product Code	Product Item	Unit	Places of use	Net price	VAT %	Gross price	Purchase price
TEMP	Tilavälinen laite	tpi	Saleable	0.00	24%	0.00	0.00
3000 Tekniset ja rakennustuotteet (44pcs)							
432	224324		Saleable	320.00	24%	396.00	100.00
10101020001	ZLRAPP-S20W2-IM.M.1.4-PSLAA/SLS/SPSL	tpi	Saleable	122.00	24%	151.28	35.00
120043	alveter		Saleable	30.00	24%	37.20	22.00
10101020002	Aerikondenssimassa	kg	Saleable	6.00	24%	7.44	2.50
8000	FA77	tpi	Saleable	0.00	24%	0.00	1.00
FINNFQAM50	Finnföam 50mm	tpi	Saleable	0.00	24%	0.00	0.00
FINNFQAM50PKT	Finnföam 50mm	pkt	Saleable	0.00	24%	0.00	0.00
3567895437	Irtalämöönmittaus		Saleable	1567.00	24%	1943.00	1 000.00
1322347896	Irtalämöönmittaus_asetusohj		Saleable	716.00	24%	888.00	100.00
Jasmin lehti	Jasmin lehti	tpi	Saleable	0.00	24%	0.00	0.00
Kalusteasennus	Kalusteasennus		Saleable	0.00	24%	0.00	67.00
1004	Kassa		Saleable	150.00	24%	186.00	0.00
200001	Kivim.osa	tpi	Saleable	250.00	24%	310.00	150.00
44444	Leikkuritila		Saleable	6.00	24%	7.44	0.00

Figure 17 – All products overview in Netvisor ERP

Continuing with Netvisor feature testing, following inventory management, which was limited in the test version, is invoicing. This feature is a useful addition to inventory management, especially for the customers that use Netvisor which there are a few of. These customers can receive the invoice directly in their own system and thus process it quickly.

The function of adding an invoice was laid out similarly to the product insertion feature and is as such logically placed. The testing of invoicing was conducted by inserting an invoice, in figure 18 below.



The screenshot displays the 'New invoice' form in the Netvisor ERP system. The form is organized into several sections:

- Customer:** A search field containing 'Firma Oy'. Below it, a message states: 'A customer can also be found and invoiced using [customer searches](#). Customer not found? [Enter new customer](#)'.
- Invoice basic data:** A section containing several date and payment-related fields:
 - Date:** 9.5.2023
 - Entry date:** 9.5.2023
 - Value date:** (empty)
 - Term of payment:** 14 päivää netto
 - Due date:** 23.5.2023
 - Delivery date:** (empty)
- Seller:** A search field containing 'Käyttäjä Testi'.
- Our reference:** (empty)
- Your reference:** (empty)

At the bottom of the form, there is a checkbox labeled 'Copy customer's additional information fields to invoice' and two buttons: 'Save' and 'Save as draft'.

Figure 18 – Invoice creation initial screen in Netvisor ERP

The data inserted here is fictional and used for testing purposes. The first step in the invoicing process asked for dates and reference number, additionally seller and customer.

The following screen is where the whole invoice is configured. Below in figure 19.

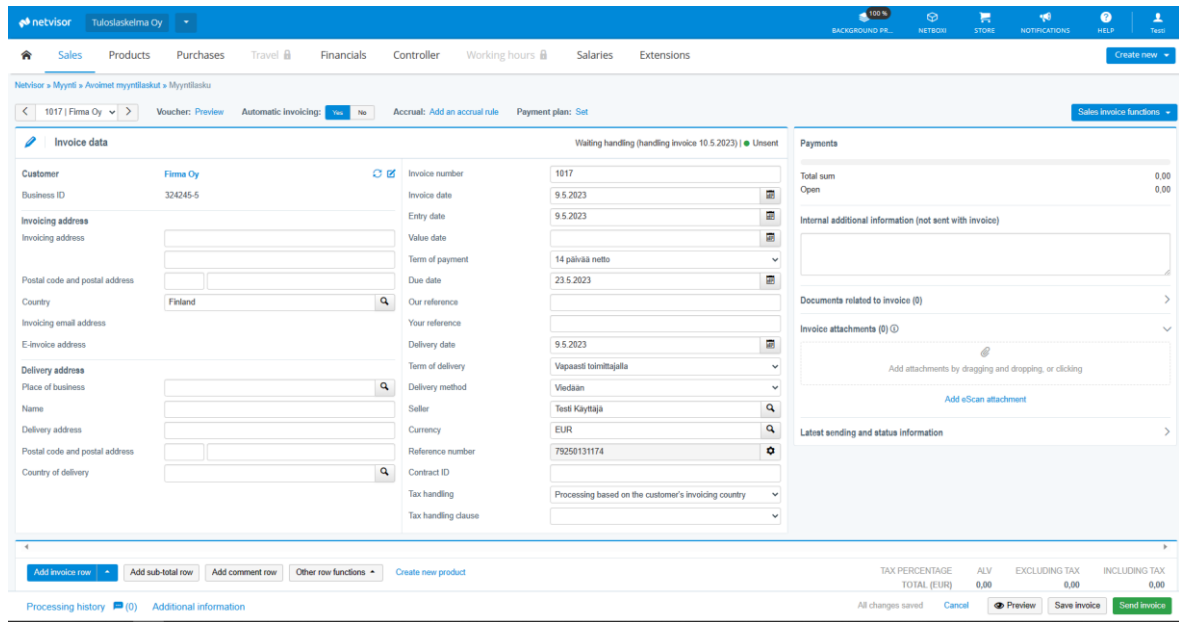


Figure 19 – Invoice data screen in Netvisor ERP

Here the additional invoice information is inserted as product, price, delivery address, tax handling, and invoice address. With the data added, the invoice can be sent to the customer. Additionally, to these functions the last tested function was sales reporting. From the sales reports there were several different alternatives to filter by. Below in figure 20.

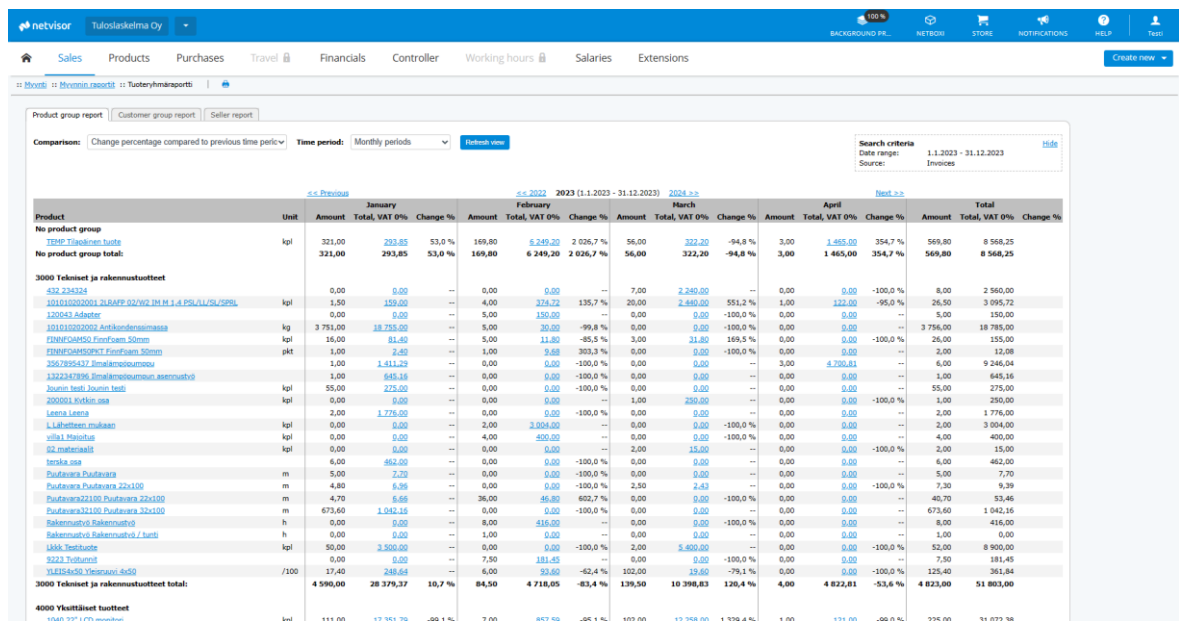


Figure 20 – Sales report, product sales in Netvisor ERP

From CCF perspective the most interesting one of the available reports would be products sales statistics. This function allows for sales overviews of product on either product level, or category level. The report produced an overview of in this case product sales in a test category. The overview could be scaled according to timeline and showed product sales each month in every category listed. The report could additionally be expanded to include customer groups and more data that is available in the ERP system.

While the test version offered limited insight into the real functionalities of the Netvisor ERP system, it allowed for an understanding of the basics within the functions and further how user-friendly the system is. The testing concluded that the Netvisor ERP system is a suitable alternative for CCF to consider, while additional discussions with sales representatives is recommended to further investigate the proposal, an initial alternative to consider is produced.

Lemonsoft

Lemonsoft offer no trial-period for their ERP system, instead they offer a catalogue over ERP system implementation or renewal that processes information from a general standpoint. Testing could not be conducted as with the other alternatives, and the conclusion of Lemonsoft as an alternative was based on information and data collected.

A deeper showcase into the system would require contact with a sales representative and further require sales meetings involving both CCF and Lemonsoft. It would be a time-consuming process for the parties involved and does not fit within the agreed scope of supply of this thesis. CCF will conduct investigation into Lemonsoft on their own if it is seen as necessary.

Spreadsheet-based inventory management

For the spreadsheet-based inventory management, the feature required is data export and import from and to WordPress. Testing the WordPress built in export and import feature resulted in further disappointments. WordPress allows for exporting all data regarding the inserted products in the platform. The user can select what to export and how, ranging

from which columns to product ID or SKU. The exported data is showed in a confusing and sub-optimal way that results in an overall difficult data maintenance procedure. Adding data in the exported file resulted in errors and or data that did not show up in WordPress when imported. Exporting data resulted in the data in figure 21 below.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
1	ID,SKU,Name,Stock,"Weight (kg)","Length (cm)","Width (cm)","Height (cm)","Categories																									
2	474,"Caudalie Beauty Elixir 100ml kauneusvesi",2,"",,"Tuotemerkit > Caudalie, Kasvot, Kasvot > Kasvovedet, Outlet, Tuotemerkit"																									
3	696,"Murad Retinol Youth Renewal Night Cream, kiinteyttävä retinoliyhdyde",,"",,"Kasvot > Ikkäntyyä iho, Kasvot > Ilmejuonteet, Kasvot > Kuiva iho, Kasvot > Luksustuotteet, Tuotemerkit > Murad, Outlet, Tuotemerkit, Kasvot > Vaihevuodet, Kasvot > Voiteet"																									
4	917,"Elf Baked Eyeshadow Trio Brown Bonanza luomiväri",,"",,"Tuotemerkit > Elf, Meikit, Meikit > Silmät, Tuotemerkit"																									
5	1099,"Caudalie Glycolic Peel kirkastava hedelmähapponaamio",,"",,"Tuotemerkit > Caudalie, Kasvot, Kasvot > Kuorinnat, Kasvot > Naamiot, Outlet, Tuotemerkit"																									
6	1136,"Caudalie Teint Divin Mineral Tinted Moisturizer BB voide sävy light/medium",,"",,"Ale-tuotteet, Tuotemerkit > Caudalie, Meikit > Kasvot, Meikit, Tuotemerkit"																									
7	1142,teintdivinbronzer,"Caudalie Teint Divine Mineral Bronzing Powder, mineraalaurinkopuuteri",0,"",,"Tuotemerkit > Caudalie, Meikit > Kasvot, Meikit, Outlet, Tuotemerkit"																									
8	1554,"t-Caudalie Glycolic Peel",,"",,"Huduvård > Ansiktsmask, Varumärken > Caudalie, Hudvård > Exfoliering, Hudvård, Outlet, Varumärken"																									
9	2053,"Caudalie Glycolic Peel, hedelmähappoja sisältävä kirkastava naamio",,"",,"Brands, Brands > Caudalie, Skincare > Exfoliators, Skincare > Masks, Outlet, Skincare"																									
10	2055,teintdivinbronzer,"Caudalie Teint Divine Mineral Bronzing Powder",0,"",,"Brands, Brands > Caudalie, Makeup > Face, Makeup, Outlet"																									
11	2319,"t-Caudalie Crushed Cabernet Scrub AMMATTITUOTE",,"",,"Ammattituotteet, Tuotemerkit > Caudalie, Tuotemerkit"																									
12	2322,"t-Caudalie Gommage Crushed Cabernet SALONG",,"",,"Varumärken > Caudalie, Salongproduktter, Varumärken"																									
13	2322,"t-Caudalie Crushed Cabernet Scrub PROFESSIONAL",,"",,"Brands, Brands > Caudalie, Professional products"																									

Figure 21 – WordPress data exported from CCF online store product inventory.

The chosen attributes were product ID, SKU, name, and category. It did not successfully export the SKU which remained invisible. Exporting data in this way would result in data errors and high manual labour.

This is not what CCF would like to implement. Further investigating the possibilities for exporting data another way, taking additional plug-ins to use may allow for more reasonable data export and import. There is an array of plug-ins available for the WooCommerce plug-in that allow export of inventory data in an organized way. The issue here is that the plug-ins are pay-to-use, and thus require an investment to be able to even understand if the solution is possible to implement in the end.

Since WordPress needs to ingest the data in a certain format, the ways of importing data are limited unless plug-ins or similar types of modifying modules are implemented. There is no way to import data in a manner that lowers the workload of the employees in the current inventory management situation.

Additionally, a budget for this thesis was not defined that could be used for testing of different solutions. This resulted in the spreadsheet method being disregarded as a viable option at this point due to the following issues.

- High cost of implementation for the result it produces
- No integration with Golli
- Testing and validation costs that do not guarantee a working result

- Combining plug-ins may result in volatility
- High amount of labour for implementation
- Reliability issues
- No concrete support, user-maintenance required

In my opinion this option requires too much labour and investments for the result it produces. The time and investments are in my opinion better invested in a solution that is futureproof and results in a system that allows for substantial savings of time or money in the longer run, rather than producing a solution that cannot feasibly be implemented nor kept running. Additionally, keeping approximately 16000 products with its range of attributes maintained in a spreadsheet is in my opinion not feasible due to the possibly unreliable data import. It is highly likely that data errors would occur and render the system inappropriate for use.

The conducted comparison matrixes where CCF requirements and wishes are taken into consideration, highlighted that the spreadsheet inventory management solution only partly satisfies the needs from the lists. Additionally, the solution is not very good at satisfying the different aspects, not to forget the certain advantageous aspects but them being far and few between it does not bring a positive indication overall of the expected performance.

Discussing the matter with CCF resulted in a similar conclusion. In addition to the negatives found in this thesis it was highlighted that testing different plug-ins in the e-commerce platform can not be justified due to the possible downtime when restorations of the e-commerce platform would possibly need doing due to the volatility in plug-in combinations. The downtime from restoring the platform would result in a significant loss of income due to the online store being down for maintenance for possibly an extended period.

4.9 Discussion About Methods and Findings

The nature of the case at hand allowed a wide range of methods to be used, and the range of information gathered using these methods allowed for a good understanding of how the

result shall later be formed and implemented. The use of these methods resulted in different alternatives, both in approaches but also in actual systems or platforms that later can be processed to create a result in the thesis.

The processing of the alternatives showcased allowed for a result to form based on the information, facts, and testing conducted and at hand. The testing could be done in a multitude of different ways, and this way offered slight insights into the system and what it offers for CCF. The process was not resistant against faults and may have allowed for certain errors or misjudgements. The width of the scope of investigation and the varying quality of information from the vendors site made conclusion-drawing difficult and required for a wide oversight over the alternatives at hand and what they offered. For example, Lemonsoft not offering a test function on their online site while Netvisor offered that. The following chapter will present the result.

5 Conclusion

This chapter presents the result of the thesis, which is in the form of a recommendation on how CCF should implement an integrated inventory management system, and which system they should use. The result is presented first in the form of a recommendation of system to use and following this a presentation over the suggested method of implementation.

5.1 Recommended Integrated Inventory Management System

The end goal of this thesis was to investigate, compare, and recommend a system that could act as an integrated inventory management system. Based on the theory system alternatives could be produced. The system alternatives were further processed in the methodology resulting in a suitable solution for CCF. Important factors to consider were the CCF requirements and wishes of the system, and not to forget the existing systems and their impact on the shaping of the result. The existing systems were not exchangeable at this time and thus required consideration in all phases and aspects.

From the range of alternatives both ERP systems would based on this thesis be suitable, they offer similar features and similar ways of implementation. Spreadsheet-based inventory management could be deemed not suitable due to the issues stated in the previous chapter. Deciding factors for the choice between the two ERP systems were feature comparison, information available on integration, information available for use and training, and at last the test possibilities.

Based on the analyses and comparisons conducted a suitable system could be proposed, which is Netvisor ERP. The Netvisor ERP system is able to integrate with the existing system without imposing volatility or significant reliability issues, while at the same time meeting the list of requirements and wishes set by CCF. Netvisor can integrate seamlessly with Golli, which was not defined with certainty by Lemonsoft. Furthermore, the Netvisor ERP system offers a whole array of other functions that can be taken into use and thus raise the effectivity of present processes by lowering the amount of manual labour and automatize several aspects. The Netvisor ERP system allows for saving time and in the long run money by allowing the employees to focus more on the core business which is selling.

The in-house expertise required for implementing and taking Netvisor into use is not very significant. Netvisor offer help and guidance in the implementing process, and the integration is taken care by partners as well. Inserting products and data into Netvisor will be a time-consuming process though, and in terms of labour cost split per project or task employees are working on quite high. Product insertion will likely take many months to complete, and at the same time there is multiple other functions that would be recommended to take into use at the same time to maximize the usability and future cost and time savings.

Inventory management can be covered by Netvisor integrated into both Golli and WordPress, and thus allow for the key requested function to be implemented. Netvisor offer a wide and configurable inventory management system fit for CCF purpose while considering the requirements and wishes. While there might be systems that offer advantages on some points, Netvisor strikes of all the points on the list well so to say. Furthermore, another few key features could be taken into use. Since multiple customer use Netvisor, taking invoicing and order management into use could save time and money by processing them in the system directly instead of using e-mail or other methods. Customers might even be more willing to order additional products if the order management and invoicing can be done easier than it is now.

5.2 Recommended ERP Implementation Method

The method of implementation is in this case as important as the inventory management system itself. The case company has no previous experience of ERP systems internally, and the existing systems were smaller and more easy systems to take into use, and further use. Implementation of an ERP system from scratch is no easy task and will require significant investments both of time by the employees, and money by the company. Selecting the correct implementation method is vital, especially with comparatively limited resources.

Taking the ERP system into use using the parallel implementation method is the suggested choice of way of working. This method minimizes the risks of compromising key systems or business functions by using the old systems in parallel with the new system being commissioned. It is certain that CCF can not operate for a prolonged period of time without the old systems in effective use. Integrating Netvisor into both WordPress and Golli can be

done by partner companies to Netvisor who both have experience of these integrations, carefully planning the implementation period can allow this stretch of the implementation to be conducted in a timely manner without disrupting day-to-day operations significantly.

Furthermore, if CCF considers taking multiple features into use at once as recommended. The recommended method can be combined with the phasing method. While integrating and taking the new system in use in parallel with the old systems, the new features must be implemented in phases and thus allow for a sort of moving-over period. This is vital both from an integration and function point of view, as well as the employees training point of view. Ensuring the system functions one step at a time is a way that will allow a smaller amount of errors to happen, at the same time ensuring the employees will have a transition period and be allowed time to learn the system.

One question mark in the result is the cost. The cost of implementation requires consulting sales representatives for a just and correct understanding. Netvisor offer expertise and will know the time and effort required for the implementation so a project cost can be calculated. It is certain that the cost will be significant, but it depends on multiple factors. Depending on the scope of procurement CCF would possibly pursue, the cost would vary. Netvisor offer multiple combinations of features to come in at multiple markets at once. Specifying the requirements and needs to Netvisor is a vital step in the process if CCF wishes to go down this route. Conclusively, the cost can not be determined at this point in time.

6 Discussion

The thesis work as a whole and the result produced by this thesis met the criteria and wishes set by the case company both in accordance with the preliminary criteria, but also with the requirements and wishes formed during the process of the thesis. The result produces a recommendation of an integrated inventory management system, additionally offering multiple more features to save both time and money for CCF in the long run.

ERP systems on the market for smaller companies were not familiar and not a part of past experiences. Experience with ERP systems used in large companies allowed for an understanding of vital functions, and so called “nice to have” functions. Possessing this experience in the thesis process was helpful, even though it is from another league of systems. Being familiar with the case company as a whole and its processes and functions was helpful, and allowed for a deep understanding of what it is that they really would want.

The wide initial scope and no initial alternatives than finding a solution that functions with existing systems allowed for an interesting thesis experience. The search for information was intense and allowing for a deep search of different types of sources. Using a wide array of sources and types of sources allowed for building a picture, one piece at a time, of how and what to look at when conducting this type of work. Internet research was a vital part of this thesis since the result depended heavily on up-to-date information, especially with shaping of the result. There was no pre-determined way of working, or alternatives to consider, and all systems were un-heard of from before. This adds to the reliability of the thesis result due there not existing any bias or prejudice towards a system or another.

The result will be handed off to CCF in its entirety, while there being no certainty to what CCF will do with the inventory management situation, having provided a suitable system for them to consider and possibly implement in the future was a pleasure. Furthermore, it will be interesting to see what route CCF choose to follow.

Additionally, I would like to thank a few people that have played an important part in the making of this thesis, as an end to this thesis. First, I would like to thank Carpelan Cosmetics Finland for giving me the opportunity to produce a recommendation over an integrated inventory management system. From CCF Jutta who provided this interesting and

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