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# DESIGNING THE E- COMMERCE ORDER-TO- DELIVERY PROCESS

– A guide for start-up companies



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## TILAUSTOIMITUSKETJUN SUUNNITTELU E-COMMERCEEN

Nykyinen taloustilanne irtisanomisineen ja lomautuksineen on synnyttänyt useita start-up yrityksiä eri aloille. Internet on mahdollistanut sähköisen kaupankäynnin ja sitä käyttämällä nämä start-upit kasvavat nopeammin kuin koskaan aikaisemmin. Tilaus-toimitus -prosessi on tärkeä osa toimitusketjua mutta e-commerce asettaa sen suunnittelulle omat haasteensa. Prosessin tulisi kasvaa yrityksen mukana vaivattomasti.

Tässä opinnäytetyössä määritellään eri e-commercen osa-alueita ja keskitytään ratkomaan niiden luomia ongelmia. Tavoite on antaa start-up yrityksille tietoa vaihtoehtoista kuten e-commerce moottoreista, logistiikkatoimijoista ja maksuvaihtoehtoista. Jokainen yritys on yksilö ja se tulee ottaa huomioon suunniteltaessa tilaus-toimitus -prosessia.

Suurin osa tämän työn lähteistä on ajankohtaisista artikkeleista tai muusta uudesta kirjallisuudesta koska e-commerce muuttuu jatkuvasti. Tätä työtä varten haastateltiin myös useaa tahoa logistiikkatoimijoista yksityisyrittäjiin ja tuloksia on käytetty teorioiden tukemiseen. Myös Case -tutkimuksia on käytetty aina kun mahdollista.

Työ osoitti että ulkoistamisen avulla voidaan rakentaa tehokkaita tilaus-toimitus -ketjuja. Ostettuja palveluita yhdistelemällä suunniteltiin Case-yritykselle malliprosessi. Aihe vaikuttaa suuresti yrityksen toimintaan ja kannattavuuteen. Tästä syystä Case-yritys pysyttelee nimettömänä.

ASIASANAT: E-commerce, tilaus-toimitus -prosessi, e-commerce engine, content driven commerce, 3PL, ulkoistaminen

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## DESIGNING THE E-COMMERCE ORDER-TO-DELIVERY PROCESS

The current financial situation with layoffs and cutbacks has spawned a myriad of start-ups in almost every sector imaginable. Harnessing the power of the internet is helping these companies grow with unprecedented speed using e-commerce. The order delivery process is a crucial part of any supply chain but designing one to suit e-commerce and to grow with the company, is a challenge.

This thesis defines the different aspects of an e-commerce order-to-delivery process and discusses possible solutions to the arising problems. The aim was to give start-ups information about the different options they have, such as e-commerce engine differences, payment methods and warehousing possibilities. Every company is unique and this must be taken into account when designing the process.

Most of the information in this thesis is based on recent articles or other literature since e-commerce is changing rapidly. Interviews with several parties, including logistic service providers, software developers and entrepreneurs, were also conducted and the information was used to support theories in this thesis. Case studies are also used whenever possible.

This thesis indicated that outsourcing helps start-ups design lean order-to-delivery processes and outsourced services were stringed together to design an example order-to-delivery process for a case company. Due to the high impact of the topic on the case company's business they have chosen to stay anonymous.

### KEYWORDS:

E-commerce, order-to-delivery process, e-commerce engine, content driven commerce, 3PL, outsourcing

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## **ABREVIATIONS**

<b>3PL</b>	<b>Third party logistics</b>
<b>3PM</b>	<b>Third party manufacturing</b>
<b>API</b>	<b>Application programming interface</b>
<b>B2B</b>	<b>Business to business</b>
<b>B2C</b>	<b>Business to consumer</b>
<b>CMS</b>	<b>Content management system</b>
<b>CTO</b>	<b>Chief technology officer</b>
<b>EDI</b>	<b>Electronic data interchange</b>
<b>IT</b>	<b>Information technology</b>
<b>LSP</b>	<b>Logistics service provider</b>
<b>OPP</b>	<b>Order penetration point</b>
<b>OTD</b>	<b>Order-to-Delivery</b>
<b>PCI DSS</b>	<b>Payment card industry data security standard</b>
<b>PSP</b>	<b>Payment service provider</b>
<b>SEO</b>	<b>Search engine optimization</b>
<b>SKU</b>	<b>Stock keeping unit</b>
<b>SME</b>	<b>Small and medium enterprise</b>
<b>UI</b>	<b>User Interface</b>
<b>WMS</b>	<b>Warehouse management system</b>
<b>XML</b>	<b>Extensive markup language</b>



# 1 INTRODUCTION

The purpose of this thesis is to act as a guide for all start-up companies that wish to use e-commerce with a focus on e-retail. In addition, the case company will receive valuable, objective ideas on how they could improve their order-to-delivery process. All of the ideas discussed in the thesis can be applied to any company, but the focus is to create a functioning order-to-delivery process for the case company. For these reasons all ideas will be explored to a reasonable extent after which the prevailing one will be selected for the case in question. It is important to keep in mind that there are no absolute truths. Every company is an individual and should be treated as such when designing the order-to-delivery process.

Due to the limited scope of this thesis, some areas will only be discussed briefly. However, for any company interested in e-commerce, more information can be found by looking at the sources.

The case company in question is a small Finnish IT start-up employing around 80 people. Their business model is oriented towards international e-commerce with offices in Finland as well as abroad. The supply chain also spans across multiple countries and this must be taken into account when designing the order-delivery process. Scalability, multiple language support and system links are of utmost importance for the case company concerning the e-commerce engine.

## 2 E-COMMERCE

Encyclopedia Britannica defines e-commerce as “maintaining business relationships and selling information, services, and commodities by means of computer telecommunications networks.”.[16]

Today the most popular of these telecommunications networks is the internet. The roots of e-commerce are in the exchange of business documents, orders and invoices, between business partners. It was first used during the Berlin blockade while airlifting goods to the city.[16]

### 2.1 Evolution to the omni channel view

According to Paul Shang, the e-retail industry has faced three major changes in the past fifteen years. First all the different retail channels were separate. This single channel approach considered the web as just another way to gain sales. The systems were not integrated and required a significant amount of manual labour. Then it was realized that sales could be increased by integrating all the sales channels in a way that it would not matter which channel the customer was using, the view of the product would always be the same. This also meant the systems would be integrated and an order placed in one system would automatically appear in the other via a central database. Hence the name multi channel. The latest development in e-retail has been the omni channel approach. It is no longer about how the customer views the product but about how the company views the customer, what the company knows about the customer and how to use that information to maximize sales and service quality. All approaches can be seen in Figure 1.[17]

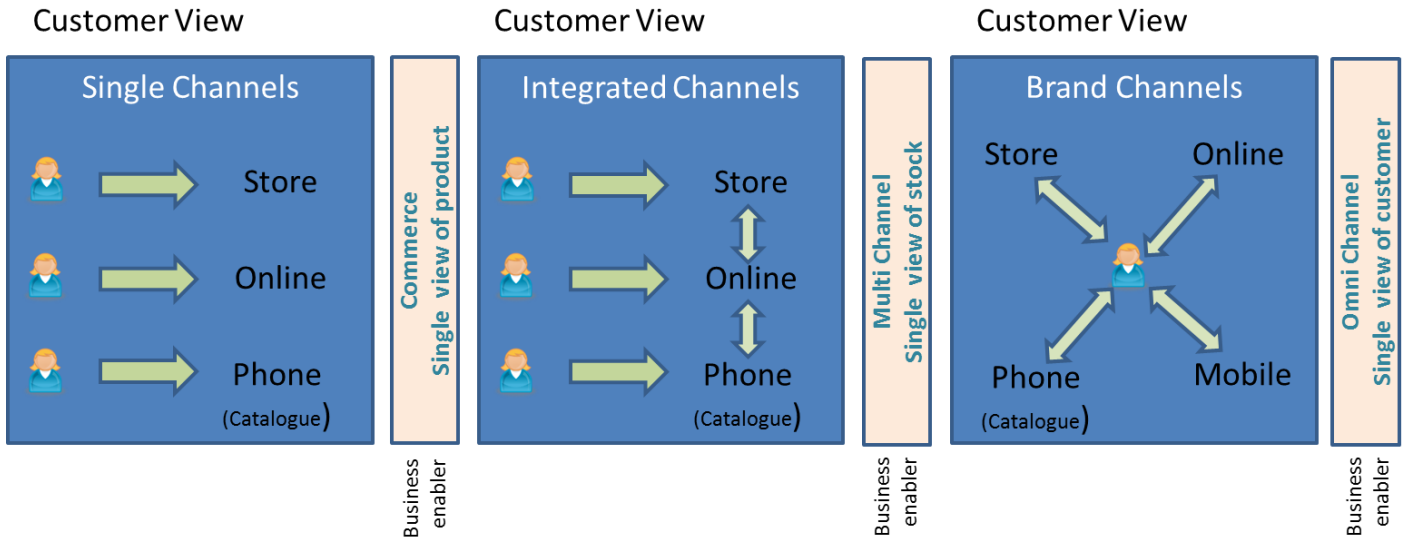


Figure 1 The three approaches to digital retail [17]

The companies that have been able to adapt to these changes have thrived.

## 2.2 Content driven commerce

Content driven commerce is defined by viglink.com as e-commerce sales linked from blogs, forums and social curation sites. Content driven commerce grew by 31% during 2011.[18]. This means that consumers are looking for inspiration and reviews from blogs and social networks more than ever. Taking advantage of this trend is vital for any e-commerce company. At the same time the Global Web Index study shows that tablet users are among the most likely to make purchases online and that the global tablet user base has grown by 282% since the first quartile 2011.

“Compared to the average global Internet user, tablet users are 57% more likely to follow the latest fashions. They are also 55% more likely to say that their favourite brand plays an integral role in their online experience. What’s more, tablet users are also 43% more likely to frequently tell friends and family about new products and services.”[19]

These two trends affect where and how the purchase decisions are made. It does not directly affect the order-to-delivery process, but is certainly something to keep in mind when working with a start-up

### 3 ORDER-TO-DELIVERY PROCESS

After a customer has expressed interest in a product in the form of an order, the order-to-delivery process begins and subsequently ends in a successful delivery of the product. Depending on a company's business model, they can be using either a push, a pull, or a combination strategy to produce their products or services. This in turn affects the customer order penetration point in the supply chain, the point where the order-to-delivery process begins. When discussing the order-to-delivery process, it is important to understand the main characteristics of each of these strategies.

#### 3.1 Order-to-delivery process in general

##### 3.1.1 Push

Predicting demand is difficult and with the new generations of e-commerce customers whose needs can change on a whim, creating accurate predictions for manufacturing is nearly impossible. The push model's supply chain is driven by forecasts up to the OPP. This leads to stock levels that are either too high or

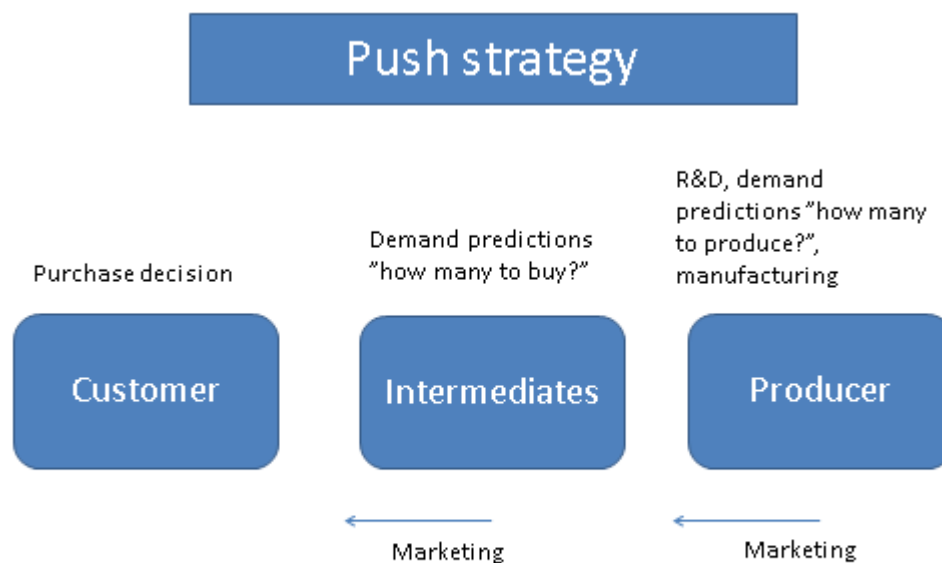


Figure 2. Push strategy [12]

too low, causing stockouts or rising warehousing costs.[12] As the name states, the product is pushed into the market with active marketing to wholesalers and other intermediaries. Make-to-stock is a traditional push driven strategy and should be considered if demand can easily and accurately be predicted.

### 3.1.2 Pull

Removing the need to predict demand is the core of the pull strategy. The order-to-delivery process starts when the customer expresses a need for the product, a good example is make-to-order.[13] Also known as Just-In-Time, the strategy requires a streamlined supply chain with good communication from end to end. Growing lead times have to be battled with efficient processes to keep the customer satisfied. This also means cutting down on scrap. Do it right the first time or DRIFT means raising the tolerance for quality so high that it virtually eliminates all defects in products before they happen.[78] By marketing an idea directly to the customers the producers will receive accurate feedback in the form of orders. When launching a new product, this can be done with preorders and with an established product every new order pulls another product through the supply chain. Some warehousing is always required but the goal is to minimize everything that does not directly add value to the customer.

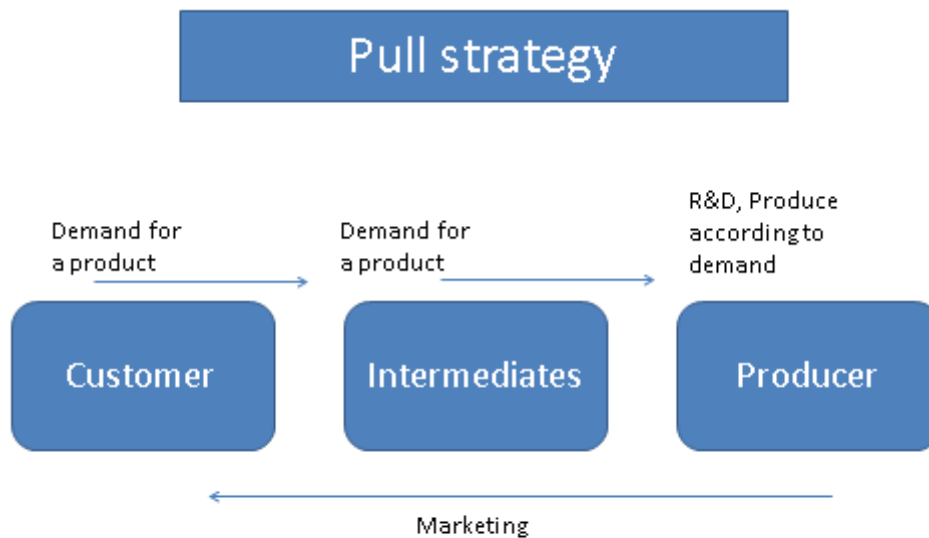


Figure 3 Pull strategy [13]

### 3.1.3 A combination

Most companies have to mix the two aforementioned strategies to meet their customers demands. This new way of thinking has been named demand chain management.[13] Keeping reasonable stock levels will help cut down on order lead times and keep the customers happy. Some forecasting is necessary when developing new products for the market. R&D takes time even when the project is being led by an experienced specialist. For start-ups, giving customers the chance to preorder the product will help with funding as well as giving much needed insight on demand.

Mcdonalds made a change in their sales process to enable this kind of a hybrid strategy. They first prepare the beef patties and buns, then store them in a special oven to keep them from cooling or drying and when the order is placed, they assemble the burger. This can be called assemble-to-order.[11]

For the purpose of this thesis we will assume the case company is using a combination strategy. Producing their products, warehousing them and after an order is received, they are assembled to fulfill that order.

### 3.1.4 Main building blocks

In its simplest form, an order-to-delivery process has five components, the customer, the order, the producer, the payment and the delivery. This might work in theory with the producer selling a product or service that is always available and the customer collecting it from the producer. Most of the time shipping, warehousing for the products and a way to process the payments, are required. However, it is not financially profitable for a start-up company to do everything themselves, but to focus on their core business.[14] Among these outsourced services may be logistics, warehousing and anything that requires large initial investments. In this thesis outsourcing will be covered in more detail when warehousing is discussed. The average OTD process may also include an LSP, a warehouse, a manufacturer, a wholesaler, payment gateways and banks.

## E-Commerce Workflow Diagram

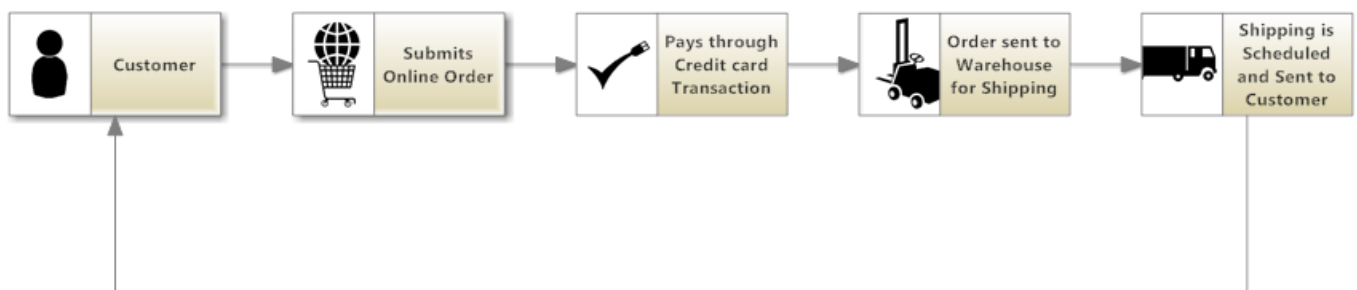


Figure 4. E-commerce workflow [79]

The process is a roadmap for the flows of cash, materials and information. An example of a fairly simple OTD process can be seen in Figure 4.

### 3.2 Order-to-delivery process with e-commerce

A property of the e-commerce environment is high market speed. The average time needed for a traditional business to establish a business model, gain goodwill, and prove its worth is about eight years – longer than a single business cycle, but usually shorter than two.[1]

If Reiss's[1] calculations are correct, the estimated length of the Internet year is about 4.7 normal years. This means one calendar year should roughly represent slightly less than one complete business cycle in the online environment. Therefore, the time needed for a company operating in an e-commerce environment to establish its business model is somewhere between one and two calendar years.

Due to this, the implementation of an e-commerce order-delivery process should be swift. The same applies for the OTD lead time. Customers are accustomed to fast paced business and expect products to arrive in a timely fashion.

The e-commerce engine is an additional building block in the process compared to a traditional OTD process. It acts as a hub for information, cash and material flows.

### 3.3 Case company OTD process

This thesis concentrates on finding solutions to execute the Case process on a practical level. Answering questions such as “How is the payment processed? What information does the e-commerce engine require to complete the order?” The case company OTD process is discussed in chapter 9.



## 4 E-COMMERCE ENGINE

In the heart of the entire e-commerce order-to-delivery process is the webshop. This is built on an e-commerce engine. Depending on the setup, the engine may have to handle orders, payments, returns, stock levels and much more.

### 4.1 Selecting the right engine

Choosing the right engine may be a difficult task for most and it is highly recommended to consult an expert in the field. When asked what engine he would recommend, Mr. Teemu Malinen, CEO of Sofokus oy, said:

”The selection depends on what kind of webstore concept is in question, what the budget is, what the first version will include and what direction the customer wants it to evolve.”

It is important to have the answers to these questions before making a decision. The less complicated the idea, the simpler the software. The four different types

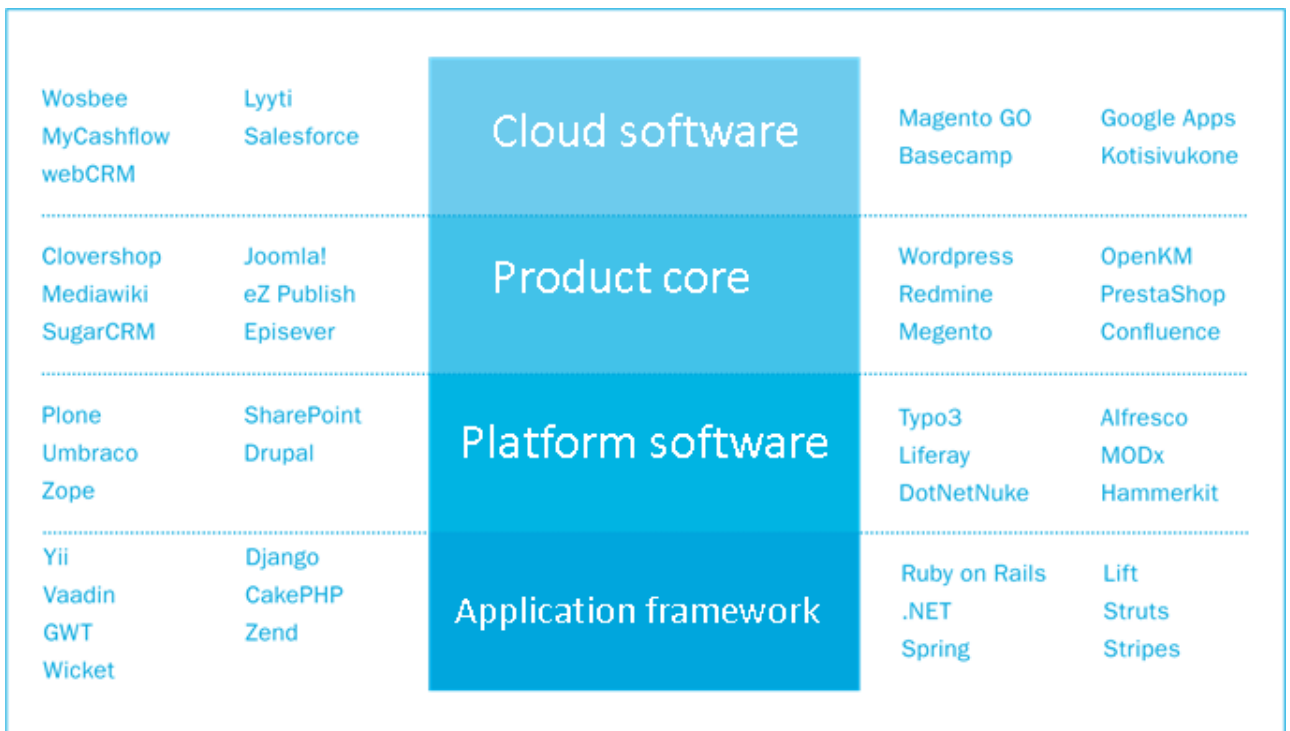


Figure 5 Different types of software [8]

## 4.2 Cloud based software

For small businesses that would be satisfied with under 100 products and are looking for a fast and cheap start into e-commerce, a cloud based solution is the way to go. Cloud based software is ready out of the box and is well suited for small webshops, but customizability is quite limited. Software integrations will most likely be very difficult.[8] Hosting the webshop is simple since the program is already in the cloud and hosting is included in the price. Using cloud based software is like renting a house. As a tenant, major renovations are not possible but the house is ready to be lived in when the lease has been signed.

## 4.3 Product core

Product cores, such as Wordpress, offer a functioning product with which to build a site. They are ready out of the box without intensive set-up times. While Wordpress is the most popular product to build any site on, Magento boasts the same achievement in the e-commerce field.[90][23] Even though little work is required to set up product core software, they still can be customized and expanded with modules and add-ons. If cloud based software was similar to renting a house, product cores are like buying one.

## 4.4 Platform software

Whereas product cores give the user virtually all the necessary tools to build their site out of the box, platform products need more work. They offer a platform on which to add modules and build a site. This allows for even more freedom of design but more work is required. Drupal is a very well-known product in the platform software category. It is built on modules that can be easily added or removed. Platform software represents building a house from a premanufactured package. All the bits and pieces are available but the right ones have to be selected and put together. There is some room to modify the final result.

#### 4.5 Application framework

As the most flexible option available, application frameworks only provide a basic frame on which to build the site. It specifies which programming language to use and some of the basic rules. For example, Instagram and The Washington Times are sites that have been built on Django. This approach is similar to building a house from the ground up. The construction inspectors set some guidelines for the build but there are no other limits.

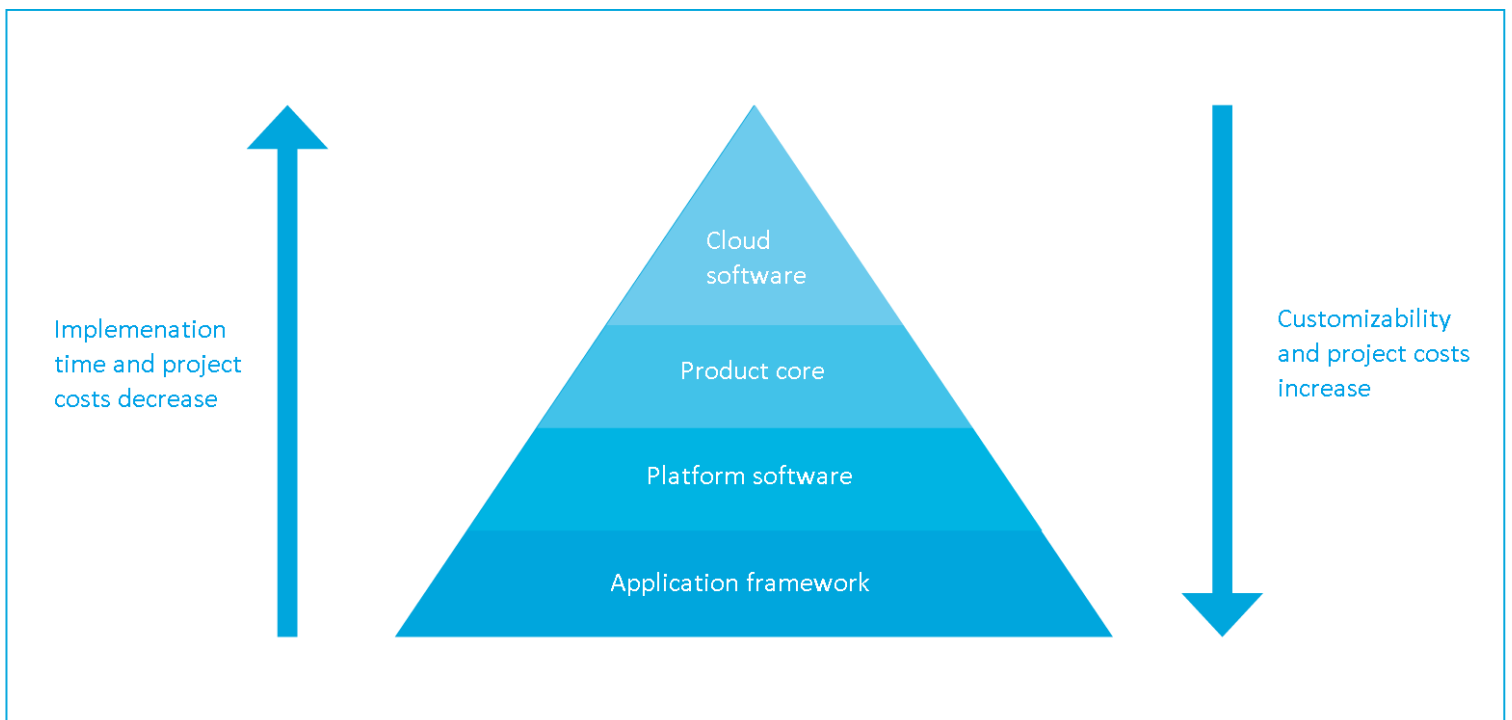


Figure 6 Cost of implementation [8]

A customized application is often seen as a large investment. As can be seen in Figure 6, project costs do increase hand in hand with customizability. However, noticing in a few years that the software that was selected will not adapt to the evolving nature of the business, switching to completely new software will definitely prove more costly than the customized approach.[8]

#### 4.6 Impact of UI on sales

Manganari, Siomkos, Rigopoulou and Vrechopoulos[20], establish a direct link between the ease of use of an online store to the consumer's attitude and pleasure towards the store. The two aforementioned affect the consumer's shopping behavior.

This sets requirements for the customizability of the e-commerce engine to create a simple yet appealing environment for the consumer. The easier the store is to use, the more the customer will buy.

#### 4.7 Search engine optimization

Making sure potential customers find the store is very important. Search engine optimization, or SEO for short, may sound somewhat complicated and to a certain extent it is. Most e-commerce engines have SEO built in or have a plugin that can be installed to manage it. Fine tuning still requires experience and knowledge. There are a few techniques anyone can use in this field to ensure their store appears frequently in searches.

Using google trends helps target campaigns by showing what people are searching for right now.[9] Manually checking how high each search engine places the site with different search terms also gives a rough idea whether for example new content is making a difference. This can also be done with network analytics tools, such as google analytics.[10] Google adwords allows for paid targeting of certain search terms.

#### 4.8 Pros and cons of different software

##### 4.8.1 Drupal Commerce

Drupal is an open-source content management system. As a CMS it is not directly oriented towards e-commerce. However, there are multiple modules available to extend the capabilities in the direction the user wants. Drupal is entirely built with these modules of which some are free and others have to be

purchased. However, updating multiple modules may be time consuming. Among the sites built on Drupal is the official page for the Whitehouse of the United States.[21]

Drupal Commerce is one of the aforementioned modules. Born to replace the highly popular Ubercart, it is made by a company named The Commerce Guys and is built to handle the e-commerce aspect of a user site. Also if writing code is not a skill the customer has, Drupal Commerce is also available as a distribution called Commerce Kickstart. This is a package that installs the Drupal core, Drupal Commerce and other modules it depends on. It does what the name promises, gives a fast kick-start into e-commerce. Drupal Commerce and Magento are quite evenly matched so if Drupal is more familiar, using it maybe more efficient.

#### 4.8.2 Volusion

One of many, Volusion is a cloud based piece of software. It has been rated number one in the TopTen Reviews best e-commerce software of 2013 comparison. Volusion is not open-source and charges users a monthly fee depending on the number of products they wish to have on sale, how much bandwidth they want to have and various other service options(Figure 7).

**It pays to choose Volusion**  
Flexible ecommerce software and hosting plans that grow with your business

	Mini	Bronze	Silver	Gold <i>Best value</i>	Platinum
	<b>\$15/mo</b> SIGN UP	<b>\$35/mo</b> SIGN UP	<b>\$65/mo</b> SIGN UP	<b>\$125/mo</b> SIGN UP	<b>\$195/mo</b> SIGN UP
Products	100	1000	2500	10000	Unlimited
Data Transfer	1GB	2GB	5GB	25GB	40GB
Transaction Fees	None	None	None	None	None
24x7 Support	Online Support	Phone Support	Phone Support	Priority Support	Priority Support

Figure 7. Volusion pricing [50]

A significant downside of Volusion is the limited amount of information it gives about the business and the customers. It does have a reporting tool but it does not compare to Drupal Commerce or Magento. Also the bandwidth limits are small. Going over the bandwidth limit has consequences in the form of additional charges for every bit over the limit. Scalability is also quite weak with Volusion as well as customizability.[22]

### 4.8.3 Magento

Magento is the most popular e-commerce software in 2012[23] (Figure 8). This says much about Magento. It is purpose built for commerce and has established itself as the number one software for the job. The community version of Magento is open-source and has no fees. However, the software is also offered

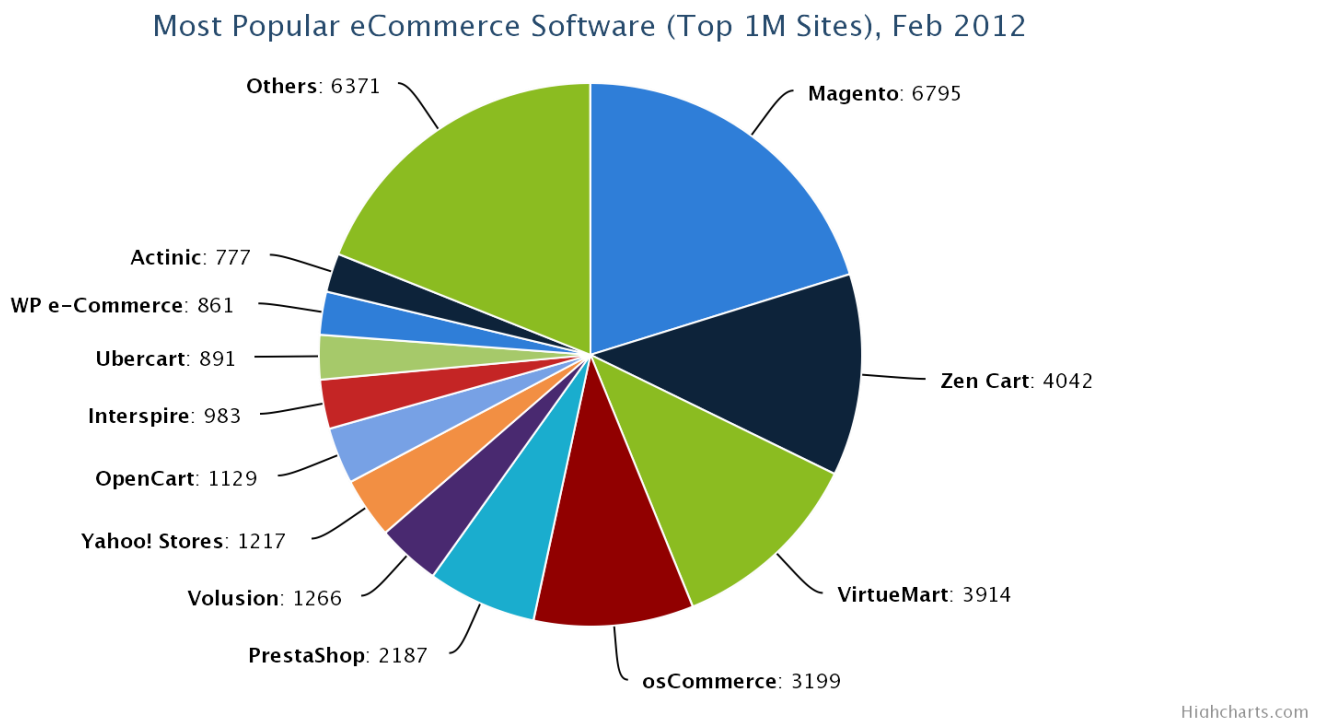


Figure 8 Magento popularity [23]

in the Magento Go version. Similar to Volusion it is a package with a monthly fee depending on the level of service desired and it is cloud based. The most expensive Enterprise version of Magento starts out at \$15,500 a year with

dedicated customer service experts. It is used by brands such as Nike, Gant and The North Face. A start-up may use the community version to begin with and seamlessly migrate to the more advanced versions if they see fit down the road.

In an interview, Mr. Richard Carter( 15 October 2013) of Richard Carter Consultancy compares Magento and Drupal Commerce as follows:

“My preference would probably be Magento, though, because it's specifically built for ecommerce whereas Drupal Commerce is an (albeit very good) add-on to a CMS. Scalability, both should scale well, and there are big sites on both Magento and Drupal Commerce, though again, my preference for larger scale ecommerce would be for Magento simply because it's older and more established as an ecommerce platform. You might find that a Drupal-only developer feels that Drupal is the right answer regardless, so at the end of the day it's just personal preference.”

#### 4.9 Complementing the online store with 3rd party services

Well established e-commerce sites such as Ebay or Amazon allow companies to build their own shop fronts. These may be used to reach an even larger audience.

A Finnish start-up Named Kiosked offers a service to monetize content on, for example social networking sites. They create interactive videos and images to allow the consumer to purchase the products with a simple click. If a customer likes the products and shares the content to their contacts, for example on Facebook, those contacts can then purchase the product without first having to enter the webshop.[28]

Another Finnish company named Nosto offers personalized product recommendations for webstores. Many e-commerce engines have this feature built in but actually configuring it to make it work well takes thousands of hours of work with algorithms. Nosto offers the service for a percentage based fee of sales made through their product.[29]

” For example if your monthly sales are 45,000 euros, and Nosto is bringing 10% of the sales(4,500 euros), the payable amount to Nosto is 4% of the sales that came through Nosto and 4%of 4,500 euros is 180 euros.”[29]

Scandinavian outdoor store.com and shop.angrybirds.com/eu/ are among the satisfied customers of Nosto.

#### 4.10 Hosting the engine

After the appropriate software has been selected to handle the task of running a company’s commerce the next question is where to host the engine. There are various ways to do this. The solution is often a compromise between service and costs. If the commerce of a company is already run on a cloud based engine such as Volusion, the hosting needs have already been managed.

##### 4.10.1 In-house server

The most resource consuming of the three, owning a server and maintaining it is often not a lean solution. The rent must be paid for the physical space required. Also the electricity consumed by the servers, and more importantly their cooling, costs a substantial amount of money. Buying the hardware is a large initial investment as well. On top of all that an employee must be responsible for the maintenance and their salary has to be paid.[15] This option is suitable if very high levels of security and speed are required.

##### 4.10.2 Outsourced server

The level of service depends on the price with outsourced servers. The cheapest options begin from a few euros. The price increases as the required bandwidth, visitors per month and availability increase. Service providers often advertise the availability percentage of their service. This means the percentage of time per year a company’s website will be accessible. Availability is more



relevant than uptime since a server can be running, in other words up, but a site may still not be available due to errors.[15]

A dedicated server is the more expensive option where a company effectively leases the hardware and hosting services from a service provider. Only one client's information is stored on the server in question. Response times to problems are quick and the scalability of the service depends entirely on the hardware.

Another option is a virtual server. It splits a server into smaller parts sharing it with multiple clients that each receive a share of the capacity. Again depending on the budget, services such as response time in case of problems, will differ greatly.[15]

#### 4.10.3 Cloud based server

Using cloud based servers is a new trend in web hosting. It resembles the virtual server option but whereas the virtual server is a single server split into parts the cloud based server uses multiple servers split in this manner to host client data. This way of hosting ensures that a client's service is not completely terminated in case of a single physical server going down. Some interruptions may occur. However, the client usually has no way of knowing what hardware their site is being run on at any given time.

Cloud based servers are a noteworthy option if the business is looking to expand in the near future. The service can be scaled according to the current load in real time. Caution should be exercised when approaching vendors since the word cloud may be used to market a variety of services, even ones that are not based in the cloud. Service agreements should be carefully inspected before making a decision.[15]

## 5 WAREHOUSING

The question of why warehousing is needed in a particular supply chain should always be addressed before considering how it should be executed. Warehousing can take place in multiple locations along the supply chain but given the scope of this thesis, the warehousing of raw materials and components for manufacturing will not be discussed.

### 5.1 Reasons for warehousing

Everytime capital is tied up in inventory, it must be justified. That same capital could be used elsewhere more profitably. Some reasons for warehousing are:

- Ensuring good customer service. When striving for the fastest possible delivery times, keeping products in stock is an easy way of ensuring customers receive their products on time.
- Unreliable suppliers. If there is more than one supplier for the product in question, an unreliable supplier should not be used. However, sometimes there is no alternative and making sure customer service is unaffected requires extra warehousing.
- Limited supply of a product. Some products may only be available for parts of the year. Warehousing is needed to ensure availability to customers.
- Economic order quantity. Buying products in larger order sizes may prove to be more economical even after the warehousing costs have been taken into account.[24]

### 5.2 In-house

The traditional way of warehousing is for the company to do it themselves. Large companies that have the space and manpower required can do this quite efficiently. In-house warehousing guarantees them greater control over a central part of the supply chain, lower costs without the profit needed by another organization and closer integration of logistics activities.[30] For example, the

entire business idea of the Elkjøpin group, the owner of Gigantti, is based on efficient warehousing and logistics. The company can keep prices low by buying large volumes of products and then efficiently delivering them to stores around the Nordic countries. Warehousing is a part of Elkjøpin's core business and therefore they have invested in it.[26]

In-house warehousing might also work well for a very small start-up that requires limited amounts of space, only has a few different items in stock and has a reasonable amount of orders per day. Anssi Juusela, co-owner of the webshop Rannekelloja.fi, was interviewed for this thesis on the 31<sup>st</sup> of October 2013 and gave some insight on their solution to the warehousing problem. Rannekelloja.fi sells wristwatches in Finland and caters to approximately ten to twenty customers a week. The small physical size of their products and the fact that they have opted to keep low stock levels has allowed them to keep the warehouse in-house. No additional space was needed to accommodate the warehouse and it is run from home. Juusela says they have no problems keeping their promise of delivery in 1-3 business days . Almost 90% of orders get shipped the same day. Currently the company employs only two people and between them they check the products arriving in their warehouse and process incoming customer orders. When asked if they had considered outsourcing their warehousing function, Juusela explained that if the business grows substantially they will have to consider it. However, they offer a service where the customer specifies their wrist's circumference and the strap of the watch is adjusted prior to shipping. The battery of the watch is also checked and changed if necessary. This makes outsourcing more challenging since special tools are required to complete the tasks. Value added tasks are possible in outsourced warehouses but costs increase as complexity increases.

Being in between these two examples of the Elkjøpin group and Rannekelloja.fi means acquiring a location for the warehouse, hiring more staff and tying up much needed capital in equipment. Also warehouse layout planning is not something to ignore. Warehousing costs and costs from capital tied up by warehousing compose 50% of all logistics costs in a company. Labour costs

compose half of all warehousing costs and the rest is divided between rent, storage, machines, IT and software. When operating a picking warehouse, about 50% of the labour costs are caused by the picking itself as can be seen in Figure 9[25]. Therefore, designing the layout to minimize picking time is crucial. This expertise might have to be outsourced if the company does not have it in-house.

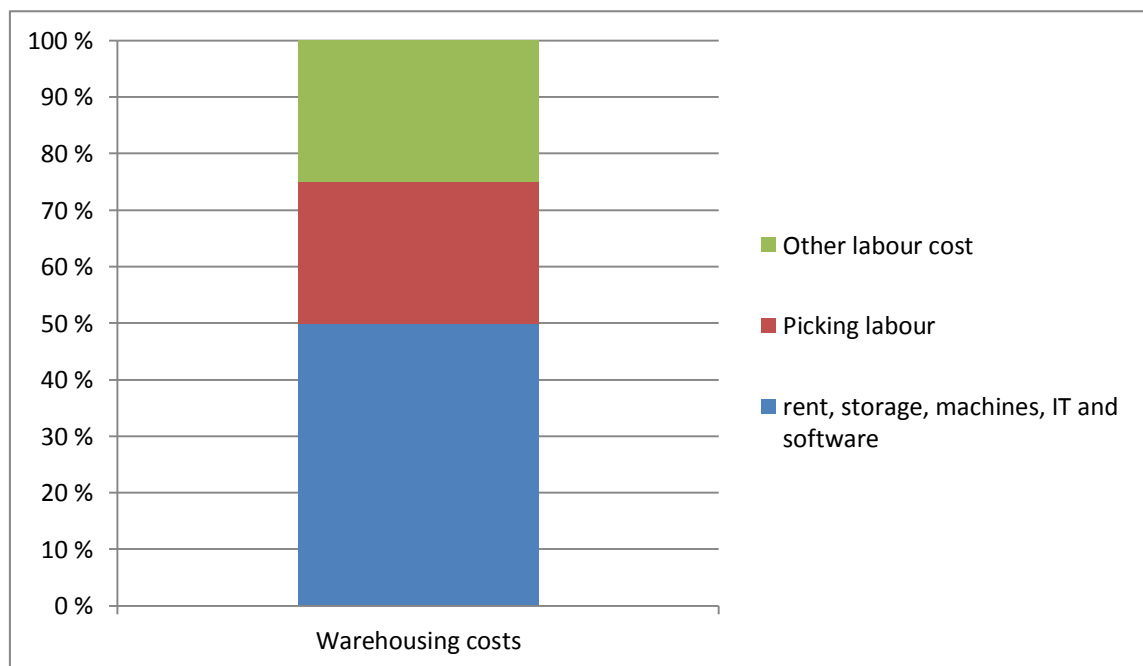


Figure 9. Labour costs division

### 5.3 Outsourced with LSP

Another option for tackling the warehousing problem is to outsource the function altogether. Before the decision is made, careful price and strategic analysis should be conducted. Hiring an employee to run a warehouse because no one else has the time, but then only having work one third of the time for that employee is not efficient.

Outsourcing avoids this problem by shifting the responsibility of efficiently running the warehouse to a 3<sup>rd</sup> party. Outsourcing can be done by companies that treat warehousing and logistics as part of their core business and companies that do not. The implications differ however. Jiang points out that companies admitting and accepting that they cannot be world class in all processes, even core processes, that contribute to making their products, have higher market values. Moving towards business strategies built around a company's core competencies sends positive signals to the stock market. However studies also indicate that outsourcing core business can lead to quality issues and delays in delivery.[41] Outsourcing non-core business increases innovativeness[42] and cost efficiency[43]. Other traits of businesses that outsource warehousing are high shipment volumes, relatively standardized customer requirements and moderate size[27]. In other words, the in-between group above should consider outsourcing. However, the more transaction specific assets a company has in a certain area, the less likely it is for it to gain a competitive advantage from outsourcing in that area.

“Transaction-specific assets arise when either the buyer or the provider of a service makes an investment which is useless outside of the relationship. For example, a warehouse built to support a just-in-time manufacturing plant may be critical to the plant's operation but worthless if the plant closes. The plant owner incurs a risk/opportunity cost by leaving the warehouse to a third party. If the warehouse operator believes that his operation is critical, the operator may seek to raise rates to an exorbitant level. To minimize this risk the plant owner will own the warehouse.”[27]

### 5.3.1 Shared operations

Many LSPs including DB Schenker and DHL offer warehousing as a service. For small companies, shared operations services offer flexibility and cost efficiency. The LSP serves multiple customers from the same warehouse with the same staff and machinery, thus improving the capacity utilization percentage and lowering costs. This, however, also means that the actions of

other companies will affect the warehouse performance of all the other companies. Response times might not always be as fast as desired.

### 5.3.2 Dedicated operations

The more expensive option is dedicated operations services. All machinery, staff and storage space is dedicated to serving one customer. This allows for fast operation of the warehouse. However, it should only be considered if customer service levels are too low with shared services and the company needs more capacity. Customer service levels may be affected by the location of the warehouse, the complexity of a value added service for example special packaging or the sheer scale of the operation in general.

### 5.3.3 E-commerce orientation

A new trend has emerged from the growing demand for e-commerce oriented 3PL warehousing. Vendors, such as Shipwire and Nettivarasto, have targeted their services to meet the needs of e-merchants. Much like their larger counterparts they also offer dedicated and shared operations.

Timo Toivonen of Nettivarasto (3 Dec 2013) states their biggest difference to traditional operators is the ease of use. Everything is designed with the needs of webstores in mind. All the customer has to do is to make their products available to the warehouse and they will take care of the rest. Shipping is handled with connections to logistics operators such as Itella, Matkahuolto, DPD, Eesti Post and DHL. The WMS that Nettivarasto uses has been custom built in-house and has open APIs ready, to which any merchant can write a piece of code and connect to. Integrations for popular Finnish e-commerce engines, such as Mycashflow, Vilkas and the Magento based Pipfrog by Soprano, can be taken into use immediately free of charge. Individual cases, such as customized Magento can also be integrated with ease. With the use of a skilled programmer, the data will be flowing in a few hours and the e-commerce engine work, such as inventory levels, should work within a few

days. Nettivarasto currently has around ten logistics workers located in Tallinn, Estonia. Their service level agreement states that orders placed before 12 o'clock will be shipped the same day. Toivonen assures that their operation will scale up with any company without a problem. According to him Nettivarasto serves dozens of businesses mainly based in Finland including the merchandise for The Dudesons. No monthly fees are charged, just ones based on shipment volumes, warehousing service needed and possible packaging material.

In a way, these companies are a hybrid between transport administration operators, with their connections to shipping, and third party warehousing providers. SME e-commerce start-ups should seriously consider this option.

#### 5.4 Whether to outsource

In terms of pure costs, the outsourcing decision can be simplified. A break-even point can be formed as can be seen in Figure 10. However, multiple other factors mentioned previously affect the decision. Control, customer service and sufficient skills are the predominant ones.[30] For the sake of this simplified example the large initial investment of in-house warehousing has been taken into account immediately. Due to the per shipment –type of pricing used by outsourced warehouses, as the amount of transactions grow so do the costs. On the other hand efficient inhouse warehousing cuts costs per transaction the more transactions there are since costs are fixed.

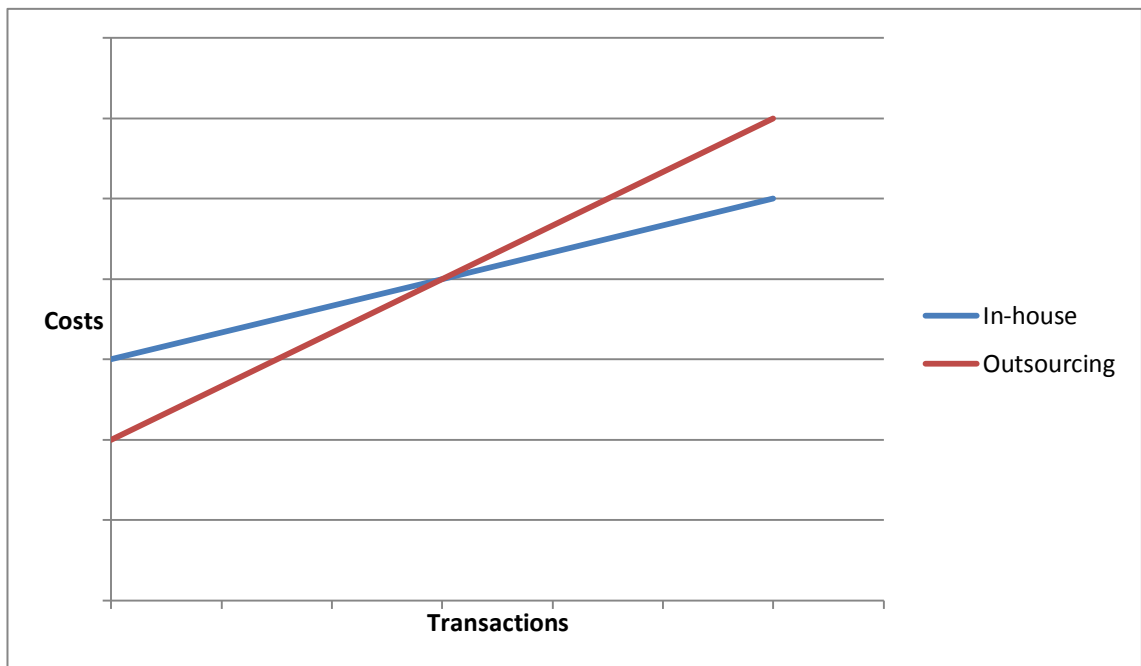


Figure 10. Break-even point

A combination of both is also a viable option. A warehouse with enough capacity to meet peak demand will only use all that capacity 75-85% of the time making it inefficient. Building enough in-house warehouse capacity to meet the average need and complementing it during peak demand with an outsourced warehouse can enable a company to achieve 90% occupancy rates.[30]

### 5.5 Vendor Managed Inventory

Vendor managed inventory seems to be better suited when a company has established itself in the market it is operating in. This criteria is not met by most start-ups. This could, however, be an option once a company grows. The basic principle is that the vendor supplying the products to a company manages the warehouse themselves and makes sure sufficient levels of products are always in stock. This makes production planning easier for the vendor.[57]The warehousing risk is carried by the vendor, however, dependence on a single vendor increases. It must be carefully considered whether this is desired or not. However, the vendor does not own the products being warehoused. Those costs are still the start-ups responsibility. Consignment stock is an option where the vendor actually owns the warehoused inventory before it is sold or used, further decreasing the risk for the company that uses the warehouse.



## 6 MATERIAL FLOW

Material flow often goes hand in hand with information flow. However, information can flow without materials but not the other way around.

### 6.1 Logistics

”Logistics is a process of planning, implementing and controlling the efficient, cost-effective flow and storage of raw materials, in-process inventory, finished goods, and related information from point of origin to point of consumption for the purpose of conforming to customer requirements”.[40]

Outsourcing the logistics function enables a company to turn fixed costs into variable costs. Hsiao identifies four levels of logistics outsourcing in his paper. Level 1: Transportation, Level 2: Packaging, Level 3: Transportation management and Level 4: Distribution network management. Logistics outsourcing cost reduction originates mainly from better utilization of capacity and better capital allocation.[40]

### 6.2 Transportation

Transporting products from the factory to the warehouse and from there to the consumer after an order has been placed accounts for most of the time spent before the products reach the consumer. Moving materials requires logistics and as with warehousing, most of the time it is not profitable for start-ups to invest in their own logistics fleet unless it is part of their core business. Inbound logistics to the warehouse might also be the responsibility of the factory if the manufacturing functions has been outsourced. It depends on the shipment terms.

#### 6.2.1 Outsourced with LSP

While the upsides of outsourcing transportation, cost savings and performance, have been proven to be possible, it is important to remember that outsourcing

can also be “a source of corporate failure and disappointment” as shown by Boyson.[44] Therefore, it is important to research all options before making the decision to outsource the transportation function to a certain LSP. Using the same LSP for warehousing and transportation may have synergy benefits. When comparing LSPs to each other, using Chee-Cheng’s model of evaluation may assist in selecting the best one. It focuses on the price, customer orientation, quality, ship-to-stock time and and objective based performance indicators.[58]

### 6.2.2 Delivery options

Another criteria that may affect the selection of an LSP is the delivery options they provide. It is possible to work with more than one LSP to ensure customer satisfaction with sufficient delivery options. Also if a company is in the business of global e-commerce it is more than likely that different continents will use different LSPs.

### 6.2.3 Delivery pricing

According to a survey conducted by North American Technographics in 2009 (Figure 12), shipping and handling costs were the number one reason for shopping cart abandonment.[59] Taking time to form a shipping strategy is important along with analysis of a company’s customer base and what they are willing to pay for shipping. Researching wether consumers want a more expensive option for expedited shipping or flat rates on all products regardless of size.

Advertising free shipping might attract more customers but depending on the business a company is in, the promotion might cut too much into the profit margin. Typically small high-end products with big pricetags can easily absorb the shipping costs with the added sales but cheaper, highly price sensitive products might suffer severely. For those struggling products, setting a minimum purchase limit for free shipping should be considered. Marking up products to

compensate for the shipping is also common practice and simplifies the purchase process for the consumer.[59]

Flat rate shipping incentivizes the consumer to buy more since the ratio of shipping costs to products purchased gets reduced the more one buys. For the merchant this form of shipping charge is tricky since the average shipping costs have to be calculated in order not to under- or overcharge customers.[59]

A shipping calculator is a modern method that is both fair for the consumer and allows the merchant to not cut profit margins. Some customers might want cheaper shipping at the cost of delivery speed or vice versa. Most LSPs offer their own shipment calculators such as UPS and USPS. Integration methods of these services are discussed in more detail in chapter 8.

#### Shipping Is A Key Factor Driving Shopping Cart Abandonment

**"Thinking of the last time you put items in your shopping cart but did not finish the online purchase, which of the following best describes why you did not complete the transaction?"**



Base: 2,921 Web buyers who have abandoned an online shopping cart  
(multiple responses accepted)

Figure 11. Shopping cart abandonment [59]

### 6.3 Packaging

Efficient packaging requires a comprehensive understanding of not only the products in question, but of the entire society the company is operating in. Laws and regulations set limits and requirements for the packaging in terms of environmental impact and recyclability. Consumers' expectations also affect the visual aspects of the package. The operating environment may be hostile for the products. Temperature variations, humidity, and vibrations are all good examples of what the packaging might have to withstand.

A good package:

- protects the product and the environment from the product,
- offers information about the product and its use,
- is easy to handle enabling efficient logistics,
- can be recycled.

[46]

The size of the package should also be considered. Extra material always means unnecessary costs and stress on the environment.

For small products, designing the package to fit through a standard mailslot would guarantee cheap delivery conveniently for the consumer to their own home. According to Eurostat (Figure 12) the employment

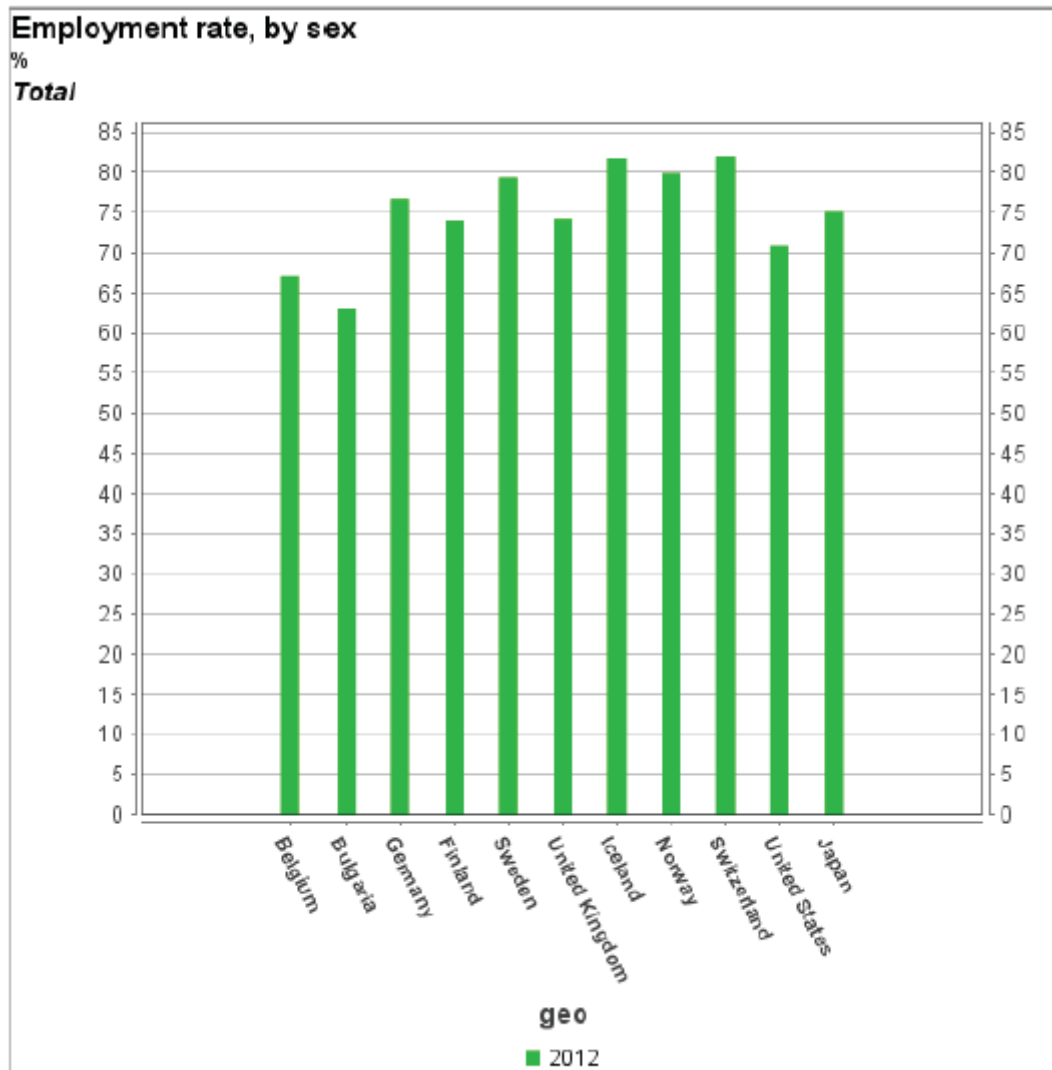


Figure 12. Employment rate 2012 [56]

rate in developed countries between ages 20 and 64 is around 70%. Getting to the post office is a hassle the consumer would rather avoid.

The SFS EN 13724 standard states:

“Guarantee of the minimum size of a mailbox: A test envelop in format C4 must fit, without being folded or damaged. This way the proper delivery of normal parcels is guaranteed. The test envelope is ca 24 mm thick. The minimum volume is established as a pile height of at least 40 mm postal goods in format C4.”[48]

The C4 envelope has dimensions of 324mm x 229mm[52] so designing a package that is 324 x 229 x 40 mm should allow it to fit through all mailboxes in Europe. The United States and Canada have their own regulations for mailbox sizes but they are all larger than the European equivalent.

## 7 CASH FLOW

Receiving revenue for products or services provided is arguably what makes the entire process of commerce worth while. It is important not to lose sales because the right payment option was not available for the consumer. Since on average 67.44% of all shopping carts are abandoned[31], this is a major issue. Payment issues do not cause all abandonments but they are one of the problems.

### 7.1 Payment systems

Different countries and populations have different demands for payment options. For example, the preferred payment method in Germany is an invoice with 58% of shoppers using it[33]. In Denmark it is Dankort. Since fees for all other cards are higher for merchants and consumers[32], Dankort is used almost exclusively. This kind of information makes researching the intended market area crucial.

Payment options are not the only issue to consider with payment systems. How to communicate with the banks and credit unions also poses a challenge.

#### 7.1.1 VAT

Magento allows setup of tax zones depending on country the consumer lives in simplifying global tax legislation management.[76] The maximum sales amounts when exporting goods to other EU countries are listed in Table 1. If the maximum amount is not exceeded, the sale can be made using the VAT of the country the products are stored in. A small webshop might want to consider using a country with low VAT for the location of their warehouse and offer lower rates to countries with higher VAT if sales stay under the maximum sales amounts per year.[74]

Table 1 Maximum sales amounts [74]

<b>Country</b>	<b>Currency</b>	<b>Maximum sale</b>
Netherlands	EUR	100 000
Belgium	EUR	35 000
Bulgaria	BGN	70 000
Spain	EUR	35 000
Ireland	EUR	35 000
Great Britain	GBP	70 000
Italy	EUR	35 000
Austria	EUR	35 000
Greece	EUR	35 000
Cyprus	EUR	35 000
Latvia	LVL	24 000
Lithuania	LTL	125 000
Luxemburg	EUR	100 000
Malta	EUR	35 000
Portugal	EUR	35 000
Poland	PLN	160 000
France	EUR	100 000
Romania	RON	118 000
Sweden	SEK	320 000
Germany	EUR	100 000
Slovakia	EUR	35 000
Slovenia	EUR	35 000
Finland	EUR	35 000
Denmark	DKK	280 000
Czech Republic	CZK	1 140 000
Hungary	HUF	8 800 000
Estonia	EUR	35 000



## 7.2 Direct integration

Direct bank transfers are a popular payment method in Finland. However, opening an account in each bank and creating an API link with each one separately takes time and money. The same applies to credit unions. The banks also charge different fees for directly dealing with them through their API. Here are some examples of fees Finnish banks charge (Figure 13).

Web payment		€ / opening account			Web banking	
Button	Service	€ / opening account	€ / month	€ / transaction	€ / month	
 Osuuspankki	<a href="#">OP verkkomaksu</a>	160	10	0,34	2,50	
 Nordea Pankki	<a href="#">Nordea E-maksu</a>	170	17	0,35	5	
 Sampo Pankki	<a href="#">Sampo Pankin verkkomaksu</a>	170	10	0,35	4,50	
 Säästöpankki, Paikallisosuuspankki	<a href="#">Sp/Pop-maksu</a>	20	0	1,10	10	

Figure 13 Web payments [49]

### 7.3 Payment gateway

Using a payment gateway reduces paperwork and simplifies the payment process for the merchant. Payment gateways provide a service that allows a merchant to accept payments from multiple sources by making just one contract. The gateway handles all communication between the parties. Figure 14 is an example of processing a credit card payment.

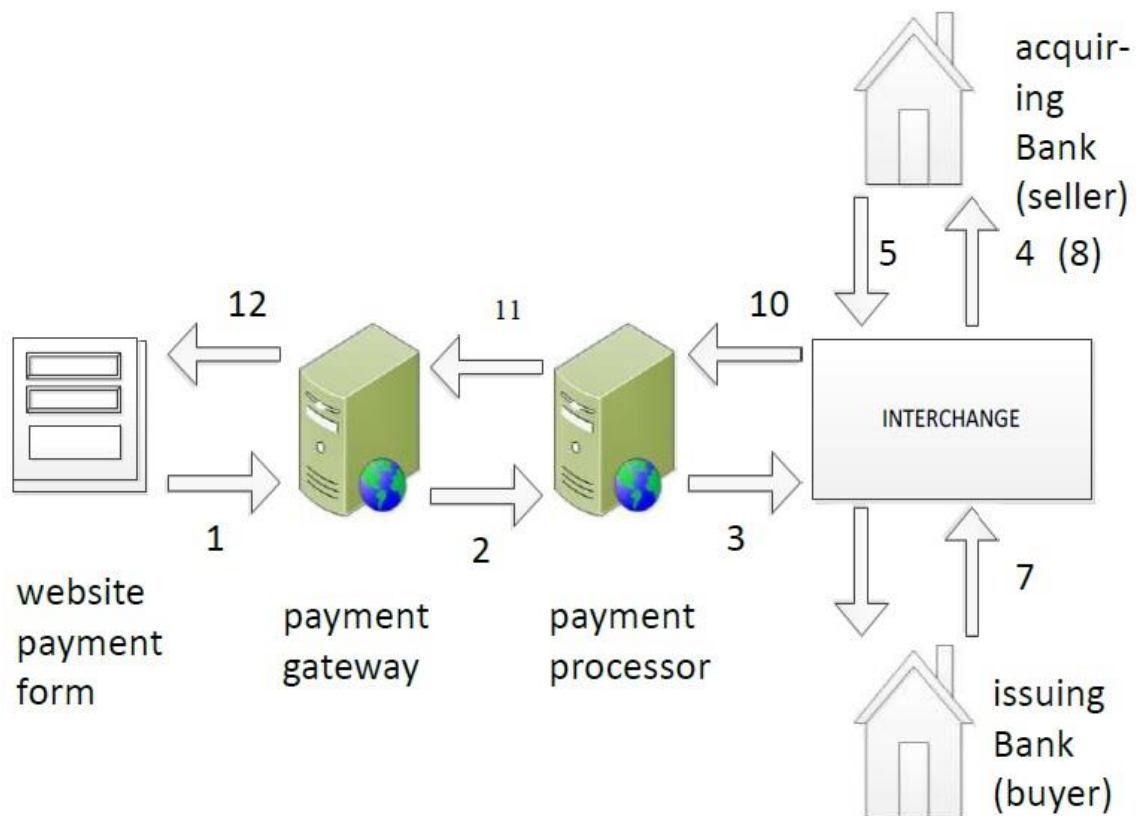


Figure 14. Credit card process [37]

Prior to payment, consumers choose their preferred method of payment. They are then redirected to the payment gateways hosted site where they complete the payment and are sent back or stay on the merchant's site and pay using an API integration to the payment gateway. Both these methods have their pros and cons.

### 7.3.1 Hosted site

When the consumer is redirected to the payment gateway site, all information is inserted directly to the payment gateway. This way no sensitive information such as credit card details or billing addresses have to be sent between the webstore and the payment gateway, eliminating the need for SSL encryption. This in turn means cost savings and simplicity for the merchant. However, the gateway still has to handle the information securely and the merchant has to trust the gateway will do so. Also some consumers might find it inconvenient to be transferred outside the webstore to complete their payment.

### 7.3.2 API integration

While completely customizable, the API integration also takes more time to create and to maintain. All information must first be collected from the consumer. Then encrypted via SSL and sent to the payment gateway where it is read and passed on through the process. The SSL certificate must be purchased and maintained by the merchant. During the payment, the consumer will never leave the merchant's webstore. Some consumers prefer this over being redirected.

### 7.3.3 Other options

Some payment gateways, such as Paypal, offer a hybrid solution. Paypal's option is called the Payflow. It combines the ease of the hosted solution for the

merchant to the seamless process of the API for the consumer. Paypal offers a secure checkout template that the merchant can customize to match their webstore. The pages handling secure information are hosted by Paypal but the consumer can stay on the merchants site. However, the SSL certificate still states Paypal as the owner and this might alarm some consumers.[38]


#### 7.3.4 API or Hosted

Hutchinson[36] raises the issue of trust concerning card payment implementations and argues that using the integrated API approach is viable when the company has built a good reputation and is trusted. Using the API will make the payment process more seamless for the consumer. However, if the company or the webstore is new, using the reputation of well known payment gateways by implementing a hosted solution should be considered.[36] Also by redirecting the consumer to the payment gateway website the need for the webstore to SSL encrypt the data is eliminated since the information will only be handled by the payment gateway.

#### 7.3.5 Selecting a payment gateway

The services are not free but cost less than opening an account for each bank separately. On average, banks charge €10/month. That would mean having accounts with all of the ten banks in the Nordic countries would cost €100/month. The payment gateway needs to be selected depending on the credit cards and banks a company wishes to accept payments with. Different gateways provide different banks and cards although some do overlap. Prices also differ between gateways. Table 2. presents an example of the two most popular gateways in Finland. Prices are for similar service packages and for companies registered to Finland or Sweden.

Table 2 Payment gateway prices [34] [35]

		
<b>Opening account</b>	0€	0€
<b>Monthly fee</b>	59€	45€
<b>Transaction fee banks</b>	Nordea 0,5€ others 0,35€	0,35€
<b>Transaction fee credit cards</b>	0,35€ + 2%	0,35€ + 2%
<b>Paypal</b>	According to Paypals prices	<b>N/A</b>
<b>Klarna invoice</b>	According to Klarnas prices	<b>N/A</b>

Price is not the only factor to consider when selecting a payment gateway or payment gateways. When dealing with money, security is of utmost importance. Even if a company decides to use an API to integrate a payment gateway into their webstore and takes rigorous care of security on their end, there are still many entities in the payment process that may not be as careful with customer data. Selecting only PCI-standard compliant payment gateways is a good start. The Payment Card Industry Data Security Standard (PCI DSS) is a set of requirements that was designed to ensure that all companies processing, storing or transmitting credit card information do so with high regard to

security.[39] Also as mentioned earlier market area research is vital to understanding what payment methods to provide which in turn affect the selection of a payment gateway or multiple gateways.

Other popular gateways include Paypal, Google payments, adyen.com, Authorize.net and the relatively new Paymill.

#### 7.4 Bitcoin

While highly experimental, and volatile, it might be worth while to include Bitcoin in the list of payment options for a webstore. Especially if the product or service being sold is directed towards tech-savy individuals.

This relatively new currency was invented in 2008 by Satoshi Nakamoto in his paper " Bitcoin: A Peer-to-Peer Electronic Cash System". The goal was to create an independent currency capable of irreversible transactions.[2]

Bitcoin has received a lot of media attention lately. The Telegraph announced that Thailand had been the first country to ban bitcoins.

" Bitcoin said it "has no choice but to suspend operations until such as time that the laws in Thailand are updated to account for the existance [sic] of Bitcoin", adding that "the Bank of Thailand has said they will further consider the issue, but did not give any specific timeline"[3]

The currency is a hot topic in New York as a federal judge has declared Bitcoin real money. The global financial data and media company Bloomberg gave it an experimental ticker (XBT) meaning Bitcoin's exchange rate in dollars can now be followed, and New York's financial regulator announced an interest in regulating Bitcoins. The New York State Department of Financial Services has concerns about the currency being used in criminal activity.[4]

Using the currency as a payment method with e-commerce is relatively simple. Most of the popular e-commerce engines have an existing add-on for it.

It is possible to handle the payments without a Payment Service Provider but due to the labour intensive nature of this method, as seen in Figure 15, it is not

recommended. A PSP such as bitpay will handle the transactions for you and will even credit your account in the currency of your choosing. They charge a fixed percentage of the sum transferred much like payment gateways.[5]

### ***BitPay makes it easy to receive bitcoins into your bank account***

#### ***The "Do-it-Yourself" Way***

1. Open an account with a bitcoin exchange
2. Verify your identity to the bitcoin exchange
3. Send bitcoins to the bitcoin exchange
4. Wait for 6 block confirmations
5. Risk currency volatility
6. Issue a sell order
7. Manually transfer funds to Dwolla
8. Wait again
9. Send money from Dwolla to your bank account

10. Wait for bank transfer (3 days)

11. Receive money in your bank account

**Total Time:** 1-2 hours actively participating

3-4 business days waiting

**Total Risk:** 1 hour (minimum) of currency volatility risk

#### ***Using BitPay***

1. Setup your BitPay account with your bank information

2. Provide an EIN

3. Receive bitcoins into your Bit-Pay account

*zero volatility risk*

4. Wait for bank transfer (1-2 days)

5. Receive money in your bank account

**Total Time:** 0 time actively participating

1-2 business days waiting

**Total Risk:** zero volatility risk

The net amount that BitPay merchants receive is equal to the gross amount (USD) of the order submitted, minus our fee.

It does not matter how many bitcoins we collect, how long it takes to collect them, what we can sell them for, or how long it takes to sell them.

The merchant gets the guaranteed net payout sent the next business day.

**Figure 15 Payment handling [5]**

## 8 INFORMATION FLOW

"Multiple experiences as well as external benchmarking indicate that 70% to 80% of the key delays in the OTD process occur in the information flow and not the physical flow"[7] Since the information flow is what connects all the different parties and entities together in the process it is important to understand what information needs to be collected, how information can be transmitted and where it needs to go.

### 8.1 Consumer information

To complete and deliver an order placed by a consumer, the system must know details about said consumer. The most important of which are the name and address. Delivering the products to the right person in the right place. Contact information is also needed to keep the consumer aware of their order's status, and in case of irregularities, to contact the consumer. For these purposes, an e-mail address and/or a phone number should always be required to complete an order as well. If an account with the webstore is required to complete an order, a username and a password must also be selected. Product names or codes as well as amounts are also needed.

This information is collected by the e-commerce engine. The address, contact information and order details are then routed to the warehouse management system (WMS). If the warehouse is small and run inhouse, the e-commerce engine might serve as the only WMS needed. Therefore there will be no need to relay the data to another system.

### 8.2 Payment information

The consumer starts providing payment information by selecting a desired payment type after which they proceed to filling in their credit card details or logging into their online bank for a direct money transfer. Depending on the payment options cash-on-delivery might also be available making the payment option selection the only piece of information needed to complete the payment.



The payment information is either collected by the e-commerce engine, then SSL encrypted and sent to a payment gateway or a bank, or directly inserted on a form provided by a gateway and processed outside the e-commerce engine. The latter simplifies the process for the e-commerce engine side. After a payment has been accepted the system responsible for it sends confirmation back to the e-commerce engine.

### 8.3 Logistics information

Picking, packaging and shipping require information already collected and sent to the WMS, and information provided by the e-commerce engine depending on the packaging type. For example different LSP:s might need different packaging to complete their shipping so this must be taken into consideration in the warehouse. Also the shipment order number has to be sent to the e-commerce engine to confirm shipment and the consumer so they may follow the movements of their order. Again if no external WMS exists the transfer of data to confirm a shipment is not necessary.

### 8.4 Integration types

Sending all this information to the correct parties is the biggest challenge of information flow. Different systems can communicate in different formats and may need translation. Bridges need to be built between those systems in order for them to even be able to send information to each other. Problems arise when those systems are located in different business entities. For example the e-commerce engine or ERP system may be in-house but the warehousing process has been outsourced. This means the warehouse WMS is on the other side of a corporate wall. Different integration methods exist to connect these applications, each with their pros and cons.

### 8.4.1 Point-to-point integration

Software called *middleware* needs to be written and acts as a translator between two applications. They use the available interfaces either the API or the actual UI to access the necessary information. If done correctly the API includes an abstract black box layer that allows a programmer to use the API without actually knowing the programming language or methods used by the application.[51] Janne Keiski of Newave Consulting said in an interview (12 November 2013) that applications often offer limited or no access to their APIs making integrations difficult. If both of the applications databases can be accessed, the integration is usually not hard. However as the number of necessary applications increases by  $X$ , the number of connections needed increases by  $X^2$  (Figure 16). This makes for a very complicated network of connections and is hard to maintain.[47] This solution is simple and enables fast communication between applications, but done in numbers will be quite time consuming.

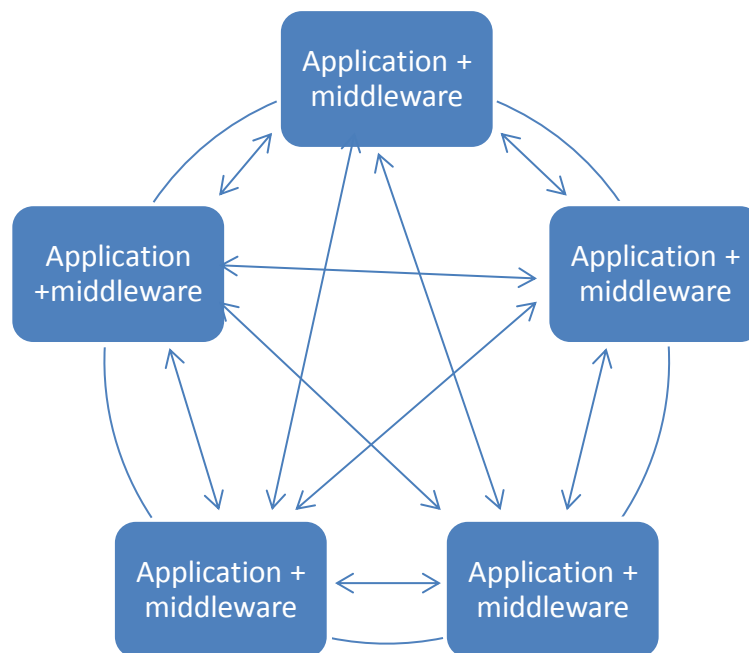


Figure 16. Point-to-point integration [47]

#### 8.4.2 Many-to-many integration

While not as fast as the point-to-point integration connection, the many-to-many integration model offers great scalability. Every new application only requires a single new connection to function.[47] (Figure 17) Both these integration types require vast knowledge of the inner workings of software. As with the e-commerce engine implementation, talent must be outsourced from developers if it does not exist in-house.

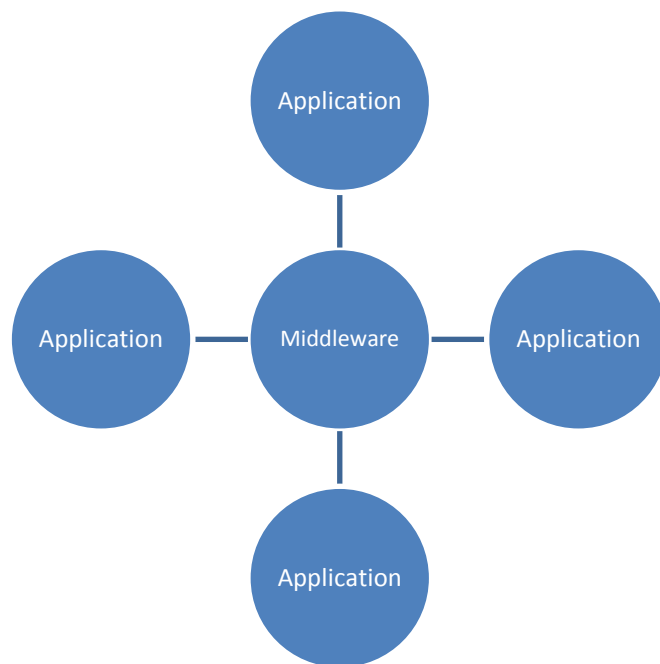


Figure 17 Many-to-Many integration [47]

#### 8.5 Data formats

After being integrated, applications need a common language to communicate. While different applications provide data in different formats, middleware communicate in a common language together. That language can be anything as long as both parties involved in the communication agree what that language is. Within a company this might be simple but in the past transfer between

business entities birthed a myriad of different formats.[53] Fortunately now there are also a few standardized formats aimed at cross corporate communication. These formats enable two companies to have common data format in which to send or receive documents.

### 8.5.1 EDI

The main standard formats of EDI are ANSI X-12 for most of North America not including the automotive industry, and EDIFACT that is recommended by the United Nations and is used in Europe, Asia and within the North American automotive industry.[54] [55] EDI is more wide spread than XML and has only a few main standards, making it ideal for communicating with multiple business partners.

### 8.5.2 XML

Short for Extensive Markup Language, XML offers more features than EDI. An XML message can be tagged to help manual translation of a certain message. However it has multiple different standards each for a different industry. This makes cross industry communication troublesome. Some examples include CIDX for the chemicals industry, RosettaNet for the hightech industry and PIDX for the energy industry.[54]

### 8.5.3 Internal use

Standards for communication between applications within a company have their own formats and as said they can be anything, however XML is becoming an increasingly popular option due to its flexibility. If a company operates only within a certain industry and uses XML to communicate with its trading partners it makes sense to use it internally as well.

## 8.6 Service-oriented architecture(SOA)

Creating simple, static, unique links between applications with point-to-point integration works for simple jobs such as retrieving a phone number from a

database. Some companies might not need anything more. As mentioned before, in numbers these connections stack up and become hard to manage. Many-to-many integrations help with this but are not flexible enough if changes need to be made often. This is where SOA excels.

Service-oriented architecture is a way to build these connections flexibly. It treats the connections not as unique but as services. Services more than one application might need. For example checking the stock level of a certain warehouse. The link is not created statically between program A and warehouse A, but as a service that programs A, B and C can all use. If a new idea demands for another program to use that same service, it already exists and can quickly and easily be put to use. SOA is an architectural approach not a technology.[61] The services are still programs but they are designed in a way to make them easily reusable. Parts of applications from different companies can be combined to achieve best of breed solutions. Combining for example an e-commerce engine, outsourced warehouses, factories, distributors and shipping calculators in this fashion would make for a very flexible and agile system.

#### 8.6.1 Case Mohawk

Mohaw Fine Papers have implemented a SOA together with Liaison Technologies and a recent project includes a process that retrieves up-to-date currency exchange rates to Mohawk's on-premises ERP system from a company called Strikelron. The Mohawk SOA is also completely based in the cloud and has been bought as a service from Liaison who do all the integration work on behalf of Mohawk. Paul Stamas, the Vice president of IT at Mohawk, stated that the data integration project cost less than \$1,000 to start up and required no in-house investment in integration tools or staff resources. Liaison handles all of Mohawks connections between on-premises applications, on-site systems to the cloud and cloud-to-cloud.[60] Any functionality a system they own has can be used to aid another process.

### 8.6.2 Risks

Vendor-lock-in is one of the risks of cloud base SOA that concern Paul Stamas. If something should happen to Liaison, bankruptcy, anything major, what would happen to all their intellectual property and integrations. Liaison uses Contivo technology to map all connections and Mohawk has a copy. However starting to use another platform even with the existing data maps would be difficult yet possible.

Another risk is that Liaison runs out of capacity as Mohawk grows. The CTO of Liaison, Bruce Chen assures they have 50% more capacity than is needed to serve all their customers.[60] Liaison is not the only vendor offering SOA as a service in the cloud but their acquisition of Contivo and their data mapping technology has made them unique.

## 8.7 Transport Administration Operator

Also referred to as TA-operators, they handle information flow mainly between LSPs and companies that need transportation services. Their services allow a company to order transportation for their goods electronically, print shipment documents and labels, and follow their shipment history. In Finland three major operators exist, Memnon Networks, Unifaun and EDI-Soft. They each have a slightly different approach to the problem and offer connections to slightly different LSPs. If a company owns and runs their own warehouse using a TA-operator should be considered.

### 8.7.1 Memnon Networks

As well as handling outbound transportation orders, Memnon offer inbound order transportation management. The systems allow a company to choose which LSP will be used to transport goods to them as well as from them to others. The entire shipment history is then available in one place.[62]

### 8.7.2 Unifaun

Unifaun has an extensive network of business partners with experience in integrating Unifaun online to different ERP or e-commerce systems. Often the integration solution already exists and the time needed is only a few days to have it up and running. For example, Magento has been integrated by a company called Nordic Web Team.[63]

### 8.7.3 EDI-Soft

The approach EDI-Soft takes is different to Unifaun. Whereas Unifaun has standard point-to-point integrations ready for multiple platforms EDI-Soft offers a service that is flexible on their end. They act as a translator between the logistics company and their customer. Much like a payment gateway the service offered enables a company to communicate with multiple LSPs through a single connection to a TA-operator. The operator takes care of EDI compliance.[64]

## 8.8 Extranet

A service that uses internet technology to provide a closed environment where a customer and a company can interact, is called an extranet.[65] A good example is the order tracking provided by DHL. A customer types in the order number and in exchange gets limited access to the database providing them with the current location and status of the package.

## 9 THE CASE SOLUTION

As mentioned earlier the case company is a Finnish SME start-up in the IT sector. They are looking to expand their business globally and plan on doing both B2B and B2C sales.

### 9.1 E-commerce engine

Out of all the options considered for this thesis, Magento best meets the requirements for this case. It is flexible yet powerful and has a vast community behind it to guarantee continuing improvement. Building a webshop capable of global expansion will not be an issue with Magento. SEO is an organic part of the software. After the webstore has been built, it can be managed by the case company's own personnel via the control panel with ease.

First the company should begin with the free community version of Magento and build the site themselves. The download link to the free software can be found at <http://www.magentocommerce.com/download>. If the needed expertise does not exist within the organization, then it should be outsourced to a well known developer such as Sofokus or Avenla. If and when the company grows, it is possible to upgrade the community version to the enterprise version.

Also an account should be created with Kiosked, mentioned in 4.9, before the webstore goes live. This enables the bloggers and other technology sites to gain revenue by turning stories they have written about the case company's products into possible purchase points and helps the case company attract traffic and sales.

### 9.2 Hosting the engine

The most cost effective yet reliable way to host the webstore is a virtual dedicated server. Nebula.fi offers state-of-the-art service with high security and always manned server centers in Helsinki, Singapore and London. The servers



are either Linux or Windows based and use Apache and IIS. In addition PHP5, Perl and .NET are supported. Magento is written in PHP so this will not cause any issues. Expanding the level of service is also possible if the need for more storage or bandwidth should arise. Also as the business grows and heads to new markets, the local versions of the webstore can be hosted closer to the consumers in Singapore, for example. Nebula is the largest website hosting company in Finland.[45]

### 9.3 Payment

Since the company is going to sell products globally it is necessary for them to be able to accept payments in multiple countries. Finland can be covered by selecting Paytrail, ex Suomen Verkkomaksut, as a payment gateway. They offer connections to all of the banks in Finland as well as Visa and Mastercard. In addition, they allow users to accept payments with Paypal and Klarna invoice or part-payment.

Most of Northern Europe uses the same payment methods with the exception of Denmark. Dankort is by far the most popular payment method in Denmark and Nets has a monopoly on accepting payments with it. A company must apply with a merchants agreement with Nets.[68] Making another contract just to accept payments with one card might not make sense but luckily adyen.com has an existing contract with Nets and offers Dankort as one of the 200 other payment methods they have. Whereas Nets charges 135€ per year just to have an active account with them, Adyen has no fixed fees.[69][70] The combination of Paytrail and Adyen cover most of the world with at least one viable payment option per country.

For the occasional popup store or trade fair iZettle offers a very affordable solution to accepting credit card payments. A card reader costs 59€ and every transaction gets charged 2.75%. There are no other fees.[77]

### 9.3.1 Security

Being PCI DSS compliant is important for any company handling credit card information. In this case Adyen has had their compliancy checked on 31 May 2013 and has passed.[71] Paytrail does not have to be PCI compliant since their card payments are handled directly by Luottokunta Oy(part of Nets). Luottokunta is PCI DSS compliant and has had their compliancy renewed in December 2012.[72]

## 9.4 Warehousing and transportation

The size of the company and the business they are in both support outsourcing the warehousing and transportation function. Traditional 3PL companies such as DHL and DB Schenker offer both warehousing and logistics. However, their operations require new integration work since no existing solution has been done to directly connect Magento and their WMS. Other services that add value to consumers such as an option to select the shipment method and company also do not exist out of the box. The operations of traditional 3PL companies are not natively oriented towards e-commerce.

### 9.4.1 Shipwire

Shipwire is the solution. A company that handles both warehousing and logistics from an e-commerce perspective in the cloud. They have existing integrations to most of today's e-commerce engines including Magento and can be operational in a matter of days. The integration manual provided on the support website is easy to follow and explains how to setup the module as well as real time shipping rates.[73] Warehouses exist on all major continents excluding Africa. For a company fulfilling 1000 orders a month and keeping an inventory of 5000 products the costs of warehousing and handling are around 2200€ per month. This number includes standard packaging boxes, void filler and packaging tape. Shipment is not included and depends on the options

available for the consumer. Shipwire offers an option to handle returns and can provide value added services if needed. As a business grows and shipment volumes increase, prices automatically drop per shipment.[67]

#### 9.4.2 Shipping options

The consumer can select from a range of delivery options for their product. Depending on the geographical location some options may not be available. All available options with shipwire include:

- Canada Post
- DHL Express
- FedEx
- Hermes Post
- Hongkong Post
- Parcelforce
- Purolator
- Royal Mail
- Shipwire Freight
- TNT
- UPS
- USPS

#### 9.4.3 VAT

When selling products to private consumers in Finland from a warehouse within the EU, the value added tax on all sales over 35000€ per year must be paid to Finland.[74] If the company would have a fixed office from where they do business in Finland, they would also have to pay the Value added tax to Finland regardless of where their products are stored.[75]

#### 9.4.4 Case Rovio

Rovio, also a Finnish start-up, has been a client of Shipwire since 2010. They are originally a gaming company but since their success with Angry Birds, merchandise became a large part of their business. From the five warehouses

around the world Rovio serves its customers with plush toys, cellphone covers and more. All their 3PM companies do is send the finished products to one of the warehouses and Shipwire takes care of the rest without involving Rovio staff freeing them to concentrate on their business.[66]

#### 9.4.5 Risks

This approach of outsourcing all aspects of order fulfillment to a single vendor raises questions about the potential risks involved. As always with outsourcing vendor lock-in is a real threat. However Shipwire is not the only company offering these services albeit they are the best fit for the task. Itella and Nettivarasto also offers e-commerce oriented warehousing. Ending a contract with Shipwire would mean removing any left over inventory from their warehouses but apart from that no permanent investments have to be made in order to use their services.

Capacity running out is also a concern. Rovio have been a customer of Shipwire for three years and have yet to experience problems with capacity. Their business exploded with the phenomenal popularity of the game Angry Birds. They have sold over a million plush toys to date.

#### 9.5 Process flow

The proposed order-to-delivery process can be broken down into the Order and payment process, and the Warehouse and shipment process.

##### 9.5.1 Order and payment (Figure 18)

The scope of this thesis does not cover the factors that affect the consumer's purchase decision. The process starts when the consumer selects checkout in the webstore. They are then prompted to fill out their address, email and phone number. The e-commerce engine will not allow a consumer to proceed to the next phase if information is missing. An availability query is sent to Shipwire automatically to make sure all products are available. If not the consumer is prompted and can choose to have the available products shipped to them

immediately or wait for the entire order to be ready. Two shipments will result in two shipping charges and this must be made clear to the consumer.

In the next phase shipping options are presented to the consumer by Shipwire with different prices, speed of delivery and possible drop off points. The service is integrated to the Magento checkout process. After the selection has been made the price of the shipping will be added to the checkout total.

Next the consumer selects their preferred payment option and is informed of possible price differences between the methods. The final price quote is presented to the consumer before they confirm the order. International payments and Dankort are processed by Adyen, domestic banks, credit cards, Paypal and Klarna are all processed by Paytrail. A failed payment results in the consumer being redirected to the payment page and a successful payment triggers Magento to create a new unique order number. Order confirmation and a product receipt is sent to the consumer via email.

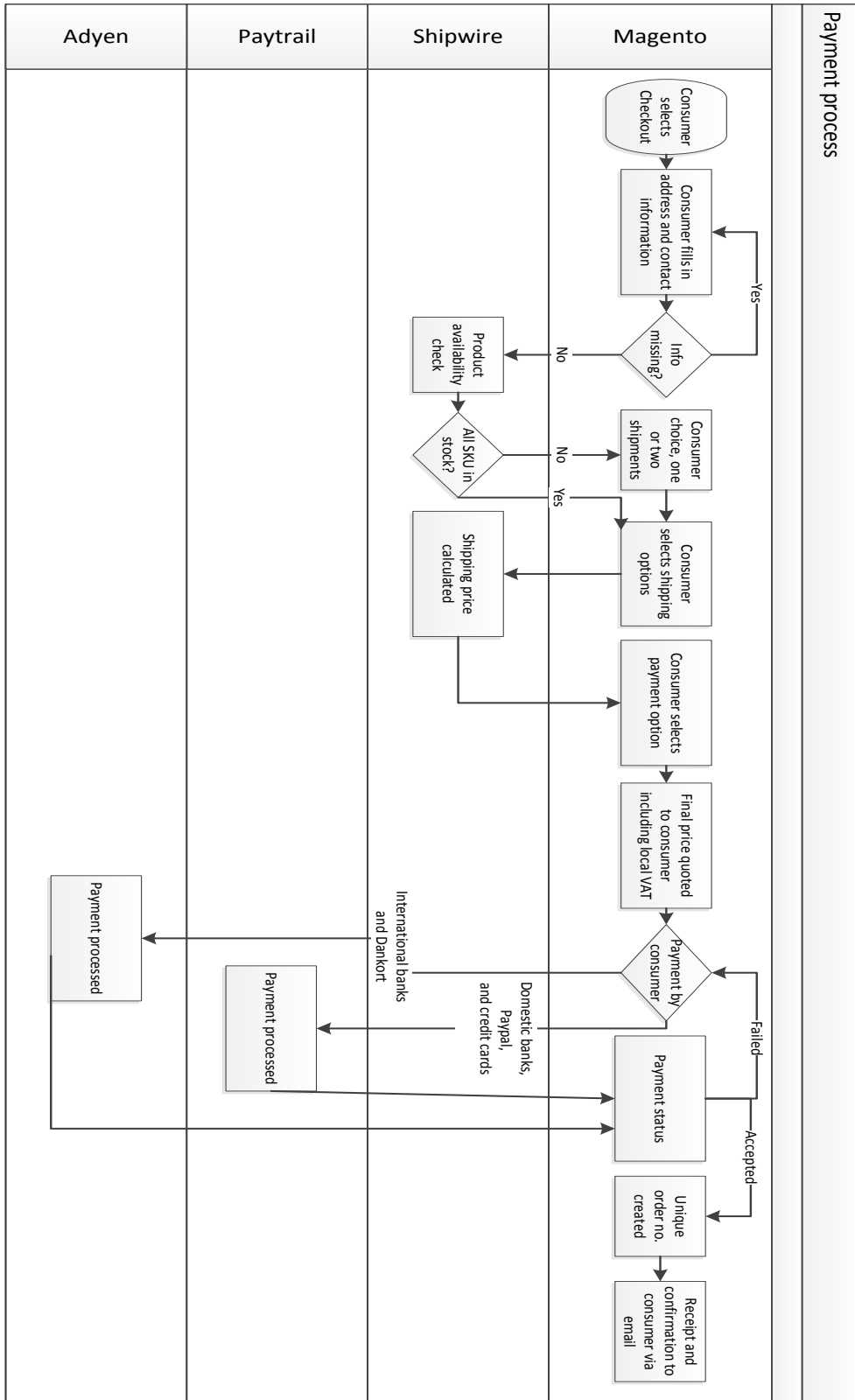


Figure 18. Order and payment

### 9.5.2 Warehouse and shipping (Figure 19)

The unique order number created in the previous process is sent to the Shipwire warehouse along with all order data; SKU numbers, quantities and shipping information. All orders are then stored in the Shipwire WMS and picked once a day to improve the capacity utilization. Orders sent before 12 o'clock will be picked and shipped the same day.

If all the SKUs are available, the order information is sent to the appropriate LSP depending on the consumer's choice. The LSP creates a shipment number and confirm the order to the WMS. The Shipwire warehouse then pack the order and print labels for the package. The same process applies even if all SKUs are not available assuming the consumer wants two shipments.

However, if the consumer has opted to wait for the entire order to be ready before shipping, the order is stored until the backlog is filled. From there the process is the same.

After the shipment is packaged and labeled the LSP picks up the order, inserts the shipment number to their system and sends an email to the consumer containing the tracking information of the shipment and a direct link to the extranet application used to track the movements. The shipment is then delivered to either a drop point, such as a post office, or directly to the customer depending on the service they selected during checkout. After successful delivery the LSP sends a delivery confirmation to Shipwire or directly to the Magento engine. This is used to measure the delivery times and make sure they stay within the range stated in the service agreeme

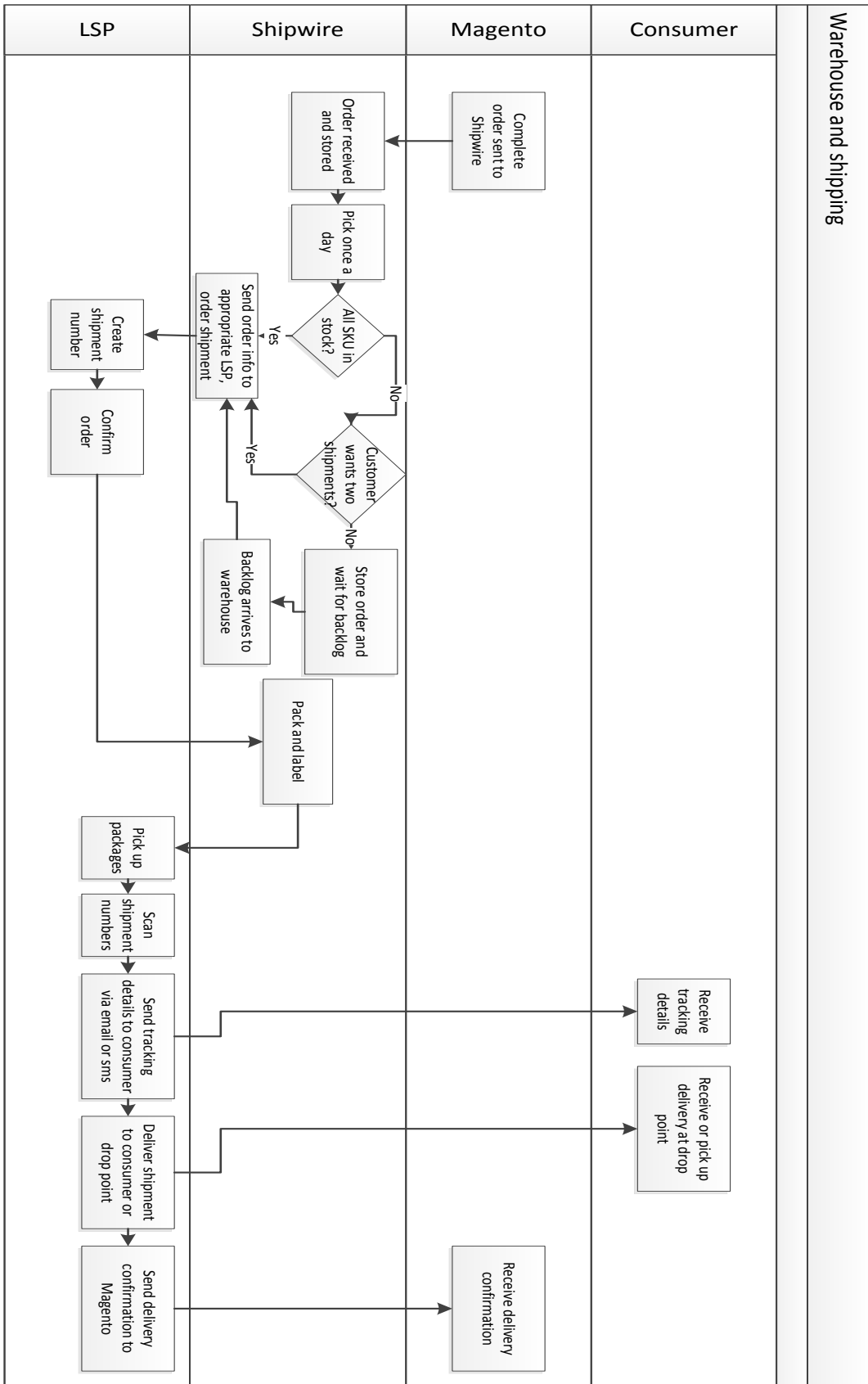


Figure 19. Warehouse and shipping



## 10 CONCLUSION

In e-commerce, outsourcing is a trend that has come to stay. Among SMEs focus on core business is favoured over complete supply chain control. Logistics providers are starting to tailor a part of their business to the needs of e-merchants and the use of these services is easier than ever before. Companies such as Shipwire and Nettivarasto are among the newcomers in this sector and in many respects are serving e-merchants better than traditional LSPs.

Open source software is dominating the e-commerce engine market with Magento in the lead. Entry level products are often free and only the customer service options such as shop development have charges associated with them. Software as a service is also popular among smaller companies or companies with only a few products and modest requirements for system integrations or software changes.

The global market is opening up to SMEs in an unprecedented way. Logistics and warehousing services no longer require heavy investments democratizing global expansion. Global payments are made possible by an array of payment gateways each with their own pros and cons. With the use of just a few gateways, virtually any currency can be accepted as payment.

During the writing and research process of this thesis some topics had to be left out to prevent the study from expanding. For example, the service level agreements and the environmental impact of different LSPs, and the taxation and local e-commerce legislation in countries around the world would be good subjects for future research.

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