# **Delivery performance of pre-orders**

Case study of bol.com



Msc Thesis Operations Research and Logistics Fleur van der Vliet April, 2017

# **Operations Research and Logistics**

MSc Thesis/Internship

# **Delivery performance of pre-orders**

Case study of bol.com

#### Abstract

As shown by a low fulfillment rate, pre-orders of bol.com were not always delivered on time. Therefore, the aim of this research is to improve the delivery performance of pre-orders, to promote a higher customer satisfaction of the e-commerce company (bol.com) and thus to provide more re-purchases.

A literature study was executed to investigate the supply chain of bol.com and the process of pre-orders. Besides, a quantitative model was found which is used to find out an optimal and reliable pre-announced time window. After the literature study, interviews were conducted which shows that not only the supplier and bol.com employees are responsible for the delayed deliveries. Some of the causes of the delayed deliveries are information related, like communication between different parties of the supply chain. For this information part, there is more research needed. Other explanations were more product related such as delayed delivery at the warehouse of bol.com. This is (partly) investigated with the quantitative model.

It can be concluded from this research that the promised delivery date should become broader (with one extra day) to give more certainty to the consumer by delivering more pre-orders on time. This leads to a better delivery performance and more customers will be satisfied.

#### **Key words**

Pre-order(s), delivery performance, pre-order fulfillment, delivery time window, e-commerce company, customer satisfaction.

April, 2017

**Student** Fleur van der Vliet **Registration number** 931009898130

MSc program Master Management, Economics and Logistics

**Specialisation** Operations Research and Logistics

Commissionerbol.com, UtrechtSupervisor(s)Dr. D. Krushynskyi

M. Bernts

**Examiner/2<sup>nd</sup> supervisor** Dr. Ir. G.D.H. Claassen

Thesis code ORL-80433



# **Preface**

During the past eight months, I worked with a lot of enthusiasm and pleasure on my Master thesis. In my opinion the process went very well. Next to writing this thesis, I also did some working tasks in the company (treating the delayed article queue and matching). In the beginning, I had some struggles with planning and dividing the task. But after some time, I became used to it and I found my own way in doing both tasks (thesis and work) on the right time.

In the beginning I did not set a deadline for myself, because I did not know how long it would take to write a thesis next to doing working tasks at a company. Therefore, I am very glad to show this report, because with some pressure and a lot of discipline, I was able to finish this research within seven months.

As I mentioned, discipline and pressure helped me with writing this thesis within this time frame. However, also a lot of social contacts help me during this though time. Firstly, I want to thank my supervisors and commissioner. Without them, I would not have known where to start and which information was most important for this report. Secondly, I really want to thank my boyfriend for helping me through this process. He has helped me by providing me with another perspective and by reducing stress about the whole thesis process. Also my sister has aided me by giving feedback and by improving the paper. Furthermore, I want to thank my friend Dian Verstappen. She has aided me with writing this whole report in proper English. Last but not least, I want to thank all the stakeholders, who provided me with information about the subject (especially during the interviews).

Hopefully you enjoy reading this thesis.

Kind regards, Fleur van der Vliet

April 2017 Zevenaar

# Management summary

The amount of internet shoppers increases, therefore there are also a lot of web shops. These web shops are able to sell a huge variety of products because they do not have to store all the products physically. Although they do not have to store all the products, consumers expect the bought product to be delivered to their homes fast. This provides some logistical struggles. One way to reduce these struggles is to sell the product in advance (before the actual release date). Then the demand is already known and the products can be delivered on time. So if consumers are pre-ordering their products, it is easier for a company to forecast the demand of the product. Bol.com is also using this theory, it allows customers to order products before their release date. However, it seems that they do not always deliver these products on time at the customer.

This research is done for the company bol.com. It investigates the delivery performance of pre-orders, specialized on one category within the bol.com assortment: music. The main research question is:

"In what way can bol.com reduce the delayed delivery of new product releases to improve their performance?"

According to the literature, on time delivery has the largest effect on the last part of the supply chain: the customer. When at product is not delivered on time, customers are less satisfied with their purchases. This results to less re-purchasing of the customer. Therefore, in order for companies to stimulate the customer to repurchase at their company and get a higher turnover, they should deliver on time.

Two related factors to this problem are the promised delivery date and the customer satisfaction. Nowadays, the company (bol.com) promises one specific delivery date to the consumer, but if they change it to a time window, what influences does this have on the consumer? Next to this, the customer satisfaction can explain whether the customer is happy with the service and if they are willing to repurchase at the company, so this variable is very important.

To investigate these factors six interviews were done first. Three with different employees of bol.com, a supply chain specialist, the buyer and the logistic specialist. The other three interviews were done with account managers of three different (big) suppliers. After these interviews, a quantitative model, found in the literature, was adapted and applied on the data.

The results of this research showed that if the time window becomes broader the customer satisfaction will exponentially increase and decrease. This depends on the promised time window. It can increase because more orders will be delivered on time so there are more customers satisfied. In contrast, it can also decrease because a broader time window provides less certainty for the customer about the delivery so they could be less satisfied with the (broader) time window. In conclusion, from the model it was found that more customers are satisfied compared to a promised delivery date of 'the release date', if one day is added to the existing time window. This means that the promised delivery day will not only be the day of release but the delivery time will be on 'release date or one day after release'. Hence, adding one more day at the promised delivery date provides more satisfaction of customers and it provides a higher fulfillment performance of bol.com because there will be more orders delivered on time.

Based on these findings, it is recommended that the data which is communicated to the analyzing program should be improved. Namely, it should be all completed. Another recommendation is that it should be found out whether the model is also applicable to other categories (or separate for every product category). During the research a lot of explanations between 'big' and 'small' releases were made, but there was not one clear definition. Since the employees have made many explanations, it would be wise to make a clear definition so everyone is using the terms in the same way. Finally, this research was mainly focused on quantitative research. However, according to the interviews there are also a lot of information stream struggles, therefore it is recommended to do more qualitative research.

# Table of contents

Preface		3
Managemen	at summary	4
Figures		8
Tables		9
Chapter 1. In	ntroduction	10
1.1. Back	ground information about e-commerce	10
1.1.1.	Advantages of online shopping – Consumer and Retailer	10
1.1.2.	Disadvantages of online shopping – Consumer and Retailer	11
1.1.3.	Expanding assortment	11
1.1.4.	Advance selling	11
1.2. Introd	duction of the company bol.com	12
1.2.1.	Assortment of bol.com	13
1.2.2.	Bol.com plaza	13
1.3. Probl	lem statement	15
Chapter 2. F	Research framework	17
2.1. Resea	arch objective	17
2.2. Resea	arch framework	17
2.3. Resea	arch questions	18
Chapter 3. L	iterature study	19
3.1. Supp	ly chain and Supply chain management	19
3.2. Intern	net provides integration of the supply chain	19
3.3. The s	supply chain of bol.com	20
3.3.1.	Supplier	20
3.3.2.	Warehouses	21
3.3.3.	Logistics service provider	21
3.3.4.	Consumer	22
3.4. Deliv	very versus customer satisfaction	23
3.4.1.	Time window	23
3.4.2.	Customer satisfaction	23
3.5. Quan	titative model	24
Chapter 4. N	Methodology	26
4.1. Resea	arch methods	26
4.2. Data	collection	26
4.3. Focus	s on one specific category	26
4.3.1.	Example of the appearance of the text during a pre-order release	27
4.4. Resp	ondents of interviews	28

4.5. Design	n of the quantitative model	29
4.5.1.	Quantitative model (1) - Reliability	30
4.5.2.	Assumptions	31
4.5.3.	Example of the model – Reliability	32
4.5.4.	Quantitative model (2) – Attractiveness	32
4.5.5.	Assumptions	33
4.6. Data a	nalysis	33
Chapter 5. Re	esults	34
5.1. Analy	sis of the Music category	34
5.1.1.	Results of analyzing music category data	34
5.2. Result	s interviews intern at bol.com	36
5.2.1.	Tasks of the intern employees at bol.com	36
5.2.2.	Penalize the suppliers	37
5.2.3.	Reasons of late delivery – following intern employees	38
5.2.4.	Moment of release (release date)	38
5.2.5.	Suppliers (and arrangements)	39
5.2.6.	Big and small releases	39
5.2.7.	Forecasting releases	40
5.2.8.	Contact with suppliers	40
5.2.9.	Customer communication	40
5.2.10.	Uncertainties in the analyzing tool: KIP	41
5.3. Analy	zing results interviews extern at bol.com	41
5.3.1.	Tasks of the external employees	41
5.3.2.	Reasons of late delivery – following employees of suppliers	42
5.3.3.	Moment of release – release date	43
5.3.4.	Arrangements of suppliers with bol.com	43
5.3.5.	Big and small releases	44
5.3.6.	Contact between supplier and bol.com	44
5.3.7.	Warehouses	45
5.3.8.	Delivery services	45
5.3.9.	Track and trace system	46
5.3.10.	Wholesaler	46
5.4. Apply	ing logistic model on existing data	46
5.4.1.	Information stream vs. product stream	46
5.4.2.	Results of the model – Reliability	47
5.4.3.	Results of the model – Attractiveness	47
5.4.4.	Results of a combination of the two models	48

Chapter 6. Conclusion and Discussion	50
6.1. Conclusion	50
6.2. Discussion	50
6.2.1. Limitations	52
Chapter 7. Recommendations	54
7.1. Recommendations for further research	54
Chapter 8. Literature	55
Chapter 9. Appendices	59
Appendix 1. Example of orders before release date	59
Appendix 2. Fulfillment report	60
Appendix 3. Overview of non pre-orders and pre-orders between January – September 2016	61
Appendix 4. The number of non pre-orders and pre-orders per week in September 2016	62
Appendix 5. The number of non pre-orders and pre-orders divided in different fulfillment categories	63
Appendix 6. The number of non pre-orders and pre-orders in week $38 - 2016$ with filter on	63
Appendix 7. KPI fulfillment pre-orders	64
Appendix 8. Results from the analyzing program (KIP) focuses on games collected in excel	65
Appendix 9. Emailcontact with a business analist of bol.com (I. Kocer)	65
Appendix 10. Orders of World of Warcraft placed at the supplier	66
Appendix 11. Overview fulfillment game: World of Warcraft	66
Appendix 12. Indication amount of pre-orders per category	67
Appendix 13. Indication amount of pre-orders fulfilled late (and fulfilled on time)	67
Appendix 14. Example: applying model on the reliability of the delivery of the orders	68
Appendix 15. Total number of orders from March 2016 – September 2016	69
Appendix 16. Overall fulfillment	69
Appendix 17. Fulfillment pre-orders compared to non pre-orders	69
Appendix 18. Overview with pre-order articles which were delivered late	70

# Figures Report - Fig

<u>Report – Figures</u>	Page
Figure 1. Amount of internet users in the Netherlands between 2005 – 2014	10
Figure 2. The history of bol.com	14
Figure 3. Research framework	17
Figure 4. Traditional versus reduced supply chain	20
Figure 5. Supply chain of bol.com	20
Figure 6. Delivery services of a bol.com order	22
Figure 7. Net promoter score	24
Figure 8. Model without exponential relation	24
Figure 9. Example 1 of text on website	27
Figure 10. Example 2 of text on website	27
Figure 11. Number of different products delivered by suppliers	29
Figure 12. Total quantity delivered on time by suppliers	29
Figure 13. Model with exponential relation	30
Figure 14. Total number of pre-orders within the music category	35
Figure 15. Overview of music articles with 20 or more pre-orders	36
Figure 16. The average of customer satisfaction on reliability of delivery in relation to	
different time windows	47
Figure 17. The customer satisfaction related to the attractiveness of the time windows	48
Figure 18. Total satisfaction based on satisfaction of 'attractiveness of the time window'	
and satisfaction based on 'reliability of delivery'	48
Appendices – Figures	Dogo
Figure 1. Orders placed before release date	<u>Page</u> 59
Figure 2. Daily fulfillment report	60
Figure 3. Overview of non pre-orders and pre-orders (half year)	61
Figure 4. Overview of non pre-orders and pre-orders (weekly	62
Figure 5. Number of non pre-orders and pre-orders per fulfillment categories	63
Figure 6. Number of non pre-orders and pre-orders (week 38 2016)	63
Figure 7. KPI fulfillment of pre-orders	64
Figure 8. Results of delivery (product from games category)	65
Figure 9. Overview of orders of games article: world of warcraft	66
Figure 10. Overview of fulfillment of games article: world of warcraft	66
Figure 11. Number of pre-orders per category	
Figure 11. Number of pre-orders fulfilled late and fulfilled on time	67 67
Figure 13. Total number of orders (March – September 2016)	69
Figure 14. Overall fulfillment of company bol.com	69
Figure 15. Overall fulfillment of pre-orders compared to non pre-orders of company bol.com	69
rigure 13. Overan furniment of pre-orders compared to non pre-orders of company dol.com	U

# **Tables**

Report – Tables	<u>Page</u>
Table 1. Summary of notations in the original model	24
Table 2. Summary of notations in the models	30
Appendices – Tables	Page
Table 1. Delivery data of five random orders	68
Table 2. Customer satisfaction calculated with a time window of zero	68
Table 3. Customer satisfaction calculated with different time windows	68
Table 4. Overview of pre-order articles which were delivered late	70

# Chapter 1. Introduction

This chapter focuses on a short introduction about e-commerce and the company bol.com. At the end the problem statement will be explained. This chapter aims to provide some background knowledge to understand the proposition of this research.

# 1.1. Background information about e-commerce

Since 2005 the amount of online shoppers, which refers to individuals who sell and buy products or services over the internet, is increasing (Huseynov & Yildirim, 2016; CBS, 2015). The internet offers sellers and buyers a communication channel and makes it possible to come together on the electronic marketplace, therefore the business environment is fully changed by the internet. The increase of internet users is shown in Figure 1 (CBS, 2015). Following Central Bureau Statistiek (2016) the amount of internet users in 2015 has increased to 71% of the total Dutch population. Consumers are driven to shop online due to the development of the internet and the easy accessibility of internet usage (UCLA internet report, 2001). However, not every consumer likes to shop online because different reasons. The advantages and disadvantages of online shopping are discussed below. Moreover, following the UCLA internet report (2001) and Purcell (2011), online shopping is the third most popular activity after emailing and web usage. Online shopping belongs to the concept *electronic commerce* which is defined as the transacting, facilitating and conducting of business activities over computer networks i.e. e-commerce (Huseynov & Yildirim, 2016).

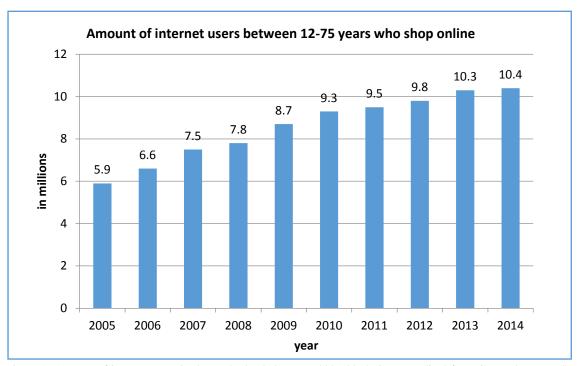


Figure 1. Amount of internet users in the Netherlands between 2005-2014. Source: edited from Centraal Bureau Statistiek, 2015 (retrieved on: August 24, 2016)

#### 1.1.1. Advantages of online shopping – Consumer and Retailer

An advantage of online shopping for the consumer can be the actual travel distance from the shopper to the store and the idea that you need to travel before you can shop. The consumer does not have to travel a long distance to visit the online store contrary to the physical store. Besides, consumers can make informed decisions because they can obtain more information about available products and services on websites than they can obtain when shopping in physical stores. Another advantage to mention is that it enables consumers to shop 24 hours a day. In conclusion, consumers save costs and time by using the internet as an online shop (Huseynov & Yildirim, 2016; Hoffman and Novak, 1996). An additional study done by Swinyard & Smith (2003) found an extra advantage, because

consumers want their purchases to be private which is possible via online shopping whereby no one knows what the consumer bought. Also, consumers like to have their products delivered at home which is possible in most of the cases of online shopping.

Furthermore, there are also advantages for the retailer to use e-commerce. Firstly, sellers do not have to invest money to build and maintain a physical store, they only need a readable website. Secondly, they can reach the consumer worldwide with a low cost. Since all these costs are reduced, the seller can also offer the consumer a discount on their products (Huseynov & Yildirim, 2016). This can lead to an increase in selling products and therefore a higher turnover. Another advantage following Burke (1997) is the 'quick' transmission of information via the internet, they do not have to do it personally or with brochures, simultaneously as mentioned before, it gives the consumer easy accessibility to the information of a product.

## 1.1.2. Disadvantages of online shopping – Consumer and Retailer

Although all the convenience of the e-commerce online shopping, there are still consumers who do not want to shop online since this is perceived to be more risky than retail store shopping. This because of the following reasons: consumers do not trust to give all their personal and financial details, they find it difficult to judge quality of the products via the internet (Huseynov & Yildirim, 2016), they want to inspect the products physically and they want personal contact with the seller (Poel & Leunis, 1999). All these disadvantages prevent consumers to shop online.

Also for the e-commerce companies there are some disadvantages of using e-commerce. The launch of a website of the company is not just an IT part, instead using e-commerce affects the whole company. Firstly, business processes need to be transformed into a website (Addison, 2003), which is an investment of money and time where the return of investment is uncertain (Burke, 1997). Secondly, if the company wants to operate all over the world they should extend their operations due to international time differences. Another disadvantage to mention is that people within the company should have more flexible working hours if they want to operate 24 hours 7 days a week (Addison, 2003). Moreover there are some products which do not lend themselves for purchases via internet. For instance urgently needed products or products which need an in-store demonstration. The last disadvantage to mention is the increasing return rates. Consumers cannot inspect the products physically before they make their purchase, it appears often that consumers send the products back when they do not fulfill their needs and/or wants (Burke, 1997).

#### 1.1.3. Expanding assortment

As mentioned before, with the increasing number of internet users who buy products or services online, the demand for different customized products is increasing. According to Burke (1997) a variety of products can easily be provided by online stores, because they do not need to store all the different products in a physical shop. This is confirmed by Oestreicher-Singer & Sundararajan (2010), since the arise of internet it is easier to sell a huge variety of different products. Next to this, if the seller wants to fulfill all the needs of the consumer, the seller should have a huge product variety in the online store. Therefore, an issue has emerged for top management in global markets, because it is very hard to maintain low inventories of a huge product variety while providing high consumer services. So this could create struggles for companies to offer a wide variety of products with the best service and a high quality (Ngniatedema, Fono, Mbondo, 2015).

# 1.1.4. Advance selling

One way to reduce these struggles could be to decide to already sell products before the products are released. This is referred to as the concept of *advance selling*, which refers to sellers who allow buyers to already purchase a product/service at a time preceding consumption and having the product physically. So if consumers are pre-ordering their product, it is easier for a company to forecast the demand of the product (during the pre-order stage). Therefore, the company can better order the

amount of products they need, to fulfill the demand of the consumer which leads to a better management of the inventory of the product (Shugan & Xie, 2000; Yu & Kapuscinski, 2012). Since it is easier for retailers to forecast the demand if they use the pre-order stage, a lot of retailers allow consumers to buy their product in advance, for example in the book or electronics industry (Zhao & Stecke, 2010). For instance, bol.com allowed consumers to pre-order the movie "the Jungle Book" on Blue Ray. Consumers could already order it before the releasing date of 24 August 2016 (Appendix 1 Example of orders before release date).

Advance selling delivers some advantages for retailers. Firstly, retailers can reduce inventory risk by using the pre-orders of the product to forecast the demand of the product in the selling season. Secondly, because the consumers have not inspected the product, they can be uncertain about the value of the product. They may, therefore, be triggered by the price discount to order the product before the release date (Zhao & Stecke, 2010; Yu & Kapuscinski, 2012). According to Prasad, Stecke & Zhao (2011) only in the selling season do the consumers recognize their valuation of the product. Before the selling season the consumer does not know how to value the product since the consumer cannot touch or try the product.

Besides these advantages, there are also disadvantages to mention about advance selling. Most of the companies have a price discount on their pre-orders to trigger the consumer to order the product before the releasing date. This price discount is to compensate the risk that the consumers take to preorder the product (Zhao & Stecke, 2010). This creates a tradeoff for the consumer between a price discount before the selling season and their uncertainty about the valuation of the product (Prasad, Stecke & Zhao, 2011). This price discount can lead to a lower profit margin of the company (Zhao & Stecke, 2010). Another disadvantage to mention of advance selling for a retailer is the uncertainty of information about the product. Before the product is released, the retailer who wants to start the preorder stage does not always get information about the product from the supplier already. The retailer knows from some special products that they are coming in a certain period. For instance FIFA 17, a really popular Playstation game which comes every year with a new release around September. If the company does not get information about the product for example: they do not get an EAN code from the supplier, the retailer should make their own 'fake' pre-order EAN (M. Bernts, personal communication; September 15, 2016). An EAN code is the abbreviation of European Article Number, an international barcode consisting of 13 numbers, which represents a lot of information about the product (Chen, 2008; GS1 US, 2008). Afterwards, the retailer should bundle the 'fake' EAN with the 'real' EAN together to a global ID. This global ID refers to "globally unique numbers and supplementary data elements" (GS1 US, 2008) i.e. an overriding code within the company where all EAN's from the same product are coming together on this code. Sometimes, this bundle process is not (completely) done or too late which can cause delayed or no deliveries (M. Bernts, personal communication; September 15, 2016).

# 1.2. Introduction of the company bol.com

As discussed before, the Internet is becoming increasingly popular. This has a positive influence on the shopping behaviour of the population. Therefore, the number of web shops increases as well. An example of a web shop is bol.com. Almost everybody in the Netherlands would know bol.com, the largest internet store of the Netherlands and the market leader of selling online books, electronics and entertainment (Lems W., 2010).

As shown in Figure 2 (page 14), on 30 March 1999 the German Media company Bertelsmann opened their online bookshop, with the name bol.com (an abbreviation for Bertelsmann On-Line). Figure 2 shows the whole history of bol.com, from expanding the assortment to take-overs (Lems W., 2010).

#### 1.2.1. Assortment of bol.com

In 2015, bol.com has more than 6.5 million active consumers in the Netherlands and Belgium with an assortment that consists of over 13.5 million articles such as books & e-books, music, movies, games, electronics, toys, baby articles, garden articles and everything for living, animals, sport and leisure time. Recently, they also started focusing on products in the categories personal care, jewelry, bags and leather goods (bol.com, 2016; Organization (direction)).

# 1.2.2. Bol.com plaza

Since 2004 the company provides consumers with the opportunity to sell their own products via bol.com (second hand selling). In 2011, they opened their web shop for other shop owners which is called 'bol.com Plaza', as shown in Figure 2. These shop owners - with or without their own web shop - can supply their products via the bol.com web shop. This provides a greater variety of goods for bol.com's consumers to choose. Bol.com Plaza is responsible for 2.5 million articles of the total assortment (bol.com, 2016; Organization (direction)). All the articles in the assortment are divided in four different categories: Books & Entertainment, Home & Living, Lifestyle and Toys & Electronics. Within these categories there are a lot of different subgroups like movies, music, Dutch books, international books, games etc.

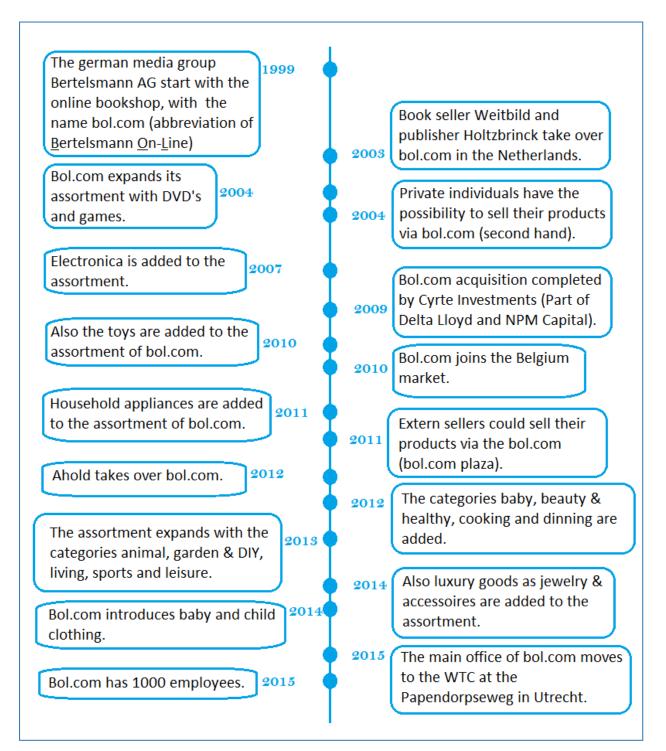


Figure 2. The history of bol.com, source: edited from bol.com (2016 – welkom bij bol.com).

#### The vision of bol.com

The company wants to offer convenience to its customers by allowing them to choose from an unlimited assortment. Besides this, the consumer also receives a competitive price and high service level bol.com, 2016; Over bol.com). In short, the mission of bol.com sounds like:

"The undisputed #1 retail platform for everyone who wants to buy or sell anything in the Netherlands and Belgium."

(Overbeek C. (2016). Winkelproces [Workshop presentation slides])

## 1.3. Problem statement

The web shop bol.com wants to fulfill the needs and wants of the consumers. The web shop mentioned that they know how to control the processes and systems to fulfill the expectations of the consumer and to serve them the demand and service they expect (bol.com, 2016). Unfortunately this is not always the case. Some reviews on ervaringen.nl suggest that the products of bol.com are not always delivered on time (<a href="www.ervaringen.nl/bol.com">www.ervaringen.nl/bol.com</a>, August 24, 2016). Additionally, a study from Koyuncu & Battacharya (2004) stated that due to a longer delivery time, consumers are less willing to purchase from the internet. Therefore, delivering the products not on time can lead to losing consumers (Ngniatedema T., Fono L.A., Mbondo G.D., 2015). This is confirmed by the study of Huseynov & Yildirim (2016), 61% of the consumers perceived the risk that the delivering is not on time which influenced their behaviour on online shopping. Contradictory, as mentioned earlier, online shopping is becoming more popular and consumers are increasingly asking customized products from e-commerce companies which contributes to the difficulty of delivering on time (Ngniatedema T., Fono L.A., Mbondo G.D., 2015).

According to the daily reports, bol.com does not always deliver products on time (Appendix 2. Fulfillment report). As shown in Appendix 2, the report does not include pre-orders (i.e. ordering a product before the release date) because when they started making this report they did not have enough information about pre-order releases.

Recently, the company want to focus more on the pre-orders of released products because they found out that the performance of these pre-orders is very low, shown by a low KPI (see Appendix 3. Overview of non pre-orders and pre-orders between January 2016 – September 2016). This results in less customer satisfaction, which is expressed in a 'lower' Net Promotor Score (NPS). The NPS is used by bol.com to measure the customer loyalty of an organisation (Alles over marktonderzoek, 2015). According to the NPS workshop from bol.com (2016), the customer loyalty is a key driver of the growth of bol.com and therefore one of the most important key drivers within bol.com. So, to keep the NPS as high as possible and to add the pre-order release information in the daily report which gives a better overview of the fulfillment of pre-orders, they should first do more research on this topic (M. Bernts, personal communication 25 August, 2016).

According to Prasad, Stecke & Zhao (2011) the consumer can avoid 'out of stock' and the certainty to have the product on time if they order and buy a product in advance. Unfortunately, this is not always the case. As mentioned earlier, the Appendix 3 shows that pre-order releases have a low KPI. Besides, bol.com has a KPI fulfillment target of 99% which means that at least 99% of the orders should be fulfilled on the promised date. The Appendix 3 shows that the average KPI of pre-orders is much lower than this target and also as the average KPI of non-pre-orders. This means that there are more pre-order products not fulfilled on the promised date than non-pre-orders.

Furthermore, Appendix 3 shows that on average 1.17% of the total number of orders consist of preorders. To get a better overview of the importance of this problem, an example will be shown below which zooms in on a random week in September (Appendix 4). Remarkably, there is a filter used on the fulfillment category. This category consist of the following elements: cancelled, cancelled late, fulfilled on time, fulfilled late, open on time, open late and unknown. Since fulfilled late is after fulfilled on time the largest element in this category (Appendix 5), the focus during this research will be on fulfilled late (delivery the order, but it was not on time). So, in the example below the filter is placed on fulfilled late and fulfilled on time to make a comparison (Appendix 6). Example (see Appendix 4 The number of pre-orders and non pre-orders per week in September 2016 and Appendix 6 The number of pre-orders and non pre-orders week 38 with filter)

For this example, the focus is on week 38 in September. In this week there are 647,849 orders placed of which 12,230 are effective pre-orders. From these 12,230 pre-orders, there were 4,856 pre-orders delivered late and 7,374 delivered on time to the consumer. So, approximately 5,000 consumers per week, which is 32.6% of the number of pre-orders per week, do not get their pre-order on time and they shall not be satisfied with their order at bol.com. This could result in a lower NPS.

In conclusion, pre-orders are a vital component within bol.com and since there are many pre-order products not delivered on time at the consumer, a lot can be improved in this area. Therefore, bol.com wants to know why products are not delivered on time, to improve their performance focused on pre-orders of new products (i.e. releases).

Due to the time frame of this research, the focus is on one of the subgroups where pre-order releases is a main issue i.e. movies, music, books and games (Appendix 3). According to expectations, the results of this research on one specific subgroup can help to find answers on questions about the other subgroups. To analyze the categories and to find out which category has the most data with the lowest KPI and therefore is interested to focus on, the analyzing program KIP will be used. KIP is an abbreviation for 'Knowledge Integration Platfora' and is used at bol.com.

# Chapter 2. Research framework

First the research objective will be explained. Subsequently, the research framework will be explicitly explained to show the steps which were taken to do this research and to find results. Finally the research questions will be discussed.

# 2.1. Research objective

The research objective of this research can be explained as follows:

"The aim of this research is to provide recommendations to improve the performance of pre-order delivery, based on the part 'supplier to bol.com warehouse' of the supply chain of bol.com by analyzing literature on on time deliveries, pre-order items and e-commerce, by taking internal and external interviews and applying a logistics model on existing data".

# 2.2. Research framework

A research framework explains the steps that are taken during the research. To make this clear, the overview is made in Figure 3.

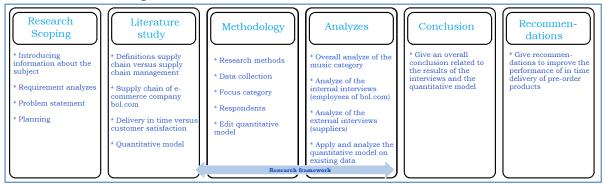


Figure 3. Research framework edited from: Business Planning experts (2015 - market research).

- *Part 1:* The first part, research scoping, consist mainly of the information about the proposal. Here, the problem statement is mentioned and there was some information found to introduce the topic.
- Part 2: The second part is the literature study, consist of desk research to provide background information about the topic and the company. First, some concepts are defined to ensure that the reader's and author's understanding of the concepts are aligned. Secondly, the supply chain of the company needs some explanation. Finally a model is presented in the literature study which could give solutions to the problem.
- Part 3: In the third part, the methodology is discussed. First, the research methods that are used are explained. Next to this, the target product category is determined. The respondents that are chosen are discussed and the model is edited to apply on this specific case.
- Part 4: In the analytical part the focus is on the results of the interviews (internal and external) and the logistics model. First, an analysis was conducted on the category music, to find some overall results. Secondly, some interviews were done to find more information about the problem statement and to find the bottlenecks of delivering late. Finally, the (edited) model found in the literature is applied on existing data to find solutions to solve the problem.
- *Part 5:* The conclusion (and discussion) part provides the conclusion related to the results and there is a discussion part on the conclusions.
- *Part 6:* In the recommendation part, recommendations are given which are aimed at improving the performance of pre-order deliveries.

# 2.3. Research questions

The main research question is given below, which can be divided in three subquestions. These are related to the research framework. The related parts are given separately for every subquestion.

RQ: "In what way can bol.com reduce the delayed delivery of new product releases to improve their performance?"

SQ1: In which way is the supply chain of bol.com organized?

Related to part 2 of the research framework: literature study of the research framework

SQ2: In which way do suppliers and bol.com influence the delivery of new product releases to the consumer in the category music?

Related to part 4 of the research framework: Analytical part of the research framework

SQ3: How can the amount of delayed delivery of new product releases in the music category be improved?

Related to part 4 of the research framework: Analytical part of the research framework.

# Chapter 3. Literature study

This chapter will explain the difference between the concepts supply chain and supply chain management. Subsequently, the supply chain of bol.com will be explained. Furthermore, the customer satisfaction on delivery time will be approached in two different ways. This information can be used to answer SQ1. Finally, a model will be explained which will be used to apply data and to find the optimum.

# 3.1. Supply chain and Supply chain management

Considering the supply chain of Bol.com, it is important to make some concepts clear. To start with the concept 'supply chain' itself. Across authors, the definition of supply chain is more common in comparison to the definition of the concept 'supply chain management' (Mentzer et al., 2001). Three different definitions of 'supply chain' are given below.

"A network of connected and interdependent organizations mutually and co-operatively working together to control, manage and improve the flow of materials and information from suppliers to end users." (Christopher, 2005, p. 19)

"A supply chain consists of all stages involved, directly or indirectly, in fulfilling a customer request. The supply chain not only includes the manufacturer and suppliers, but also transporters, warehouses, retailers, and customers themselves." (Chopra and Meindl, 2001, p.13)

"A supply chain is a network of facilities and distribution options that performs the functions of procurement of materials, transformation of these materials into intermediate and finished products, and the distribution of these finished products to customers." (Ram & Harrison, 1995)

Note that these definitions include the final customer in the supply chain. Following these definitions, the management of the supply chain can be considered as the tasks to do to get results and to influence the behavior of the supply chain. There are a lot of different definitions of this concept, two definitions are given below.

"The management upstream and downstream relationships with suppliers and customers in order to deliver superior customer value at less cost to the supply chain as a whole" (Christopher, 2005, p.18)

"The management of multiple relationships across the supply chain" (Lambert et al., 1998).

Still there are researchers developing or expanding the definitions for this concept. As mentioned before, the concept of 'supply chain management' is not that clear compared to the concept 'supply chain'. Therefore some authors are defining the concept more from a management philosophy view, others more from a management process view and some define it more in operational terms, where the flow of materials and products are involved. (Christopher, 2005, p.18).

As the definitions of supply chain management explain, there is a close relation with the core business activities of the organization. According to Johnson et al. (2012) the organization should offer only activities which they could offer with excellent achievement. If this is not the case, the organization should outsource the activity.

## 3.2. Internet provides integration of the supply chain

Due to web-based information transferring between customer, retailer and supplier, the supply chains are changing (Johnson & Whang, 2002). Following Disney, Naim and Potter (2004), a traditional supply chain is characterized by four echelons (i.e. retailer, distributor, warehouse and factory). This

is confirmed by Chopra and Meindle (2001, p.14) who explain that a supply chain consists of a variety of stages (including raw material suppliers, manufacturers, distributors, retailers and customers) and each stage is connected by the flow of information, products or funds. However, the

use of internet drives to integrate parts in the supply chain (Disney, Naim and Potter, 2004). For a web shop it is reliable to reduce the supply chain with one echelon/stage. For instance bol.com does not have a 'physical retailer stage' since there is a delivery service which brings the products from the warehouse to the customer (or a pick up point) and they are not using a physical retailer shop anymore. The comparison between the reduced supply chain and the traditional supply chain is shown in Figure 4.

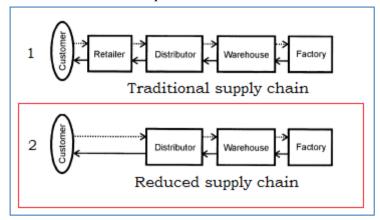


Figure 4. Traditional versus Reduced supply chain, adapted from Disney, Naim and Potter (2004).

# 3.3. The supply chain of bol.com

According to Chopra and Meindl (2001, p. 13) the supply chain does not only consist of manufacturers and suppliers, also the warehouses, transporters, retailers and consumers should be included. The supply chain from bol.com is shown in Figure 5. In this figure, also some examples of the different stages are given. To make the concept more clear and to get a better overview of the supply chain of bol.com, every stage will be discussed separately below which can be linked to the reduced supply chain in Figure 4.

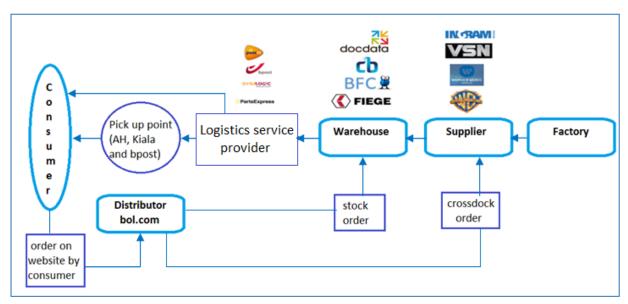


Figure 5. Supply chain of bol.com edited from Overbeek C., (2016 - Winkelproces [Workshop presentation slides]).

#### 3.3.1. Supplier

Bol.com collaborates with more than 500 active suppliers ("Logistieke uitdaging vooral in leveranciersrelaties", 2013). In Figure 5 there are shown examples of four different suppliers (in the category Entertainment). Ingram is one of the biggest suppliers in the category International Books. The VSN (abbreviation of Video Service Nederland) is a big supplier for games software. Another example of a supplier is Warner Music, this supplier delivers different music products like CD's and LP's. The last supplier to mention in this part is Warner Movies, this is a supplier who delivers movies on DVD, Blue RAY or 3D. These suppliers deliver cross dock orders, but they deliver also

products to replenish the stock in Docdata (L. Schuffelers-Bron, personal communication; September 6, 2016).

Some suppliers produce the products by themselves. Other suppliers are called 'wholesalers'. They are ordering the products at another supplier. Therefore the wholesalers can be seen as an intermediate and they are providing an extra stage in the supply chain.

## 3.3.2. Warehouses

From the start of bol.com, they are working together with the warehouse of DocData. Bol.com outsourced the warehouse part to Docdata, so Docdata is responsible for the processes in the warehouse and the employees who are working over there (Winter, 2013).

Since the beginning of 2016, bol.com is building their own warehouse called the BFC, which is an abbreviation of 'bol.com Fulfillment Centre'. They expect to use the warehouse in the beginning of 2017 next to the already existing warehouse: Docdata (Docdata, 2015). There are several reasons for bol.com to build their own warehouse. The first reason is to become independent so they can manage the processes by themselves (M. Bernts, personal communication; August 30, 2016). Secondly, bol.com is expanding their assortment continuously therefore they need more space to store all the products. Thirdly, it is less expensive for bol.com to have their own warehouse than to outsource their warehouse (Bosma, 2015).

Besides Docdata and the BFC, also Fiege is used as warehouse by bol.com. It is especially used for: "odd sized and large consumer goods such as white goods" (Fiege, 2016).

The last warehouse to mention which is used by bol.com is: CB. This is only used for the delivery of Dutch books. For most cases CB pick and pack the orders and send them to the consumers. In some situations CB sent the orders to Docdata. This was depending on the kind of order. For instance, a replaced order can only be done by the warehouse of Docdata. CB sends the book to Docdata and Docdata fulfils the replaced order by sending the product to the consumer. Recently, they changed this. Nowadays, CB can send the replaced order by themselves directly to the consumers. This provides a faster delivery to the consumer when they replace their article (M. Bernts, personal communication; September 15, 2016).

In the past if the consumer ordered two or more products from different warehouses (Docdata and CB) the consumer receives different packages, because Docdata and CB send their orders separately to the consumers. However, it would be easier and cheaper to send one package with all the products together to the consumer. Therefore, bol.com changed the organization a bit. They send a lot of Dutch books from CB to Docdata to have Dutch books in stock at Docdata (the Top 6000 Dutch books). From there, Docdata can send the products together for one order if they have the books in stock. Unfortunately CB still sends the book by themselves, if they do not have the book in stock (M. Bernts, personal communication; September 15, 2016).

## 3.3.3. Logistics service provider

Bol.com is working together with different delivery services between the different countries. A special part about ordering & deliveries on the website of bol.com provides information about the delivery service, as shown in Figure 6 (Customer service: order & deliver, 2016).

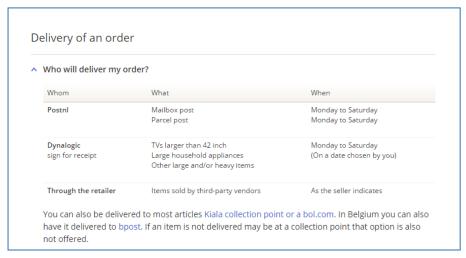


Figure 6. Delivery services of a bol.com order – 'who will deliver my order?' retrieved from: bol.com (2016 - Customer service: order and deliver).

These delivery services get the products sorted on postal code from Docdata (or another warehouse) and they need to deliver the products to the consumer or to a pick-up point in a special time frame. The time of delivery differs per product, for products on stock they can be delivered the same day at a pick up point or 24 hours delivery at home. However, products which are not in stock take more time to deliver.

PostNL delivers the greater part of the bol.com orders in the Netherlands and Belgium, both home delivery and AH pick-up points. The delivery service Kiala is only delivering to Kiala pick-up points in the Netherlands and Belgium. Bpost another delivery service used by bol.com, is only delivering in Belgium at bpost pick-up points. The other delivery service Dynalogic delivers exclusively large and/or heavy products, mainly white goods. Since a year, bol.com is also cooperating with another delivery service which is called Parts Express. This delivery service is delivering the products which are ordered before 12h am, same day at the AH pick up points. Since October 2016, bol.com is also delivering the same day at home, however these orders are delivered by PostNL.

#### 3.3.4. Consumer

According to the business dictionary (2016) a consumer is the end user of the product and at the same time the consumer is the cause of the arise of the order. If the consumer orders a product at the bol.com website and the product is in stock at a warehouse then it is called a *stock order*. Bol.com will give a signal to Docdata to pick and pack the product which is in stock and to give it to the delivery service. They should deliver it in a special time frame to the consumer. If the product is not in stock, bol.com orders it at the supplier. The supplier should deliver it in a given amount of working days to Docdata. When Docdata receives the products, they should pick and pack the order and give it to the delivery service. This is called a *cross-dock order* or *back order* ("Logistieke uitdaging vooral in leveranciersrelaties", 2013). The last order to mention which the consumer can place is the *pre-order*. According to Prasad, Stecke & Zhao (2011), this kind of order refers to avoiding out of stock by order and buy a product in advance.

## 3.4. Delivery versus customer satisfaction

The in-time delivery of pre-orders have an effect on the last part of the supply chain: the customer. If the order is not delivered on time, it is assumed that the customer is less satisfied than if the order is on time delivered. However, it seems to be a challenge for a company to always deliver on time because the customers can place an infinite amount of orders, but they expect all orders to be delivered fast (Huang et al., 2009).

According to Peritz (1993) and Huang et al. (2009) the waiting time of delivery of consumer goods or services is an important component of the overall satisfaction of customers. The customer satisfaction is referred to: "it measures how good customer's expectations are met by a given transaction". According to retail literature, customer satisfaction leads to more customer loyalty. Therefore, it is important for a company to have satisfied customers. For the reason that customer loyalty indicates that customers are likely to engage activities and repurchase products or services of the (e-commerce) company (Huang et al., 2009).

Besides, as explained by Yankelovich (2000) about 86% of the consumers are rating on-time delivery as highly important, which relates to the repurchasing process. Because 85% of the consumers who receive their product on time are willing to purchase a product again via the internet. However, 33% of the consumers who do not receive their product on time are willing to repurchase. So, in order for companies to stimulate consumers' repurchases, it is important for them to deliver on time.

#### 3.4.1. Time window

If the product is not delivered on the date that is promised to the customer, the product could be considered as delivered late. However, what happens with the fulfillment numbers if the 'promised date' is changing to a 'promised time window'. For instance, the article has an release on the December 13, the company can promise to the customer that it will be delivered between the 13<sup>th</sup> and 15<sup>th</sup> of December. Does this have any influence on the fulfillment numbers and does it have an influence on the customer satisfaction?

If you make a broader time window of delivery it is predicted that there will be more orders delivered 'on time' which makes the company more *reliable* and makes the customer more satisfied. However, it is also important to take into account the customer satisfaction about the promised 'date' or 'time window'. Because it is assumed that if the customer orders a product with a delivery time window of three days it is less attractive than ordering a product with a delivery time window of one day (Huang et al., 2009). Therefore, it is important to find out the influence of this time window on the customer satisfaction.

#### 3.4.2. Customer satisfaction

As explained above, the customer satisfaction measures how good customer's expectations are met. Bol.com is measuring and evaluating the customer satisfaction by the Net Promotor Score. According to Mackintosh (2015), the NPS is introduced in 2003 by Fred Reicheld. It is used to measure customer loyalty and satisfaction by asking customers questions on a rating scale of 0 till 10. These questions are related to the overall experience of the customer about the company. Customers can be categorized in three groups based on their answers: a rating between 0 and 6 are ranked as Detractors, a score between 7 and 8 are ranked as Passives and Promotors shows ratings between 9 and 10 (shown in Figure 7). The Net Promotor Score is the result of subtracting the percentage of detractors from the percentage of promotors, which is an estimate of the overall customer satisfaction.



Figure 7. The Net Promotor Score explained in a figure, edited from: Checkmarket (2017 - Net promotor score – NPS – hoe te meten?)

The NPS could be used to measure the customer satisfaction and compare to a different time window. However, after some internal research on the NPS scores of bol.com, it was found out that the NPS is not measured on pre-orders. So, customers with only a pre-order (release) included are not asked to filling out the questionnaire. If the order includes a release and another item, or no release, then a randomized number of customers are asked, three weeks after ordering, to fill out the questionnaire (Expoints bol.com, 2016).

## 3.5. Quantitative model

Since pre-orders are not included in the NPS scores it is impossible to use these data in the quantitative research (model) because this research is based on pre-orders. Therefore, another kind of measuring should be used. According to Wang et al. (2016) the customer satisfaction on delivery on time in a specific time window can be defined as follows:

$$U(t_{i}) = \begin{cases} (t_{i} - ee_{i})/(e_{i} - ee_{i}), t_{i} \in [ee_{i}, e_{i}) \\ 100\%, t_{i} \in [e_{i}, l_{i}] \\ (el_{i} - t_{i})/(el_{i} - l_{i}), t_{i} \in (l_{i}, el_{i}] \\ 0\%, \text{ otherwise} \end{cases}$$

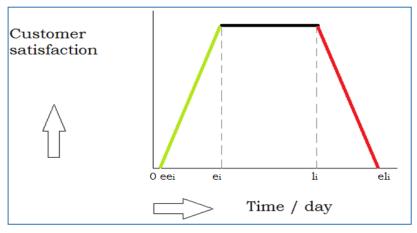
$$(1)$$

Table 1. Summary of notations in the original model.

Variable	Explanation
$U(t_i)$	Customer satisfaction in percentage.
$\mathbf{t_i}$	Number of days after release date that order <i>i</i> is delivered to the consumer.
eei	The number of days before the promised date, the order <i>i</i> was delivered.
$\mathbf{e_i}$	The beginning of the time window, the first date which is promised as delivery date to the customer with order $i$ (release date).
$l_i$	Original number of days after release date that the customer receives their order and is still 100% satisfied (end of the promised delivery date/time window).
$el_i$	Max. number of days after release when the customer is still more than 0% satisfied.

In Figure 8 the model (expression (1)) is explained in a graphical manner. The green line shows the window [ee<sub>i</sub>, e<sub>i</sub>) which belongs to articles which are delivered earlier than the date which is promised to the customer. Since preorders are not delivered before their release date, this part of the graph is irrelevant for this project.

Figure 8. Model with linear relation adapted from: Wang et al. (2016).



The horizontal black line describes the 'delivery time window': the number of days after the release date, the order is promised to the customer to be delivered. For example, the release is on November 12, it is assumed that the time window is zero. This indicates that the article should be delivered on the November 12 (on release date). However, if the time window becomes broader for instance two days, then the item could be delivered between the November 12 and November 14 (and it is still on time).

The last line to mention is the red line. This line shows orders which are delivered late, not in the promised 'delivery time window'. This is shown with a linear line. So if the order is delivered later, the customer satisfaction will linearly decrease. This means that the decreasing factor between one or two days delay is the same as the decreasing factor between ten and eleven days delay.

# Chapter 4. Methodology

This chapter explains the different kind of research methods that are used during this research. Besides, it explains how the data is collected. Furthermore, the category to focus on, the selected respondents and the design of the quantitative model are explained. Finally, the manner to analyze the data are described shortly.

## 4.1. Research methods

This research is done by two different research methods. First, interviews are conducted with different persons based on their function, internal (bol.com employees) as well as external (suppliers) selected by contact persons and data. This kind of method is called qualitative research (Boeije, 2005). This research is conducted to get more inside information about the causes of the delivering late of preorders.

Another part of this research is focused on applying a (consisting) logistics model which focus on the logistic problem to make it possible to improve the performance of pre-order delivery. This kind of method is called quantitative research (Boeije, 2005).

# 4.2. Data collection

Data of this subject is collected with a literature study, interviews, data from the database of bol.com and a logistics model.

The interviews are started with some general questions about the tasks of the employee. After the general questions, it continued with questions about the process between the organization bol.com and the suppliers and some focus on special pre-order products which are delivered late with different reasons. At the end there are some general questions again. There is a difference between the internal and external interviews. The interview transcripts and coded categories are added on the USB stick.

The researcher chose to use a list of questions instead of a topic list, because pre-formulated questions made it easier to stay close to the goal of the research. All the questions are open, since this made it easier to collect more data. In addition to that at the end of the interview examples of deliveries are used. This is to get specific information about delivering on time. It was possible to do these interviews and giving existing examples, because the researcher was doing an internship at the company and therefore the data was available to the researcher. The used examples could strengthen the results that are found. The reliability of the interviews is increased since the interviews were all recorded and transcribed. Since these transcripts were checked by the interviewees, the validity of the data of the research is increased as well. The researcher chose to focus on one category and on three suppliers and three internal employees due to the time frame. The choice of the category and respondents is explained below.

Besides the interviews, also a model is used to apply existing data and find out the optimum of customer satisfaction when the promised delivery date changed to promised delivery days. The model is derived from an article and was edited to use for this specific case.

## 4.3. Focus on one specific category

Since data is available for different product categories, a choice should be made regarding the category to focus on. At first, the choice was made to focus this research on games because this subgroup includes almost the most data about pre-orders together with one of the least KPI fulfillment rates. However, just started with the analysis in KIP it was found out that the results in the reports of KIP related to games are a bit distort. This can be explained as follows.

As shown in Appendix 8 some pre-order products show another (offer) release date in the analyze program KIP compared to the release date which was shown on the website of bol.com. For instance the game 'World of Warcraft' shows an offer release date of '25-08-2016' which is used to analyze

and a release date of '30-08-2016' which is used on the website of bol.com (the catalog release date). The catalog release date is given by the supplier, is added in the system but nothing is done with it (sometimes it appears on the website at the product specifications). The offer release date is the most up-to-date release date. So, the difference between the two release dates is that the offer release date will be updated and the catalog release date not (Appendix 9. Email contact with I. Kocer).

All the products of 'World of Warcraft' that are ordered at bol.com are received on the August 26, 2016 or later (see Appendix 10). This means that they could be sent to the consumer from the August 26, 2016. These results are confirmed by the data in Appendix 11. Here it is shown that there are 700 pre-orders on the product which are fulfilled on the August 29. Which means it is delivered four days after the offer release date however one day before the website release date (catalog release date). This means it is delivered on the website release date at the consumer because the difference between fulfillment day and delivery day is one day. This makes sense, because what is the real release date? Is the (offer) release date the right release date, or is it showing some distorted results because the offer release date that is used in the analyzing program is not the right release date to use (compared to the catalog release date)?

After some conversations with different employees within bol.com (mainly with a 'business analyst' and 'Product Owner BI') it was found that it probably has something to do with changing the release date manually in Bizpos (which is the product catalogue system of bol.com) and the appearance of the text on the website during the possibility to pre-order the release. To make it more clear there will be given an example below.

#### 4.3.1. Example of the appearance of the text during a pre-order release

There are two situations that can happen. Firstly, situation 1, there is no stock and the release date is expired AND the present day is <u>between</u> 'the release date + 3 working days after the release date' AND there is no supplier offer (see here on the left). The text which is shown on the website is: '*Not yet published – reserve a copy*' (see Figure 9).

Secondly, situation 2, there is no stock and the release date is expired AND the present day is <u>except</u> 'the release date + 3 working days after the release date' AND there is no supplier offer (see here on the right in red). The text which is shown on the website is: '*Not available*' (see Figure 10).

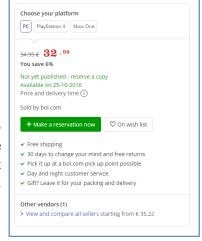


Figure 9. Example 1 of text on website.

For instance, imagine Fifa 17 Deluxe has a release date of

September 29. Before the release, the following is shown on the website 'Not yet published – reserve a copy'. If it is

assumed that there is no stock anymore and because it is a

limited edition (Deluxe) there is no stock coming anymore.

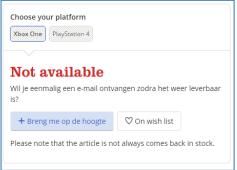


Figure 10. Example 2 of text on website.

In this case, there should be shown on the website that the product is not available anymore. To show this on the website, situation 2 should appear. Therefore, someone at bol.com is changing the release date such that the day the product is not available anymore is except from 'the release date + 3 working days'.

So, to make it more clear. The release date of Fifa 17 Deluxe is September 29. However, imagine today it is the September 28 and due to the all the pre-orders the product is sold out. Someone changed the release date of the product to September 23 (which is 3 working days before September 28). This means that September 23 is the release date and September 28 excepts 'the release date + 3 working days after the release date'. Therefore, this results in showing 'not available' on the website already on the September 28 (irrespectively the release date is September 29).

This example shows that it is mainly a textual thing, when is shown which text on the website? Due to the different release dates, analyzing data in the program KIP shows distorted results. After further analysis, it was conducted that these different release dates are mainly the case for the games category and less for other categories. The reason being that this problem mainly arises with limited edition products and the games category shows the most limited edition products. Therefore, this research focuses on another category to have less distorted results. Although it is still important to keep this problem in mind during the investigation.

Following results showed in Appendix 12 the most pre-orders are made in the categories games, movies and music. Appendix 13 shows that the music category has the most 'fulfilled late' pre-orders. Since the emphasis in this research is on delayed delivered pre-orders, the focus will be on this category during this research. The used order data file is added on the USB stick.

# 4.4. Respondents of interviews

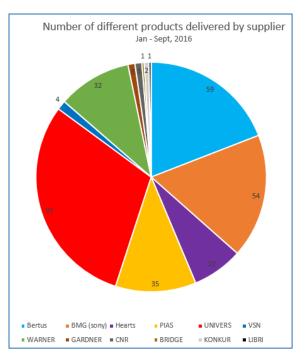
To find out the influence of the suppliers and the employees of bol.com on the delayed deliveries, related to SQ2, interviews are conducted. To know which suppliers are interesting to interview, first a supplier analysis was conducted. Unfortunately, in the analyzed data it is not shown which supplier delivered which release. So this analysis was done manually by using the LSM module (purchasing module program) and the analyzing program KIP to find out which supplier delivered which release article.

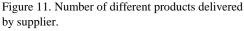
To narrow the amount of pre-orders to make the analysis easier to do manually, the following filters were used:

- Pre-order indicator (Yes)
- Product category (Music)
- $\geq$  20 pre-orders on one releases
- FulfillmentCategory (FulfilledinTime or FulfilledLate)
- ProductReleaseDate (From 1 January 2016 till 30 September 2016)

In Figure 11 the found number of delivered products per supplier –with filters- is shown. According to this figure UNIVERS delivered the largest number of different articles followed by BERTUS, BMG(Sony), WARNER and PIAS. Since these suppliers are delivering the most, they are considered to be the five biggest suppliers of the music category. Therefore, it would be interesting to focus on these suppliers during this research.

To get a better overview of these five suppliers, their fulfillment is shown in Figure 12. Unfortunately, as shown in the figure they do not deliver always on time shown by a fulfillment lower than 100%.





# Fulfilment by supplier delivering on time (Jan - Sept, 2016) 120.0% 98.9% 96.0% 94.2% 92.6% 100.0% Fulfilment percentage 75.4% 80.0% 60.0% 40.0% 20.0% 0.0% **Bertus** BMG (sony) Pias Univers Warner Suppliers

Figure 12. Total quantity delivered on time by suppliers (top 5).

Since bol.com wants a fulfillment of 99.00%, their suppliers should also have at least a fulfillment of 99.00% (personal communication: M. Bernts, 8 September 2016). Therefore, these suppliers should improve their performance. The suppliers were asked to participate in the interviews. Unfortunately, not every supplier did have time/answered. So, only three interviews were conducted with the following suppliers: Universal, Bertus and Sony.

This research focuses on these suppliers and its aim is to find out what the causes are for pre-orders being delivered late and to find out whether there are options to solve this problem to improve their fulfillment performance.

# 4.5. Design of the quantitative model

Next to the interviews, which are focused on the causes of the delays, a quantitative model will be used to find out a solution to some of the causes of delays. The model was used to find out whether a broader time window can give a better customer satisfaction and to find the time window that corresponds to the highest customer satisfaction. The first model is based on the customer satisfaction of delivery on time (reliability). The second model is based on the customer satisfaction of a given time-window (attractiveness). These models might be used to improve the delayed deliveries, which is related to SQ3. All the used notations are given below in Table 2.

Table 2. Summary of notations in the models.

Variable	Explanation
N	Set of orders i.
$\mathbf{U}^{\mathbf{R}}$	Customer satisfaction based on the overall reliability of the pre-announced time window
	for a set of orders.
$\mathbf{u}^{\mathbf{R}}$	Customer satisfaction based on the reliability of the pre-announced time window
$\mathbf{U}^{\mathbf{A}}$	Customer satisfaction based on the attractiveness of the pre-announced time window.
$\mathbf{t_i}$	Number of days after release date that order <i>i</i> is delivered to the consumer.
$ee_i$	The number of days before the promised date, the order <i>i</i> was delivered.
$\mathbf{e_{i}}$	The beginning of the time window, the first date which is promised as delivery date to
	the customer with order <i>i</i> (release date).
$\mathbf{l_i}$	Original number of days after release date that the customer receives their order and is
	still 100% satisfied (end of the promised delivery date/time window).
L	Number of days added to original time window (l <sub>i</sub> ) to get the broader time window.
L*	Number of days added on the time window which shows optimal total customer
	reliability and attractiveness.
$\mathbf{a_1}$	Customer satisfaction decay rate 1, which is assumed to be 0.5*
$\mathbf{a}_2$	Customer satisfaction decay rate 2, which is assumed to be 0.01*
β	Time window sensitivity coefficient, which is assumed to be 1 (no influence).

<sup>\*</sup> Fixed number, to show a clear and reliable view in the graph.

# 4.5.1. Quantitative model (1) - Reliability

The model that is used during this research is derived from the article of Wang et al. (2016), as explained in the literature study. However, this model should be adapted to apply it to this case. It should be an *exponential declining curve* instead of a linear declining line (as explained by Hill, Hays & Naveh, 2000). Since it can be assumed that the customer satisfaction between 1 and 10 days delay is a bigger difference than the customer satisfaction difference between 10 and 11 days delay. So, if the number of days delivered after promised customer date is increasing, the customer satisfaction will be exponentially decreasing. Also the 'el<sub>i</sub>' point (explained in section 3.5) does not consist anymore, since the customer will always be a little bit satisfied if the order arrives - the satisfaction will not reach zero but will come close to zero. Therefore, another expression would be used, which also provides another figure, see Figure 13.

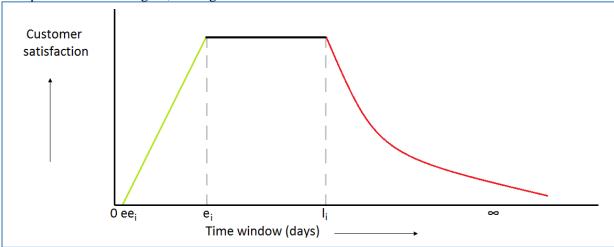


Figure 13. Model with exponential relation

#### Data & expression model 1: Reliability

The data of bol.com is used in the analyzing tool KIP. The data was filtered to only include orders over a time window of November 2015 till November 2016 within the music category. The (other) filters are given below:

Pre-order indicator (Yes)

- Product category (Music)
- FulfillmentCategory (FulfilledinTime or FulfilledLate)
- CustomerDatePromised
- DateFulfillment
- ProductReleaseDate (From 1 November 2015 till 31 November 2016)
- Difference in days (between 'promised customer date' and 'date fulfillment')
- ShopOrderID
- Fulfillment Quantity Late
- KPI Fulfillment

The customer satisfaction is measured with an expression derived from Wang et al. (2016), as explained in chapter 3, expression (1). However, this expression does not show an exponential relation, which it should be as explained before. Therefore, for this research the edited expression will be used, which is shown below in expression (2).

$$u^{R}(l,t) = \begin{cases} \frac{(t-ee)}{(e-ee)}, t \in [ee,e) \\ 100\%, t \in [e,l] \\ \operatorname{Exp}\left(-a_{1}*(t-l)\right), t \in (l,\infty) \end{cases}$$
 (2)

The first line in expression (2) will remain the same as expression (1). It relates to orders which are delivered before the promised customer date. As explained earlier, this would not happen for preorders of releases, because it is punishable if the pre-order of a release will be delivered earlier than the release date.

The second line in expression (2) will also remain the same compared to expression (1). It is valid when the order is delivered on time i.e. delivered within the time window of the order [e, l].

The third line in expression (2) will change compared to expression (1). This relates to orders which are delivered late, which means that the date fulfillment is after the customer promised date/days, as shown with the red line in Figure 13. However, line 3 in expression (1) is linear and the red line in the Figure 13 is a curve (exponential), therefore the expression should be adapted. So, line 3 will change in an exponential expression, as shown in expression (2). Since the expression is exponential, the customer satisfaction will never reach exactly zero percent but could become close to zero percent (as explained above). The a<sub>1</sub> which is included in this expression can be seen according to Hill, Hays & Naveh (2000) as the 'delivery time promised elasticity of customer satisfaction', so when the delivery time becomes more the customer satisfaction becomes less. If a<sub>1</sub> is changing, the graph is changing as well. So, there should be chosen a fixed and reasonable coefficient a<sub>1</sub> to get a reliable graph.

The last line in expression (1) relates to products which are delivered later than an assumed day  $el_i$  after the promised customer date. Although, the expression became exponential so this line will be removed and will not happen anymore. Therefore, this line is not shown in expression (2). So, t will never reach the x-axis (see Figure 13).

To calculate the overall consumer satisfaction based on reliability of a specific time window period the following expression will be used:

$$U^{R}(L,N) = \beta \frac{1}{|N|} \sum_{i \in N} u^{R} (L + l_{i}, t_{i})$$
(3)

## 4.5.2. Assumptions

Before the model can be expanded and the data can be applied, some assumptions were made. These assumptions are mentioned below:

> It is assumed that the data obtained from the database of bol.com is reliable.

- ➤ It is assumed that all the consumers were informed (by email) when the product is delayed due to different reasons (so, the customer satisfaction is purely measured on the product stream not on the information stream).
- ➤ It is assumed that all orders with a pre-order indicator are pre-orders.
- ➤ It is assumed that all pre-orders with an unknown promised customer date (which is shown by a date with the following initials: 01-01-1970) have unknown data. So, these orders are filtered out.
- ➤ It is assumed that the promised customer date is the same as the product release date per order.
- ➤ It is assumed that orders with a date fulfillment more than 1 day earlier than the promised customer date is delivered on time (so have the customer satisfaction of 100%).
- ➤ Only orders which are fulfilled on time and fulfilled late are included. The orders that belong to one of the following categories are filtered out: Cancelled, CancelledLate, OpeninTime, OpenLate or Unknown. Remarkable is that a product is delivered on time if the date fulfillment is a day before the release date (promised customer date). For reason that after the date fulfillment, the product is ready in the warehouse to be picked by the delivery service. So, the product has still one day to be delivered at the customer.
- ➤ It is assumed that the relation between the reliability of a delivery of an order and the customer satisfaction can be shown in an exponential relationship.
- $\triangleright$  The coefficient  $\beta$  is assumed to be 1 since it does not have any influence on the customer satisfaction.
- $\triangleright$  To get a reliable and reasonable view in the graph(as result), the coefficient  $a_1$  is assumed to be 0.5.

# 4.5.3. Example of the model – Reliability

This model which explained first, would be applied to show the reliability assumption:

"If you make a broader time window of delivery it is predicted that there will be more orders delivered 'on time' which makes the company more reliable and makes the customer more satisfied."

According to Mackintosh (2015) there are customers moving from the detractive group to passives/promoters group because there are more products delivered on time. Therefore, a higher customer reliability results in a higher customer satisfaction and a better pre-order product fulfillment.

A shortened example of applying data to this model is given in Appendix 14. For every order the difference in days between the promised customer date (release date) and the date fulfillment is measured (see example in Table 1, Appendix 14). The customer reliability on that specific order is measured as well (see example Table 2, Appendix 14). By using expression (2) (above) all the customer reliability for a different time windows is also measured (see example Table 3, Appendix 14). Also, the overall customer satisfaction related to reliability (U<sup>R</sup>) of the five orders is calculated, with expression (3). Finally, the overall customer reliability can be pointed out to different time windows and the results can be shown in a graph.

# 4.5.4. Quantitative model (2) – Attractiveness

Next to the customer satisfaction based on the reliability of delivery, another performance should be measured. As shown before, the customer satisfaction increases by giving a broader time window, because there are more products delivered on time. In contrast to the increasing customer satisfaction, it is also decreasing by expanding the time window since customers do get more uncertainty about the product delivery it is not promised on one specific date, but on two or more days. Therefore, the broader the time window the less attractive the delivery service. This uncertainty is resulting in less customer satisfaction.

# Data & expression model 2: Attractiveness

Customer satisfaction based on the pre-announced time window is independent from specific orders. Therefore, these data is not used. There is only an exponential relation between customer satisfaction and the different expands of the time windows. Therefore, this can easily be calculated with a derived version of the previous expression. The next expression will be used for this part:

$$U^{A}(L) = \exp(-a_2 * (L))$$
 (4)

The second model which is explained, would be applied to show the assumption on the breadth of the time window:

"If you make a broader time window of the delivery, it is predicted that there will be more uncertainty about the specific delivery moment to the customer, so there will be less satisfaction of the customers."

As mentioned before, according to (Huang et al., 2009), if the customer orders a product with a delivery time window of three days it is less attractive than ordering a product with a delivery time window of one day.

# 4.5.5. Assumptions

Before the model could be expanded and the data can be applied some assumptions were made. These assumptions are mentioned below:

- ➤ It is assumed that the relation between a pre-announced time window and the customer satisfaction can be shown in an exponential relationship.
- ➤ The customer satisfaction on pre-announced time windows are not depending on the product/order.
- $\triangleright$  The coefficient  $a_2$  is assumed to be 0.01. It should be a fixed number to give a reliable view in the graph.

# 4.6. Data analysis

The results of the interviews were non-standardized data, which should be categorized (Saunders et al., 2004). Therefore, different categories were made based on the raw data which referred to as 'open coding' (Straub, 1992). After making these categories, all the interviews have been coded to different categories. This helps in creating links between the different interview results. The goal of this analysis is to draw and verify conclusions about the delayed deliveries of the releases.

After doing the interviews, the product stream will be improved by applying the edited model on the existing data to improve the performance of pre-order delivery. Firstly the model is used to calculate the satisfaction compared to the deliveries on time. After this, the satisfaction is calculated compared to different time windows. Finally, the two models will be added to each other, which shows an optimum of the total customer satisfaction related to a specific time window.

# Chapter 5. Results

In this part of the report, the results will be given on the different parts of the research. As explained before the focus is on the category music, so the music category is analyzed first. The analysis is discussed below. Subsequently, the results of the interviews are summarized. These results will be used to answer SQ2. Finally, the results of the model are explained and discussed. The results of this model are used to answer the last subquestion, mentioned in chapter 2.

# 5.1. Analysis of the Music category

To use real examples in the interviews, an analysis was done on the music category. This analysis is mainly done with excel, the purchasing module and the data analyzing program of bol.com, named KIP. It results in giving more information about pre-orders which were delivered (late) to the consumer or warehouse of bol.com, which could be used as example during the interviews.

## 5.1.1. Results of analyzing music category data

As shown in Appendix 15 there are around 45 million orders placed from November 2015 till November 2016. From these 45 million orders, approximately 600,000 are pre-orders, so this is around 1.3% of the total number of orders placed in one year. Therefore, it is an important part for the e-commerce company bol.com. As shown in Appendix 16, the fulfillment over the year is 98.6%. So, 98.6% of the total orders were fulfilled on time. However, in Appendix 17 it is shown that most delayed deliveries do appear for pre-orders. Here it is shown that pre-orders have a fulfillment of 90.5% (which is substantially lower than the overall fulfillment). Therefore, it is chosen to focus on the delayed deliveries of pre-orders. Due to the time frame, it was chosen to focus on one category within the company bol.com. In this case, the focus is on music as explained before. To get clear, concrete and recognizable examples for the interviews, the number of orders should be narrowed down with specific filters.

From the approximately 600,000 pre-orders, 120,667 are within the music category. Figure 14 shows a clear overview. The red bar shows the number of pre-orders which were delivered late (7.75%) and the green bar shows the delivered pre-orders on time (85.34%). The other 6.91% is related to other categories of fulfillment like cancellations, open lates etc. (showed by the yellow bar).

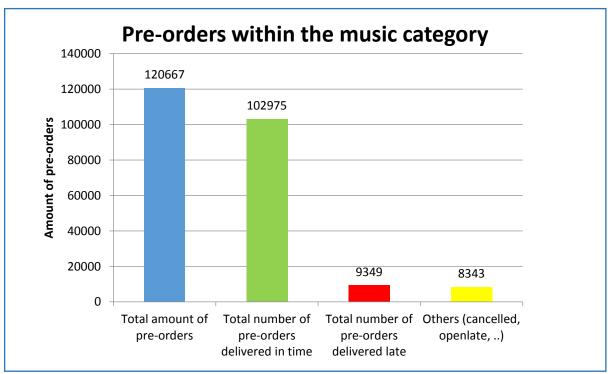


Figure 14. Total number of pre-orders within the music category divided in different categories: delivered on time, -late or other. 1

Bol.com wants a fulfillment of 99.0% (also for pre-orders) (Personal communication: M. Bernts; September 8, 2016). As mentioned before, the fulfillment of the total pre-orders is 90.05% and from the pre-orders in the music category it is 85.33% (in a time frame of a year November 2015 till November 2016). Since the fulfillment does not reach the 99.0%, it is important to do research on this problem to improve the fulfillment. Data about delayed deliveries was used to have some clear examples to discuss during the interviews. These data are coming from the analysis in the KIP-tool (to find the pre-order products with corresponding EAN) and some analysis in LSM (purchasing module – to find the right supplier). Unfortunately, at this moment the supplier is not yet correctly related with the delivered articles in the analyzing program KIP. So, the corresponding supplier of a release was manually find in the purchasing module (LSM). There are a lot of releases, therefore the bottom limit of a minimum of 20 delayed delivered pre-orders per product was chosen. Besides, also the time frame was shortened because that makes it easier for the employee and supplier to remember the specific product (and the corresponding problem of delivering late). The time frame is from March 1, 2016 till September 30, 2016. The articles which are included are shown in Figure 15.

-

<sup>&</sup>lt;sup>1</sup> This information used a time frame from November 2015 till November 2016, i.e. 12 months.

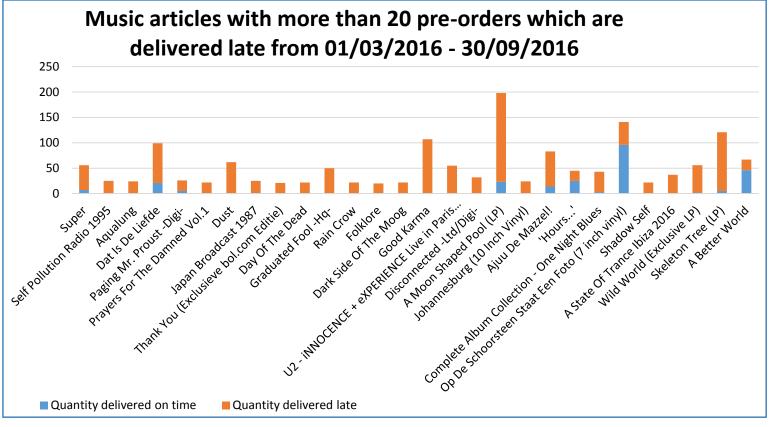


Figure 15. Overview of music articles with 20 or more pre-orders which were delivered (partly)late.

This figure shows that some articles which were delivered late and some articles were partly delivered on time and partly delivered late. For these articles the corresponding supplier was found manually. Other data from these articles is added via the KIP-tool (automatically) like: the release date, EAN, order data as shown in Appendix 18. All this information is discussed during the interviews with the suppliers and internal employees to find out why these articles were (partly) delivered late (to the consumer/warehouse of Docdata).

#### 5.2. Results interviews intern at bol.com

This part discusses the results of the interviews with the internal employees: the buyer, supply chain specialist and the logistic specialist of the category music. These three persons were interviewed since they have an influence on the process from supplier to warehouse to customer within the category music and they possess knowledge about the release process.

There are shown some quotes based on the interviews. These quotes of the interviewees are translated by the researcher since the interviews were done in Dutch. This language was for both parties the mother language, which prevents wrongly interpreted information because of a language barrier. The results of the interviews will be discussed below distinguished in the different categories.

# 5.2.1. Tasks of the intern employees at bol.com

Three interviews were done with persons with different functions. Therefore, they have all different tasks. To make it clear what every person is doing every day, their tasks are discussed below.

#### Buyer

Firstly, the tasks of the buyer is to negotiate with suppliers about for instance yearly meetings, articles and conditions in contracts.

Following the buyer, the supply chain specialist experiences forecasting as a problem. Thus, the supply chain specialist asked the buyer to help with forecasting releases. Therefore, every Wednesday, the buyer is checking the number of back orders compared to the number of articles ordered at the supplier. She added here "... and of course I see which articles are in stock and which

are not. If I have the illusion that the supply chain specialist did not take contact with the supplier of the articles which are not in stock on that moment, then I do it by myself. Actually, it is not my task."

Remarkable, they do not give a sign to the supply chain specialist or the logistic specialist if a release is delayed. This because it is assumed that the supply chain specialist sees it by themselves, but if they did not see, it is not clear if the customers are informed. In general, the deliveries will be seen as delayed.

#### Supply chain specialist

The supply chain specialist is responsible for the (operational)purchases, inventory management and forecasting. If the supply chain specialist purchases an order, he or she needs to fill in a requested delivery date. This date shows when the order should be delivered at Docdata (warehouse of bol.com). However, if they place an order manually, this is not always done since it takes a lot of time to add the data manually on every order (Personal email communication, R. de Blanken).

Another task which is mainly done by the supply chain specialists is the check whether an order is pre-announced and delivered. If the orders are not delivered by the suppliers, the supply chain specialist takes contact with the suppliers. However, in the peak (September – December) they hire some out-sourced labour to do these tasks.

The last task to mention is whether the supply chain specialist knows that the order will not be delivered on time, they ask the logistic specialist to turn out a list with customer details. The supply chain specialist send these to the customer service (with a detailed mail with the reason of the delay) so they can inform the customers about the delay of the release. This is confirmed by the logistic specialist. They do not send it to the customer service by themselves, because the supply chain specialist is responsible for the availability of the articles.

The buyer indicates that the supply chain specialist focuses on the delivery of the releases by the supplier. They check this every Wednesday, unfortunately this is only done for the big releases. Besides, the supply chain specialist is mainly focused on the 'mistakes'. They do not follow every product and their deliveries, rather they are only focused on the deliveries which went wrong.

#### Logistic specialist

The logistic specialist is responsible for delivering the articles on the promised customer delivery date. Besides the long-term tasks are determination of the delivery date, check-out lay-out, package quality etcetera.

It is not the intention for a logistic specialist to have contact with the suppliers, because this is officially a task for the buyers and the supply chain specialist. However, sometimes the logistic specialists have contact with the suppliers because of different reasons for example they are used to it, the suppliers are contacting the logistic specialists by themselves or a lot of customer orders are influenced by the late delivery (so it has an impact on the function of the logistic specialist).

#### 5.2.2. Penalize the suppliers

At this moment, there are two types of penalize the suppliers for late delivery.

The first punishment to mention is the 'red- and yellow card system'. This is related to the delivery process of the supplier. There are different kind of mistakes a supplier can make in his delivery process. An example is when a supplier pre-announced a delivery, but they do not deliver on that specific date. If this happens for the first time at a supplier, they get a yellow card which means that the supplier does not get the opportunity to drop their products at the warehouse (they are refused at Docdata). They get the card and the supply chain specialist should contact this suppliers. Together, they should determine when the order could be delivered (again) by the supplier. If it happens for the

second time or more, they immediately get a red card. A red card has the same meaning as the yellow one, but the color defines that it happened before.

Another punishment which is introduced recently are fines. The buyer explained this procedure: "In the contract with suppliers it is included that a release should be delivered three till four days before release. If this has not happened and the supplier does not actively let us know that they cannot deliver the released products on time, they will get a fine." Unfortunately, the buyer also mentioned that this is only discussed with small suppliers, because with large suppliers they did not have a yearly meeting yet. However, they will discuss this coming year with the large suppliers. Also, the process is not fully worked out and therefore this process is not always working well. So, the aim is to make the process clear coming year and work it out so they can give the suppliers fines when it is needed. These fines are mainly meant to compensate the customer for late delivery.

#### 5.2.3. Reasons of late delivery – following intern employees

The different kind of reasons mentioned by the three specialist based on their experience are given below.

- Product is not ready yet.
- Some suppliers are wholesalers and should order the products by their suppliers, sometimes they order it late which could cause the late delivery.
- ➤ Bol.com does not order on time. Therefore the suppliers did not forecast enough and should wait on their suppliers which can cause a late delivery.
- Placing an order while the supplier is out of stock.
- There could also be some delay caused by the warehouse, for instance by a failure in the process.
- > Sometimes the supplier communicates a wrong release date, in reality it is the date they receive the articles from their suppliers.
- Sometimes it is not possible to order the articles of the release because the offer feed of the supplier is incomplete.
- There can also be a delay specific on the special editions, because these could be delivered from another warehouse which takes more time or sometimes there are signing actions linked on the release.
- > The releases are not a phenomenon for everyone. In some categories it is less important. If these categories are adapting a process where all the categories are included, they forget sometimes to take releases separately.
- The delay could also be supplier specific, for instance:

  a. "At Sony, they are delivering by DHL. However, that goes from South-France via different hubs to us. Somewhere in Belgium, there is a hub which has a failure (every other day). Some delay is arising there, but mostly this goes about one day, so it will be on time for release."
  - b. "At Warner, if we do not order in the time window 'Friday before release' and we order it for instance on Monday, then it is the agreement that they will deliver on the day of release".

#### 5.2.4. Moment of release (release date)

According to all the three internal employees (buyer, supply chain specialist & logistic specialist) most releases from the music category are on Friday. According to the supply chain specialist, in most cases they use a time frame of a week to order the release articles. Some suppliers asked (when there is a big promotion) the supply chain specialist to order earlier, because then the supplier can take that into account with the production. It would be expected that the delivery of the release articles to the warehouses are on Tuesday/Wednesday before release. However, this has not always happened due to different reasons as mentioned in subsection 5.2.3.

The release dates which bol.com communicates are coming from the offer feeds of the suppliers. It is

assumed that suppliers do fill in a release date in their offer feed. Via a system (Bizpos) this is communicated with the bol.com system and their customers. It is possible to change the release date manually by bol.com, however if this is done once, the release date is not automatically changing anymore when the supplier is changing it in the system. So, it is preferred to do not change the release date manually and to wait for the information(changes) of the suppliers. This is confirmed by the logistic specialist. The changing release date is most of the time not happening for the music category because in most cases they have a 'hard' release date, so it is not really possible to change it.

#### 5.2.5. Suppliers (and arrangements)

According to the buyer, there are five big suppliers in the music category, namely: Bertus, Warner, Universal, Pias and Sony. With all their suppliers, they have contracts which consist of a general part (legal framework with agreements) and a specific supplier part (conditions).

Bertus is a wholesaler as well as an own publisher. "So, they for instance have products from Bertus themselves. For example the CD of Adele, that was an item from Bertus own. So, if you want to buy it somewhere else, you pay more because they also need to get it from Bertus." Concerning their own products they are more focused to deliver on time at the warehouse of the retailer. Because, if the artist noticed that product is not deliverable/cross-dock the artist will take contact with you as supplier and they are not amused. You do not want that an artist is disappointed about your service, therefore if it relates to a suppliers own products they are more focused than if they are an in-between supplier.

Following the buyer, there are no concrete arrangements about specific purchase dates. However, as mentioned before the supply chain specialist indicates that there is in general a time frame of a week till 3 days before release, to purchase the releases.

Recently, Gardners is added to the music suppliers. The buyer of books told that Gardners is only delivering on the release date or later. However the music buyer did not know this. Besides, Gardners is from England which results in having other release dates. During the analyses which were done before adding Gardners to the music suppliers, these problems were not shown. Therefore it was a little surprise. However for now, it should be adapt so it will become available at our website when the release date is already exceeded. Gardners is needed since they could play as competitors for Bertus and they can deliver sometimes exclusive items which are hardly available at other suppliers.

The last point to mention about the arrangements with suppliers is that the big suppliers (like Universal, Sony and Warner) will let bol.com know if they have a limited stock. Bertus and the small suppliers do not send a message, so you should be on time with ordering.

#### 5.2.6. Big and small releases

It is clear that there is a distinction between 'big' releases and 'small' releases when handling the processes. However there is no clear definition of a 'big' and 'small' release. According to the buyer, it is on intuition. But the supply chain specialist indicate a big release as: "... from 20 pre-orders or more. Well, the really big ones are, of course, more like thousand pre-orders or more." However, it is not that the focus for the supply chain specialist is only on the 20 pre-orders of more, it is also on important titles even if there are no pre-orders on the article. According to the buyer, the supply chain specialist is less focused on the small releases (with one or two pre-orders). Also, the logistic specialist mentioned that the focus is mainly on big releases. However, the logistic specialist defined a big release as follows: "...around 200 pre-orders". Besides, she indicates that it depends on the amount of time she has to check the releases.

If there is a change in 'big' releases, the suppliers keeps the employees from bol.com up to date. For example it is communicated if the release date changed or the supplier gives a sign to the supply chain specialist to order enough due to limited stock.

Another difference is in customer communication. If releases with a lot of customer orders are delayed, an automatic email is sent to the customers with information about the delay. However, the releases with a few customer orders are not informed by email. There are automatic delay mails which can be sent, however the logistic specialist mentioned that the orders of delayed small releases are not informed by this automatic email. Since the information in the automatic email is not correct, this email is not send to the customers (with orders on 'small' releases).

If there are releases delayed with a special target group, like products from Justin Bieber or Shawn Mendes, the buyer or someone else is advising the special care team. So they can immediately help the customers who are disappointed because their product is delayed.

According to the buyer, there are meetings between different departments about releases. However, during this meeting the focus is mainly on 'big' releases. Also, the communication is mostly about the 'big' releases, because if there is a delay it should also be communicated with S&OP to know if it is possible with the planning.

Besides the focus on 'big' releases, the focus is also on the 'big' suppliers. Unfortunately, there is less focus on the small suppliers.

#### 5.2.7. Forecasting releases

Slim4 is used to forecast the actively stock, so the articles we want to manage from stock. By means of the average turnover and a number of parameters, the system gives a forecast of the amount of stock to cover a period.

The forecasting process is as follows, first take a look on the releases in the coming 10 days. It is coming from BIT (a software) which also shows the number of backorders. On the basis of these number of backorders the amount of orders are determined. In most cases order a few products more than the number of backorders.

Buyers do help the supply chain specialists with forecasting. However, forecasting is a complicated process. For instance the 'freaky titles' are really hard to forecast before the release. Other factors like promotions and social media could also have a huge influence on the number of orders (on a specific moment). The supply chain specialist mentioned also the disadvantage of releases on Friday, because there is immediately a weekend after it. This makes it not possible to switch if there is not enough stock left on the day of release because it will just be delivered on Monday (after the weekend).

#### 5.2.8. Contact with suppliers

The buyer has contact with the five big suppliers almost every hour. The contact with the small suppliers is about once a week. Sometimes with the really small suppliers the buyer does not have contact with them at all. The supply chain specialist also has most contact with the big suppliers. For instance if they get a red card, the supply chain specialist immediately contacts with this supplier. However concerning the small releases, they could wait with it (since in most cases it relates to one or two pre-orders).

A supplier consists of there is a sales part and product part. The artists have contact with the product part and bol.com as retailer has most contact with the sales part.

The logistics specialist does not want contact with the supplier, because that is more a task of a supply chain specialist or buyer. However, sometimes the supplier is calling the logistic specialist about a delivery then I take the call in spite of sending them to the supply chain specialist.

#### 5.2.9. Customer communication

According to the buyer the customer communication process is not really clear, she indicates: "We do not know when, what, if the mail is sending to customers and what is shown in the mail." The supply

chain specialist adds on this that the email will inform customers about the delay and if it is available it will show the reason of delay.

The customer communication related to 'big'and 'small'releases is already mentioned in part 5.2.6. Big and small releases.

#### 5.2.10. Uncertainties in the analyzing tool: KIP

From August, the supplier Gardners is added to the music supplier's list of bol.com music. The release date of Gardners of the products should not show in the analysis that are done in the KIP-tool during the period January till August. Unfortunately, for some products the release date of Gardners is shown in KIP for this time period. Therefore it can be concluded that the results in KIP are not always reliable, because this is not filtered out.

The logistics specialist mentioned that the data that is used in the analyzing tool KIP is delivered from different systems. The last time there were a lot of changes which could result in unknown fields (or incorrect/incomplete fields).

Unfortunately, the information which is communicated to the customer at the moment of order is not found in the analyzing tool KIP. This is confirmed by the release date that is shown in the reports from the program KIP. It is the present release date of the best offer. However, the best offer can change every hour. If different offer feeds show different release dates and the best offer feed is changing, the release date will change as well. This could disrupt the results of the analysis. This makes it hard to make a connection between the delay and the release date. Also the 'promised customer date' can change if the release date is changing. Since this indicator is not fixed, it could be hard to interpret the results. Therefore, it could be appear as a delivered on time in the analysis/report from the program KIP while in real life it was delivered late.

## 5.3. Analyzing results interviews extern at bol.com

This part discussed the results of the interviews with three suppliers. They are interviewed since they have a lot of knowledge about the delivery process of the article from warehouse of the supplier to warehouse of the company: bol.com.

There are shown some quotes based on the interviews. These quotes of the interviewees are translated by the researcher since the interviews were done in Dutch. This language was for both parties the mother language, which makes it easier to give as much as possible information (it prevents a language barrier). The results of the interviews will be discussed below distinguished in the different categories.

## 5.3.1. Tasks of the external employees

The interviews are done with three employees of different suppliers. Since not every person had the same task at the supplier, their tasks are discussed below distinguished to the different suppliers.

## **Universal**

The interviewee from Universal is a Key Account Manager therefore he is occupied with a number of big accounts in the Benelux, whereby he is mostly responsible for the Netherlands. A colleague is managing Belgium, however the interviewee takes care of the strategic parts of both countries. As Key Account Manager at this supplier, one is responsible for doing business with partners, from day to day to year, for instance inventing actions. Besides, being key account manager of Universal, he is also taking care of the logistical part. Since the warehouse of Universal is in 'suspension of payment', there is a logistical chaos and therefore he is more taking care of the logistics part.

#### Sony

The interviewee from Sony explained his tasks are related to his responsibility of the logistical process in the music category (CD's, DVD's), from placing orders at the plants to take care of on time

delivery at the warehouses. Besides, he takes care of the article portfolio and follows the warehousing process in a system (from pick, pack to sending the orders as fast as possible).

#### Bertus

The interviewee from Bertus described his task very shortly and in general the same as the interviewee from Universal. He is also a Key Account Manager at the company Bertus where he offers labels to different partners so the products can be offered at their partners (for instance bol.com can offer the products from Bertus).

#### 5.3.2. Reasons of late delivery – following employees of suppliers

Every employee of a supplier mentioned some reasons for late delivery, some suppliers have the same reasons some have different once. All the reasons will be explained below:

- > Changing the release date due to different reasons (will be explained below).
- > Some products are hard to schedule because sometimes they become popular in a short time for instance if the artist passed away. This cannot be predicted, but can cause an enormous increase in sale.
- In some cases the artist wants to hold the product in their factories until two days before the release, because of privacy reasons or promotions. However, two days is very short to deliver the product from a factory (mostly abroad) to the warehouse to the customer therefore this could lead to a delay.
- > Sometimes an artist decides to not place the product on the market, because in the music category the artist is leading. This could lead to delays or no delivery because of late decisions the artists make or the artist changed his mind about the product and wants to change something which could also cause a delay.
- A delay can be caused because of low stock levels, due to a wrong forecast.
- Miscommunication can also lead to a delay. For instance if the warehouse is not doing their job and there is some miscommunication, the release could be delivered late.
- Another reason could be that there is a restriction on the number of articles which will be produced. Then it could be decided to make more products however this takes more time to make. Therefore some orders will be delivered late and some on time (first production).
- A product could be made in a 'normal' version and a 'deluxe' version. In most cases, the deluxe version needs more time to be produced, therefore this version can be delayed due to a longer producing time (then expected before). Besides, artist do often require a complex print, which could be another factor of delay.
- If bol.com places an order later than three days before release, it can also lead to a delay.
- Releases with a low pre-order/order percentage, make the logistic process harder and sometimes these 'small' releases take more time which can result in a delay.
- ➤ Products made from 'vinyl' are a problem since the demand often exceeds the supply. It takes more time to produce vinyl and there are few vinyl plants. This makes it hard to fulfill all the orders on the vinyl products, therefore sometimes it can lead to a delay of the release products.
- A delay can arise caused by the delivery service between the warehouses or between the warehouse and customer.
- A production fail can also be a reason to deliver late to the warehouse/customer. For instance if the components to make a product are not on time at the plants, the plants are not able to make the product on time.
- Another reason (mainly small incidents) can be that the trucks, warehouses or employees (on both sides) are not in good 'condition', for instance employees at the warehouses which are not alert or trucks that have a leaky tyre.
- Especially a reason of supplier Universal to deliver late: since September 2016 they changed the warehouse due to 'suspension of payment'. So, from this moment there are some delays

due to different reasons: warehouse management, capacity, failures etc. which can all be placed under the heading: Chaotic warehouse.

#### 5.3.3. Moment of release – release date

Following all three suppliers, it can happen that the release date will change. This could also have different kind of reasons, which will be explained below:

- ➤ If the product is not ready yet, the artist can change the release date and finish the product before the new release date. Then the article is in principle not late, just not finished.²
- Sometimes the release date differs per country, if the release in another country is earlier (for a specific reason) and this release date is changing. It could also change the release date in the Netherlands/Belgium.
- > The item can be disapproved (by the artist) and should be revised, this can result in a change of release date.
- Sometimes the release date is not known yet and the retailer wants already show the article in the shop, then it could be that the retailer predicts a date/month when the article probably will be released. This is not a concrete date, when the date is known the predicted date/month can be changed to a concrete date. However, because not everything of the product was already known/finished, it could be that the release date is changing.
- A new version of the article can also cause a change of release date in the system. If it is really another version with extra content then it should be considered as a new article (with a new release date). However, if it is a re-run or the product was not in stock for a long time, then it should not get a new release date (but sometimes it does get a new release date). If someone sees this happen, they change back to the old release date, however it is not always seen.

#### 5.3.4. Arrangements of suppliers with bol.com

All the suppliers of bol.com have arrangements with bol.com (for instance about delivery and order time). The differences and agreements in arrangements between suppliers will be discussed below. Also some points which are not discussed with all the three suppliers (therefore not possible to compare) are shown in this section.

#### Agreements and differences

The employee of Sony and Bertus mentioned that bol.com has the agreement to place orders before Tuesday before release. The suppliers will send the orders on Tuesday and the bol.com warehouse will receive it on Wednesday. However, Bertus indicates that if the orders from bol.com are placed after Monday before release, the order will not be delivered on time (to deliver before release date). Sony mentioned that if they have stock left they would be able to still deliver it before release.

The employee of Universal mentioned that bol.com should order the articles at least a week or 10 days before the release (also to provide out of stock). This provides an easier forecast about the demand (from different customers). However, seven till ten days before release could be sometimes too early for bol.com to order. For the reason that in the last week before release there could still be coming a lot of orders. However, Universal accepts if bol.com is still ordering in the last week but it is good to have already an indication about the amount of demand.

#### Universal

There are also arrangements about the lead times with Universal, these are known by some buyers and other employees of the category according to the employee of Universal. In the ideal world, Universal delivers before 11.00am on the Wednesday before release (on Friday). However, the struggles with

<sup>&</sup>lt;sup>2</sup> According to the employee of Universal, about 2 out of 10 releases have a changed release date.

the warehouse and 'suspension of payment' provides sometimes delays but this is known by some employees of bol.com. If this regards to a big release, Universal contacts bol.com (and their other customers) and they are looking for a solution to still satisfy the customer.

Some products have priorities or are not well known (not sure about the demand). The buyer from bol.com has contact with an employee of Universal about these products to discuss the amount of demand/supply, to make it easier for both parties.

The last thing to mention, especially for Universal, is that the artist leads the product. This means that if the artist decides to change a release date, they are changing a release date regardless bol.com already put an offer online. This can lead to a loss if the artist changed their release date, because then the supplier cannot deliver to bol.com (and other customers) and bol.com cannot deliver on the 'communicated' release date to their customer.

#### Sony

The employee of Sony mentioned that when there is not enough stock, the orders are not fulfilled by the theory: 'first in first out'. If it involves important releases, the sales people (from Sony) know how to divide the stock to their different customers.

#### 5.3.5. Big and small releases

The only point that was mentioned by the Employee of Sony and Universal about the difference between big (amount of demand) and small releases is the 'communication'. If a release date of an important (big) release product is changed, it will be communicated via email to bol.com. All the other changes of release dates are communicated via the system.

#### 5.3.6. Contact between supplier and bol.com

Every supplier has contact with bol.com in a different manner. Some have more closely related contact. Others contact more often via systems. There will be explained separately for every supplier to show the difference in contact.

#### Universal

The employee of Universal mentioned that there is contact between him and 5 or 6 employees of bol.com and every Wednesday he is available at the bol.com office. The contact could be about orders, action, states etcetera.

The most communication from Universal to bol.com is via the system (EDI). However, as mentioned, when it is about an big release, the supplier tries to communicate it manually to their customers. It is not possible to do this for every product, since they have more than 22,000 articles. This could be about the change of release date, but also about products which will not be produced anymore or changes in the offer feed.

There is also contact if there is a release with concealment, which will becoming known in the evening. This product should already be added in the shop (and will be activated on the website on the moment of release). Therefore, it is also needed to have communication with each other (the retailer and supplier).

The employee of Universal indicates that every Tuesday he is checking the bol.com orders (of priority products). If in his opinion bol.com ordered not enough articles, he gives a sign to the buyer to check again whether it is enough. This works also the other way around. If bol.com noticed that there is a lot of demand on a specific product, then they ask the suppliers if it is possible to deliver the amount which was asked. If it is not possible, then bol.com should also order at another supplier to have it on time.

#### Sony

Once or two times a year there are meetings between the supplier and bol.com. Besides, the interviewee of Sony has (mail) contact with the buyer from bol.com almost every day.

#### **Bertus**

The supplier of Bertus mentioned that he has contact with bol.com almost every day: mainly with Alexandra or Raymond about delivery time, titles or items. Besides, the employee of Bertus is present every two weeks at the office of bol.com to discuss new releases.

The employee of Bertus has also contact with bol.com about ordering. Bertus mainly, may sometimes suggest bol.com about the amount of ordering of specific products or they recommend bol.com to order some products if there are no orders placed yet.

Changes in release dates are communicated with bol.com via the system, so not manually (only if there are questions from bol.com which are sent to the supplier).

#### 5.3.7. Warehouses

Since Universal has some struggles with their warehouse, it is important to give a short summary about these struggles to which also could declare a part of the low fulfillment. The other two suppliers did not mention that much about their warehouse. Only Sony mentioned that they have an European warehouse in France. So, all products which Sony delivered to the Netherlands (us) are coming from the warehouse in France.

#### Universal

In contrast with the other two suppliers, Universal mentioned to have struggles with their warehouse management. From the beginning, they were delivery products from one warehouse to all over the world. Previous March, their warehouse requested 'suspension of payment'. This means that Universal should search for another warehouse before they become bankrupt. From March onwards, the new commando was made to search a new warehouse and a new sales order process. In September they changed their old warehouse to four new warehouses and from there on, it is one huge drama. The problem is that the total warehouses do not have the capacity that they should have to fulfill all the orders and that the four different warehouses all have a different warehouse system.

Besides these problems, the employee of Universal mentioned that they are afraid to lose the warehouse, so they store all different products in the new and old warehouse. To be able to deliver the product to the customer, even if the warehouse become bankrupt.

At this moment, with the different warehouses, it is hard to deliver products on time. But Universal is working hard to realize a fast delivery again with the different warehouses. They manage their warehouses by dividing them in different groups. They have one warehouse (Hannover) specialized on releases. Another warehouse is used to deliver bestsellers, where they strive to delivery in 24-48h. The other warehouse is used to deliver the 'deep catalogue' items (strives to delivery in 24-72h).

#### 5.3.8. Delivery services

Sony and Bertus are using DHL as their delivery service. Unfortunately, Sony encounters delays with this delivery service frequently. Bertus did not mention this especially, however if this happens Bertus does not feel the responsibility of this delay, this is seen as the responsibility of the delivery service.

Universal also had DHL as delivery service with a fulfillment of 96-98%. However, when they changed their warehouse structure they were also obliged to change the delivery service. However, it has turned out that this new delivery service performs badly. In principle, Universal has started working with DHL again as of December 2016 (therefore, some problems related to the delivery service will be solved).

#### 5.3.9. Track and trace system

In the past Universal could see what was happening with an order every minute. Nowadays, with the new warehouses and systems they only see when bol.com placed an order and they see an invoice (hopefully the order arrives at Docdata). This explains why orders may get lost. In some cases the problem is only seen because the customer is asking about their order delivery.

The employee of Bertus mentioned that they have a sort of 'track-and-trace system'. However, this is managed by his colleague's from logistics.

The employee of Sony mentioned that they have a sort of track and trace system in days. Besides, they get reports about orders which departs, orders which should arrive at the bol.com warehouse and a feedback report. If Sony gets the sign that something went wrong with an order, then they immediately try to solve the problem to get the order as soon as possible to the right customer.

#### 5.3.10. Wholesaler

Bertus is a wholesaler, so they need distribution rights to use labels and deliver the products made by another supplier. In contrast to Bertus, the suppliers Universal and Sony are not wholesalers. Therefore, they have a monopoly for specific music articles. So, if they are delivering late it is not only to bol.com (it is to all the customers of Universal and Sony).

Universal is also delivering to wholesaler Bertus. So, if Universal (as first supplier) is not able to deliver it by themselves anymore, it could be possible that Bertus still has the products available. In this case they can deliver to bol.com. However, it can also be that if bol.com orders directly via Bertus it is more expensive and takes more time. Because it takes more time if Universal delivers first to Bertus and Bertus to bol.com instead of an immediately by to bol.com Universal. Therefore, in most cases, Universal is named as 'preferred supplier' in the system of bol.com.

#### 5.4. Applying logistic model on existing data

In this part there will first be some explanation of the information stream and product stream related to the previous interviews. Afterwards, the quantitative model will be applied on the existing data. This will show whether it is possible to get a better performance when the promised delivery date will change. First, the model related to the reliability will be explained, then the model with preannounced time window will be discussed. Finally the two models will be combined to draw a conclusion.

#### 5.4.1. Information stream vs. product stream

From the interviews, it seems that the relatively low fulfillment could be caused by different factors. This can be divided into two streams: the information stream and a product stream. The information stream are factors as: (mis)communication with the customers or communication between the supplier and the delivery service. This all has to do with the stream of information which can be improved for instance by having a better communication between the different parties and by making clear agreements with the different parties (as well as with the artist). Due to the time frame, it is not possible to do further research on this part during this investigation. Therefore, a further (qualitative) research is needed in order to improve the information stream.

In this research, the focus will be on the product stream. In the interviews, different explanations were given for late delivery. Due to the time frame it is not possible to focus on every explanation. Rather, this research will focus on the problem that the product was not delivered on time at the warehouse of bol.com, due to different reasons explained in the interview results section 5.2.3. and section 5.3.2. Since the products are not on time in the warehouse of bol.com, the products could not be sent to the customer on time. By using the model explained in section 4.3. promised delivery time window can be found which gives an optimal level of customer satisfaction and it also gives a higher fulfillment performance.

Most of the data that is used is available in the analyzing program KIP. This data showed when the product was fulfilled (or sent) from the bol.com warehouse to the customer. So a day after this fulfillment it will have arrived at the customer. It is assumed that the delivery service made no mistakes, so independently of the delivery service all products will arrive one day after the warehouse fulfillment. To use the data, the difference in days between warehouse fulfillment (+ one day) and the release date is calculated. These differences are plotted to the different time windows. This will be further explained below.

#### 5.4.2. Results of the model – Reliability

The model used data from November 2015 till November 2016 (filtered on: music category). With all these data the overall customer satisfaction over a specific time period related to the reliability of the delivery can be calculated using expression (3) regarding section 4.5.1.. This expression showed how much customers are satisfied when the promised delivery date is not the release date, but a specific time window. So, are customers more or less satisfied when the promised delivery date is not one specific date but more days? The results of these calculations are given in Figure 16.

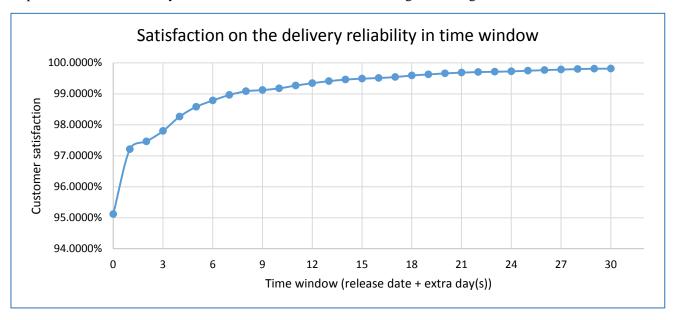


Figure 16. The average of customer satisfaction on reliability of delivery in relation to different time windows.

The figure shows an exponential increasing relation, which means that if the time window becomes broader the customer will be more satisfied and therefore more reliability in the promised delivery date. However, the broader the time window the smaller increase in customer satisfaction is shown.

#### 5.4.3. Results of the model – <u>Attractiveness</u>

The expression (4) regarding section 4.5.4. is used to measure the overall customer satisfaction related to the attractiveness of the time window. So if the time window becomes broader, are customers more or less satisfied? It is shown in Figure 17.

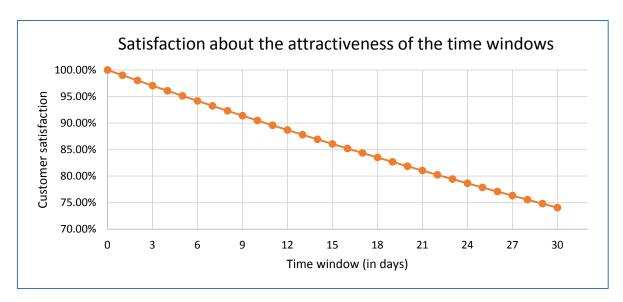


Figure 17. The customer satisfaction related to the attractiveness of the time windows.

This figure shows a decreasing exponential line. In the first instance, the graph looks linear, but if you compare the specific numbers, it is definitely exponential. Every day extra at the time window will provide exponential decreasing of the customer satisfaction. So every extra day the customer satisfaction is less decreasing. In conclusion, if the time window becomes broader, the customer seems to be exponentially less satisfied. This can be explained by the less certainty the customer have about the specific date of delivery.

#### 5.4.4. Results of a combination of the two models

To find the optimal time window, the two models should be combined by the following expression:

$$L^* = \arg \max_{L} [ U^{R}(L, N) + U^{A}(L) ]$$
 (5)

By adding up the reliability and the attractiveness, the total customer satisfaction is find. With this expression and the results from section 5.4.3. and 5.4.2., Figure 18 can be constructed.<sup>3</sup>

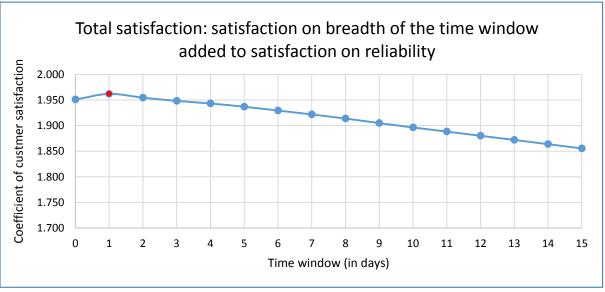


Figure 18. Total satisfaction based on satisfaction of 'attractiveness of the time window' and satisfaction based on 'reliability of delivery'.

<sup>&</sup>lt;sup>3</sup> The customer satisfaction U<sup>R</sup> and U<sup>A</sup> is not in percentages but in indices (multiplied by 100) to get a clear overview.

In Figure 18 it is shown that if the customer satisfaction of a 'reliable time window' and the customer satisfaction of 'the attractiveness of the time window' are added to each other, there will be an optimum at + 1 day. So, if the promised delivery date is not a fixed date anymore but it is 'release date + 1 extra day' the customer satisfaction will be optimal. Next to this, also the fulfillment performance of pre-orders will be higher since more products will delivered on time at the customer.<sup>4</sup>

-

<sup>&</sup>lt;sup>4</sup> These data is only based on the music category. It is not yet investigated if this theory can also be applied to the other categories, more research is needed.

# Chapter 6. Conclusion and Discussion

This part will give the answer on the main research question and therefore make a conclusion about the results found in chapter 5. Besides, the results will be discussed and some limitations will be given during the research.

### 6.1. Conclusion

From this research, for every subquestion and the main research question, conclusions can be made which are shown below.

Conclusion about the organization of bol.com (SQ1)

• The organization of bol.com can be explained by using the supply chain. Since bol.com do not include a retailer, it is shown that the supply chain of bol.com is not a traditional supply chain but a reduced supply chain. The supply chain of bol.com consists of manufacturers, suppliers, warehouses, transporters and consumers.

Conclusion about the influence of the suppliers and the bol.com employees (SQ2)

• A lot of explanations are given by different interviewees as to why released products are delivered late to the customer which is caused by different parts in the supply chain of bol.com. Not only the supplier and bol.com employees are responsible for the delayed deliveries. Some of these explanations of delayed delivery are information related. So, the communication between different parties in the supply chain are not correct. For this information part, there is more research needed to solve these problems. Other explanations were more product related, which is (partly) investigated with the quantitative model.

Conclusion about the improvement of delayed deliveries (SQ3)

• The amount of delayed deliveries can be improved by using the quantitative model which showed whether the delivery time which is promised is reliable. By using the quantitative model it is found that if the time window becomes broader the customer satisfaction will exponentially increase and decrease. This depends on the promised time window. It can increase because more orders will be delivered on time, leading to more satisfied customers. On the contrary, it can also decrease since a broader time window provides less certainty for the customer about the delivery. This could be a reason for customers to be less satisfied with the (broader) time window.

Conclusion about the performance improvement of delayed deliveries (RQ)

• Concluding, from the model it was researched that when one day is added to the existing time window, so the promised delivery day will not only be the day of release but the delivery time will be on 'release date or one day after release', more customers will be satisfied compared to a promised delivery date of 'the release date'. So, adding one more day at the promised delivery date provides more satisfaction of customers and it provides a higher fulfillment performance of bol.com because there will be more orders delivered on time. Finally, the consequence of more customer satisfaction will lead to customers re-purchasing products at the same company which leads to an increase of sales.

#### 6.2. Discussion

Internet became more popular in the recent decennia. Therefore, the most literature are found recently so it cannot be seen as obsolete data. However, there are some articles used during this research which are not from this decennia but before. For instance the article of Peritz (1993), does not focus on e-

commerce but on a supermarket (physical shop). Although this is not the same, some theory is used from this article because it was assumed to be applicable on e-commerce. Caution must be taken since waiting time in a supermarket could be seen differently from waiting time of a product ordered via internet at home. This as opposed to the article of Wang et al. (2016), which is just focused on home delivery. However, it focuses especially on the delivery of perishable products. Although bol.com does not sell that many perishable products, it is assumed that the theory of the article of Wang et al. (2016) is applicable on this research. So, both articles are used despite the different focus. To have a more reliable comparison more literature should be found on the specific waiting time of home delivery of imperishable goods.

During this research, the NPS was not used to measure the customer satisfaction of pre-orders because this information was not available. If this information was available, it could give an overview of the satisfaction of customers measured by the experiences of the customers themselves. Therefore, it could give a more trustworthy view of the satisfaction depending on the delivery time.

Both assumptions that were made in section 4.5.3 and 4.5.4. about the reliability and the attractiveness of the time window were in line with the literature according to the articles of Huang et al. (2009) and Mackintosh (2015). Also, it was confirmed by the quantitative model used during this research. As shown in the model and explained before, the customer satisfaction will increase and decrease while the time window becomes broader. Therefore, the optimum should be found to know which time window suits best with the product category. This could be different for other categories, thence further research is needed for the other categories.

Furthermore, one of the key drivers of bol.com is to deliver 'on the same day' or 'within 24 hours' (section 3.3.3. Logistics service provider). Therefore, applying the conclusion of making the promised delivery time two days instead of one day would be hard for bol.com. Although if the company wants to follow the conclusion and they want to change their promise deliver date to a promise delivery window, they can think of applying the time window only to the small releases. For the reason that it is obvious that people do not want to wait longer than the release date (especially) in the case of a big release which they could also easily order at another (web)shop. However, people who order products which are less common (and almost only available via the bol.com web shop) or products that do not affect customer satisfaction if delivered later than expected, might be prepared to wait longer. These group of products (small releases) could easier get a 'promise delivery window' instead of exactly one date. Moreover, there is no clear distinction yet between 'big'-releases and 'small'-releases. This was mentioned in the interviews by the employees of bol.com as well as the employees of the suppliers, because they all appoint a different number of products which should be included to be a part of the small releases group. Therefore it can be concluded that the definition of the group is not clear. Bol.com should define the 'small releases' and 'big releases' to get a clear distinction. Because of this, their own employees and the employees of the suppliers can handle these releases in the same way. Depending on this indicator (big or small), bol.com can give a promised delivery time window for 'small releases' and a specific release date for 'big releases'.

As mentioned before, customers can go to another (web)shop if bol.com shows a broader promised delivery time window than another (web)shop. However, perhaps the other (web)shops do also have problems with the fulfillment performance of pre-orders, since in some cases the problem of delivery late is already early in the supply chain. So the delay could also happen at other companies' supply chains. This is also mentioned in the interviews because sometimes the supplier cannot deliver the product at bol.com on time. But in most cases, this means that they cannot deliver the product on time to all the shops, so also not to the competitors of bol.com. Therefore, it could be possible to apply this research to other (web)shops as well. They could also make their time window broader which could result in a higher fulfillment performance of the pre-orders and a better customer satisfaction. As

mentioned in the literature this could lead to more re-purchasing of the customer, so a higher sales of the company.

Another point to discuss is that during this research, only the 'objective waiting time' is taken into account. However, the customer expectation, determination or attribution also has influence on the customer satisfaction. For example the objective waiting time of a food product would be the same as for another product, but the perceived waiting time depends for instance on the level of hunger. Therefore it is important to not only observe the objective waiting time, but do also take into account the perceived waiting time of the customer (Gail & Scott, 1997). For this research it was not possible to observe both, due to missing data and the time frame. So this research is only focused on the objective waiting time according to the data of bol.com. Next to missing the perceived waiting time, also the impact of the delivery service is not taken into account. The delivery service may have an impact on the customer satisfaction. This is not directly included in the data, but Stokes & Jensen (2014) mentioned: "The more aware or familiar consumers are with the disclosed carrier, the more positive their perceptions of the delivery process." Therefore, this can have an influence on their satisfaction of the order delivery.

Moreover, the conclusion of this research is based on a quantitative model which includes two fixed 'a'-coefficients,  $a_1$  and  $a_2$ . However, this 'a' is assumed but it could also be another number. Depending on this number, the optimal time window can change. If  $a_1$  becomes bigger, the optimal time window will be more extra days and vice versa. If  $a_2$  becomes bigger, the optimal time window becomes smaller and vice versa. Since both 'a'-coefficients change the other way around, they will neutralize each other.

Another point of discussion are the assumptions that are made. Some information was not available or was outside the research area, therefore there were assumptions made based on the available information. Also, the information stream was not taken into account because a quantitative model was used. So, there were some assumptions made for this information stream. However, these assumptions could also have an influence on the customer satisfaction. For instance, the assumption was made that there was communicated to the customers when the product delivery was delayed. So, this provides another customer satisfaction then when the customers are not informed.

The last point to mention, there were also some causes of delay mentioned in the interviews on which bol.com and the suppliers have no influence. For instance, the artist decide on the last moment to change the release date. No one has influence on this, so it is hard to adapt to it. Unfortunately, this could cause a decreasing delivery performance of bol.com while they are independent of this cause. In this case, only the customer communication can diminish the 'pain' and try to still get satisfied customers by informing them on time (as fast as possible). On this moment, the communication with the customer is not optimal as mentioned in the interviews. It is not clear what, when and who is communicated with the customer. So, further research is needed to improve the customer communication.

#### 6.2.1. Limitations

The interviews during this research were done with three employees of one company: bol.com and with three employees of different (big) suppliers. Since every supplier interview was done with one employee (instead of more employees of the same supplier), less different perspectives were given then if the interviews were done with more employees of the same supplier. Also, the interviews were only done with the three big suppliers. So the small suppliers were not included in the interviews. This could also lead to biased results. To get a more reliable overview of the different suppliers, it would be nice to have interviews with small and big suppliers. Besides, it will be good to compare information of different employees at the same supplier. So for further research it would be nice to interview more employees of the same supplier.

Another limitation during this research was the assumptions that were made. Since not all the data was available, a lot of assumptions were made. These assumptions were made with underlying thoughts, however these assumptions could still lead to biased results. For instance, the analyzes of the music category in Chapter 5 was focused on the months March till September. Since the suppliers were found manually, it was not doable to do it for more months. However, the most important months November and December are not included in this time frame. Therefore, these analyzes could be biased.

Since the data analyzing program KIP did not show all the data directly it was also a limitation during the research. A lot of pre-research was needed for this program to find out how all the results could be showed together. Next to this, as mentioned before the suppliers were not fully included in this program. This made it hard to find out which supplier delivered which product. So, this was found out manually, however this took a lot of time. For further research, it would be nice if the suppliers are included in this data analyzing program. Besides saving time, it also could (easily) lead to new results.

## Chapter 7. Recommendations

After doing this research some recommendations can be done. Firstly, it would be wise to improve the data in the analyzing data tool KIP. Since some data is not correctly filled in, other data is not available at all. So, to make it easier to analyze the data, make it more reliable and get a better overview of all the data the analyzing program KIP should be improved. The most important categories which should be improved/included are:

- Include the suppliers in the program to be able to know which supplier delivered the product of which order. So, if orders are delivered late and the product was not at the warehouse on time, it is possible to see which supplier did not deliver on time the product to the warehouse.
- Improve the promised delivery date. At the moment some promised delivery dates are unknown so it is hard to know when the customer did expect the delivery. Improve the program so for every order the promised delivery date is known. Next to this, the promised delivery date should be fixed and should not change with the release date.
- Improve the release date, so it will be fixed in KIP and will not change all the time. The release date is changing with the 'best offer feed'. So the release date should be linked to the placed order. If the release date is changing in the best offer feed, it will not change anymore in KIP since it is coupled to the order and the order is already placed.

Next to that, more qualitative research should be done. This research was mainly focused on quantitative research. However, a lot of explanations of delayed deliveries were focused on the informative stream. So, it is recommended to do more (qualitative) research on this informative stream to improve the customer satisfaction and the fulfillment performance of bol.com.

Moreover, there are a lot of uncertainties about the distinction between 'big' and 'small' releases and therefore every employee of bol.com (and suppliers) are focused on different parts. More research is needed to find out a definition for 'big' and 'small' releases, to provide more clarity for the employees. Furthermore, releases are a group which are forgotten a lot because releases do not occur in every product category. Make releases more important within the company so every employee remembers to include this group. Therefore, there could be no more mistakes made about this group.

Finally, the NPS could be a reliable measure to measure the customer satisfaction. Unfortunately, as mentioned before, the NPS is not measured for pre-orders. It would be nice to measure the NPS for pre-orders to get a better overview of the customer satisfaction compared to the pre-orders. Besides, it can be used to analyze different points related to the pre-orders like: delivery time, quality, availability etcetera.

#### 7.1. Recommendations for further research

With more focus on this specific research, it is recommended to investigate on the 'a-coefficients'. During this research, the 'a-coefficients' are assumed because it was beyond the scope of this research to find a reliable 'a-coefficient'. Besides, in this research it was assumed that there is an exponential relationship between the time window and the customer satisfaction. However, it could be a reasonable question for further research if the relation between the time window and customer satisfaction is exponential.

Another recommendation is to apply this research to the other product categories, since this research is only focused on music. It would be nice to know whether this research is also applicable to the other product categories, so investigate whether the delivery date can also be changed to a time window.

# Chapter 8. Literature

Addison, T., (2003). E-commerce project development risks: evidence from a Delphi Survey. *International Journal of Information Management*, 23(1), p. 25-40; DOI: 10.1016/S0268-4012(02)00066-X

Alles over marktonderzoek, (2015). Net Promotor Score. URL: <a href="http://www.allesovermarktonderzoek.nl/onderzoeksmethoden/net-promoter-score">http://www.allesovermarktonderzoek.nl/onderzoeksmethoden/net-promoter-score</a> (retrieved on October 20, 2016).

Boeije, H.R., (2005). Onderzoeksmethoden. Amsterdam: Boom onderwijs.

Bol.com ervaringen, (2016). Ervaringen. URL: http://www.ervaringen.nl/bol.com (retrieved on September 8, 2016).

Bol.com: 'Logistieke uitdaging vooral in leveranciersrelaties' published on: 11 June 2013. URL: <a href="http://www.twinklemagazine.nl/nieuws/2013/06/bol.com-logistieke-uitdaging-vooral-in-leveranciersrelaties/index.xml">http://www.twinklemagazine.nl/nieuws/2013/06/bol.com-logistieke-uitdaging-vooral-in-leveranciersrelaties/index.xml</a> (retrieved on September 5, 2016)

Bol.com, (2016). Organization [direction]. URL: <a href="http://intranet.local.nl.bol.com/bol/">http://intranet.local.nl.bol.com/bol/</a> (retrieved on August 26, 2016).

Bol.com, (2016). Over bol.com. URL: <a href="https://pers.bol.com/over-bolco/">https://pers.bol.com/over-bolco/</a> (retrieved on August 26, 2016).

Bol.com, (2016). Welkom bij bol.com. URL: <a href="https://banen.bol.com/over-ons/">https://banen.bol.com/over-ons/</a> (retrieved on August 26, 2016).

Bosma, A., (2015). Bol.com bouwt eigen fulfillment center in Waalwijk voor verdere groei en innovatie. URL: <a href="https://banen.bol.com/nieuws/bol-com-bouwt-eigen-fulfilment-center-in-waalwijk-voor-verdere-groei-en-innovatie/">https://banen.bol.com/nieuws/bol-com-bouwt-eigen-fulfilment-center-in-waalwijk-voor-verdere-groei-en-innovatie/</a> (retrieved on September 14, 2016).

Business Planning Experts (2015). Market Research. URL: <a href="http://www.bplanexperts.com/market-research">http://www.bplanexperts.com/market-research</a> (retrieved on January 27, 2017).

Burke R.R., (1997). Do you see what I see? The future of virtual shopping. *Journal of Academy of Marketing Science*, 25(4), p. 352-361.

Centraal Bureau Statistiek, (2016). Meer Nederlanders shoppen online. URL: <a href="https://www.cbs.nl/nl-nl/nieuws/2016/24/meer-nederlanders-shoppen-online">https://www.cbs.nl/nl-nl/nieuws/2016/24/meer-nederlanders-shoppen-online</a> (retrieved on August 25, 2016).

Centraal Bureau Statistiek (CBS), (2015). Ruim 10 miljoen online shoppers. URL: <a href="https://www.cbs.nl/nl-nl/nieuws/2015/30/ruim-10-miljoen-online-shoppers">https://www.cbs.nl/nl-nl/nieuws/2015/30/ruim-10-miljoen-online-shoppers</a> (retrieved on August 25, 2016).

Checkmarket, (2017). Net Promotor Score – NPS – Hoe meten? URL: <a href="https://nl.checkmarket.com/blog/net-promoter-score-nps/">https://nl.checkmarket.com/blog/net-promoter-score-nps/</a> (retrieved on January 27, 2017).

Chen W.Y., (2008). Multiple-watermarking scheme of the European Article Number Barcode using similar code division multiple access technique. *Applied Mathematics and Computation*, 197(1), p. 243-261.

Chopra S., Meindle P., 2001. Supply Chain Management: Strategy, planning and operations. *Upper Saddle River*, NJ: Prentice-Hall, Inc. Chapter 1.

Christopher M., (2005). Logistics and supply chain management. URL book:

https://books.google.nl/books?hl=nl&lr=&id=NIfQCwAAQBAJ&oi=fnd&pg=PT7&dq=what+is+a+supply+chain&ots=x193FrKqoz&sig=yJhbvYHNVcIbPSG77cAdGmyRI0s#v=onepage&q=what%20is%20a%20supply%20chain&f=false (p.18 -19).

Consumer, (2016). In Business Dictionary. URL:

http://www.businessdictionary.com/definition/consumer.html (retrieved on September 27, 2016).

Customer service: order & deliver, (2016). URL:

<u>https://www.bol.com/nl/m/klantenservice/bestellen/subject/62649040/index.html</u> (retrieved on October 20, 2016).

Disney S.M., Naim M.M., Potter A., (2004). Assessing the impact of e-business on supply chain dynamics. *International Journal of Production Economics*, 89, p. 109-118; DOI: 10.1016/S0925-5273(02)00464-4

Docdata, (2015). Nieuw fulfillment center voor bol.com in Waalwijk. URL: <a href="http://www.docdata.nl/nieuws/nieuws/single/article/nieuw-fulfilment-center-voor-bolcom-in-waalwijk/404.html">http://www.docdata.nl/nieuws/nieuws/single/article/nieuw-fulfilment-center-voor-bolcom-in-waalwijk/404.html</a> (retrieved on September 14, 2016).

Esper, Tl.L, Jensen, T.D., Turnipseed, F.L., Burtson, S., 2003. The last mile: an examination of effects of online retail delivery strategies on consumers. *Journal of Business logistics* 24, 177-203.

Expoints bol.com (2016). Handleiding 3.4 Expoints bol.com. Retrieved on: 08-11-2016.

Fiege, (2016). The Fiege Group – From 1873 until today. URL: <a href="http://www.fiege.com/nl/fiege-group/history/">http://www.fiege.com/nl/fiege-group/history/</a> (retrieved on October 20, 2016).

Gail T. & Scott L. (1995). Waiting time delays and customer satisfaction in supermarkets. *Journal of services marketing*, 9(5), p. 20-29.

Gail T. & Scott L. (1997). A field study investigating the effect of waiting time on customer satisfaction. *The Journal of Psychology*, 131(6), p. 655-660. DOI: 10.1080/00223989709603847

GS1 US, (2008). Global Identification Numbers of the GS1 System. *Barcodes and eCom*. URL: <a href="http://www.gs1us.org/Portals/0/Documents/gi\_numbers\_of\_gs1\_41753.pdf">http://www.gs1us.org/Portals/0/Documents/gi\_numbers\_of\_gs1\_41753.pdf</a> (retrieved on September 27, 2016).

Hill A.V., Hays J.M., Naveh E. (2000). A model for optimality delivery time guarantees. *Journal of Service Research*, 2(3), p. 254-264; DOI: 10.1177/109467050023003.

Hoffman D.L. & Novak T.P., (1996). Marketing in hypermedia computer-mediated environments: conceptual foundations. *Journal of Marketing*, 60(3), p. 50-68; DOI: 10.2307/1251841.

Huang Y., Kuo Y. and Xu S. (2009). Applying importance-performance analysis to evaluate logistics service quality for online shopping among retailing delivery. *International Journal of Electronic Business Management*, 7(2), pp. 128-136.

Huseynov F. & Yildirim S.O., (2016). Internet users' attitudes towards business-to-consumer online shopping: a survey. *Information Development*, 32(3), p. 452-465; DOI: 10.1177/0266666914554812.

Johnson M.E. & Whang S., (2002). E-business and supply chain management: an overview and framework. *Production and operation management*, 11(4), p. 413-423; DOI: 10.1111/j.1937-5956.2002.tb00469.x

Johnson G., Whittington R. & Scholes K., (2012). Fundamentals of strategy, Second edition. *Pearson Education Limited. Harlow*.

Lambert D.M., Cooper M.C. and Pagh J.D., (1998). Supply chain management: Implementation issues and research opportunities. *International Journal of Logistics Management*, 9(2), p. 1-19; DOI: 10.1108/09574099810805807.

Lems W., (2010). Bol.com turn firmer in on Belgian market. URL:

https://www.bol.com/nl/m/persberichten/pers-bol-com-zet-steviger-in-op-belgische-markt/index.html (retrieved on 26 August 2016).

Mackintosh, D. (2015). Net promotor scores: monitoring practice performance. *Veterinary Sciences*, 37(7), p. 370-372.

Mentzer J.T., DeWitt W., Keebler J.S., Min S., Nix N.W., Smith C.D., Zacharia Z.G. (2001). Defining Supply Chain Management. *Journal of Business Logistics*, 22(2), p. 1-25; DOI: 10.1002/j.2158-1592.2001.tb00001.x.

Ngniatedema T., Fono L.A., Mbondo G.D., (2015). A delayed product customization cost model supplier delivery performance. *European Journal of Operational Research*, 243(1), p. 109-119; DOI: 10.1016/j.ejor.2014.11.017.

Oestreicher-Singer G. & Sundararajan A. (2010). Recommendation networks and the long tail of electronic commerce. URL: https://ssrn.com/abstract=1324064 or <a href="http://dx.doi.org/10.2139/ssrn.1324064">http://dx.doi.org/10.2139/ssrn.1324064</a>

Overbeek C., (2016). Winkelproces [Workshop presentation slides]. URL: <a href="https://confluence.tools.bol.com/display/INTRO/Naslag+trainingen+en+workshops+introductieprogramma?preview=/14190255/61804651/Presentation%20winkelproces%20september%202016.pdf">https://confluence.tools.bol.com/display/INTRO/Naslag+trainingen+en+workshops+introductieprogramma?preview=/14190255/61804651/Presentation%20winkelproces%20september%202016.pdf</a> (retrieved on September 1, 2016).

Peritz J., (1993). Retailers who keep score know what their shoppers value. *Marketing news*, 27, p. 9.

Poel D. van den & Leunis J., (1999). Consumer acceptance of the internet as a channel of distribution. *Journal of Business Research*, 45(3), p. 249-256; DOI: 10.1016/S0148-2963(97)00236-1.

Prasad A., Stecke K.E., Zhao X., (2011). Advance selling by a newsvendor retailer. *Production and operations management*, 20(1), p. 129-142; DOI: 10.1111/J.1937-5956.2010.01133.x

Purcell K., (2011). Search and email still top the list of most popular online activities. URL: <a href="http://www.pewinternet.org/2011/08/09/search-and-email-still-top-the-list-of-most-popular-online-activities/">http://www.pewinternet.org/2011/08/09/search-and-email-still-top-the-list-of-most-popular-online-activities/</a> (retrieved at August 26, 2016).

Ram G. and Harrison T.P., (1995). An Introduction to Supply Chain Management. *Department of Management Sciences and Information Systems*, 303 Beam Business Building, Penn State University, University Park, PA.

Saunders M., Lewis P. & Thornhill A., (2004). Methoden en technieken van onderzoek. Amsterdam: Pearson Education.

Shugan S.M. & Xie J., (2000). Advance pricing of services and other implications of separating purchase and consumption. *Journal of Service Research*, 2(3), p. 227-239; DOI: 10.1177/109467050023001.

Stokes A. & Jensen T. (2014). Co-branding: the effects of e-tailer and delivery carrier familiarity on price and e-tailer perceptions. *Journal of Marketing theory and Practice*, 19(1); p. 97-108.

Straub J., (1992). Basics of qualitative research – grounded theory procedures and techniques. *Kolner zeitschrift fur Soziologie Und Sozialpsychologie*, 44(3), p. 602-603.

Swingyard W.R. & Smith S.M., (2003). Why people (don't) shop online: a lifestyle study of the internet consumer. *Psychology & Marketing*, 20(7), p. 567-597; 10.1002/mar.10087.

UCLA internet report, (2001). Surveying the digital future, online. URL: <a href="http://live.online.se/wip/publishedarchive/ucla-internet-2001.pdf">http://live.online.se/wip/publishedarchive/ucla-internet-2001.pdf</a> (retrieved on August 29, 2016).

Wang X., Sun X., Dong J., Wang M. and Ruan J. (2016). Optimizing terminal delivery of perishable products considering customer satisfaction. *Hindawi Publishing Coorporation*.

Winter de, P., (2013). Hoe Docdata voor tijdwinst bij bol.com zorgt. Management Team Business. URL: <a href="http://www.mt.nl/332/78309/business/hoe-docdata-voor-tijdwinst-bij-bol-com-zorgt.html">http://www.mt.nl/332/78309/business/hoe-docdata-voor-tijdwinst-bij-bol-com-zorgt.html</a> (retrieved on September 12, 2016).

Yankelovich (2000). "Monitor eTrends: Customer Service". August 1, 2000. www.yankelovich.com

Yu M., Ahn H. & Kapuscinski R., (2012). Rationing capacity in Advance Selling to Signal Quality. *Management Science*, 61(3), p. 560-577. DOI: http://dx.doi.org/10.1287/mnsc.2013.1888

Zhao X. & Stecke K.E., (2010). Pre-orders for new to-be-released products considering consumer loss aversion. *Production and operations management*, 19(2), p. 198-215; DOI: 10.3401/poms.1080.01092

# Chapter 9. Appendices

## Appendix 1. Example of orders before release date

Examples of orders which are placed before the releasing dates – in the text the example is made about 'The Jungle Book'.

Product release after order date - delivering not on time (release date, order date, EAN, globaliD, productname, fulfilment late)

ProductReleaseDate Date.Date	ShopOrderLin	EanOrdered	GloballdOrdered	ProductName	Fulfilment QtyLate (Sum)
Aug 24, 2016	Jul 27, 2016	5053083068592	9200000058362553	The Huntsman: Winter's War (Exclusieve bol.com Editie)	
Aug 24, 2016	Jul 28, 2016	5053083068592	9200000058362553	The Huntsman: Winter's War (Exclusieve bol.com Editie)	
Aug 24, 2016	Jul 28, 2016	8717418486624	9200000057997473	The Jungle Book (2016) (Blu-ray)	
Aug 24, 2016	Jul 29, 2016	5053083068592	9200000058362553	The Huntsman: Winter's War (Exclusieve bol.com Editie)	
Aug 24, 2016	Jul 30, 2016	5053083068592	9200000058362553	The Huntsman: Winter's War (Exclusieve bol.com Editie)	
Aug 24, 2016	Jul 31, 2016	5053083068592	9200000058362553	The Huntsman: Winter's War (Exclusieve bol.com Editie)	
Aug 24, 2016	Aug 01, 2016	5053083068592	9200000058362553	The Huntsman: Winter's War (Exclusieve bol.com Editie)	
Aug 24, 2016	Aug 02, 2016	5053083068592	9200000058362553	The Huntsman: Winter's War (Exclusieve bol.com Editie)	
Aug 24, 2016	Aug 02, 2016	8717418486631	9200000059021410	The jungle Book (2016) (3D Blu-ray)	
Aug 24, 2016	Aug 03, 2016	5053083068592	9200000058362553	The Huntsman: Winter's War (Exclusieve bol.com Editie)	
Aug 24, 2016	Aug 03, 2016	8717418486631	9200000059021410	The Jungle Book (2016) (3D Blu-ray)	
Aug 24, 2016	Aug 04, 2016	5053083068592	9200000058362553	The Huntsman: Winter's War (Exclusieve bol.com Editie)	
Aug 24, 2016	Aug 05, 2016	5053083068592	9200000058362553	The Huntsman: Winter's War (Exclusieve bol.com Editie)	
Aug 24, 2016	Aug 06, 2016	5053083068592	9200000058362553	The Huntsman: Winter's War (Exclusieve bol.com Editie)	
Aug 24, 2016	Aug 08, 2016	5053083068592	9200000058362553	The Huntsman: Winter's War (Exclusieve bol.com Editie)	
Aug 24, 2016	Aug 09, 2016	5053083068592	9200000058362553	The Huntsman: Winter's War (Exclusieve bol.com Editie)	
Aug 24, 2016	Aug 10, 2016	5053083068592	9200000058362553	The Huntsman: Winter's War (Exclusieve bol.com Editie)	
Aug 24, 2016	Aug 11, 2016	5053083068592	9200000058362553	The Huntsman: Winter's War (Exclusieve bol.com Editie)	
Aug 24, 2016	Aug 12, 2016	5053083068592	9200000058362553	The Huntsman: Winter's War (Exclusieve bol.com Editie)	
	1 12 2017	**********		+ 11 11 11 11 11 11 11 11 11	

Figure 1. Orders placed before release date.

## Appendix 2. Fulfillment report

Every morning, the logistics specialists discuss the fulfillment report of the day before. This is an example of a fulfillment report (retrieved on September 26, 2016).

Red background means 'did not reach the target'. Green background means 'it did reach the target'.

#### Bol.com daily logistics 24 September 2016 - Totaal fulfilment 98.92% docdata OUTBOUND Aantal Opmerkingen Shipments verwerkt 43928 Items verwerkt 69965 Afvoer Postnl Afvoer UPS/Dynalogic OPEN LATES Aantal 245 % Sales Opmerkingen 24-uurs 81.82% 142 99.82% Zonder Voorraad Voorraad 103 100.00% Crossdock 482 17.68% 82.66% 98.77% Bertus, Gardners & Ingram 32 0.50% 759 Totaal 100% INBOUND Colli Pallets Opmerkingen Ontvangen 769 888 106983 870 Verwerkt Niet verwerkt 108 LOGISTIEK VIA BOL.COM (LvB) Aantal items besteld Fulfilment Opmerkingen 5043 99.68% LvB Overige zaken OUTBOUND Aantal Opmerkingen Items verwerkt 16997 Afvoer Postnl FULFILMENT (o.b.v. knelpunten) Aantal Fulfilment Opmerkingen Totaal 99.45% 94 Manco magazijn 0.00% Tijdelijk niet leverbaar 0.00% Print on Demand 0.00% Overig FULFILMENT (o.b.v. levertijden) 94 0.55% Levertijden Fulfilment Opmerkingen 99.68% 24-uurs 1-2 en 2-3 werkdagen 5-10 werkdagen (levertijd na stock countdown en Central Bookhouse) 87.64% Overige zaken

Figure 2. Daily fulfillment report

## Appendix 3. Overview of non pre-orders and pre-orders between January – September 2016

Overview of all the orders at bol.com (non-pre-orders and pre-orders) till the end of September 2016. Also the total number of pre-orders w.r.t. the total number of orders is calculated, namely 1.172% (see the yellow box).

\* Red boxes: no results are measured.

	KPI Fulfilment	(%)	Quantity			KPI Fulfilment	(%)	Quantity	
Product category	Non pre-order	Pre-order	Non pre-order	Pre-order	Product category	Non pre-order	Pre-order	Non pre-order	Pre-order
Baby Apparel	0,992885316	1	175870	1	Home Improvement	0,985204281		341486	
Baby Care	0,994635598		399903		Houseware	0,987495937		187095	
Baby Hardware	0,990439165		333309		International Books Fiction	0,975986127	0,795383836	488952	14936
Baby Home	0,990138679		81806		International Books Non-fiction AO	0,962311913	0,522459141	582232	10234
Bags	0,989058697		46314		International Books Non-fiction SW	0,952829215	0,451030928	269850	1688
Beauty	0,993664535	,	351490		Intimacy	0,991389153		107187	
Biking	0,986683921		97257	,	Jewellery	0,992594903		75027	
Brick voor te verwijderen productclassificaties	0,98766384		1318		Large Furniture	0,981436518		33318	
Brick voor tijdelijke productclassificaties	0,982883124		11443		Leisure	0,988449082	1	269909	1
Camera	0,984708249	0,927152318	40467	195	Lighting	0,987376794		105731	
Computer	0,987218191	0	57748	1	Major Domestic Appliances	0,987918006		50348	
Computer Accessories	0,990934363	0,45	699656	35	Mobile & Tablet Accessories	0,992957148	0,138888889	394053	46
Computer Software	0,993125194		19572		Mobile Phones	0,990816799	0,637065637	167549	288
Consumer Electronics Accessories	0,992407425		292805		Movies	0,992881273	0,944123877	1233471	58686
Cooking	0,991636141		245076		Music	0,985026891	0,833408339	587338	40258
Dining	0,988566243		285671		Navigation	0,992765083		25620	
Dutch Books Fiction	0,986465181	0,407952872	1347903	749	Outdoor Toys	0,988448568	0	225239	2
Dutch Books Non-fiction AO	0,985449115		1603051	527	Personal Audio	0,990965238	1	233891	7
Dutch Books Non-fiction SW	0,983995273	-	854202	219	Personal Care	0,992555052	1	939017	1
Ereader Accessories	0,986429433	-	26868		Pet Food	0,984806418		72756	
Ereaders	0,991839324		46247	129	Pet Non-food	0,986201789		150010	
Games Accessories	0,988571692		154808		Pet Sport Equipment	0.989112228		1223	
Games Consoles	0,990409151	-	23291	1198	Small Domestic Appliances	0,991345702	1	762789	9
Games Software	0,990936257		288697	74200	Sport	0,989491035	0	257166	1
Gardening	0,985350581	0,0,000	167869		Sunglasses	0,994360024		28184	
Gift Cards	0,997166843		116212	_	Tablets	0,990305486	0	32641	2
Health	0.98893575		279467		Television	0.985651828	, and the second	25570	
Hobby & Crafts	0,990961699		364689		Toys Core	0,989105234	0.87804878	956156	103
Home accessories Textile & Window Decorations	0,987658351	0,071120071	302112		Watches	0,991959568	0,07001070	35312	100
Home Entertainment	0,989884427	1	130381	2	Wateries	0,552505000		55512	
nome entertainment	0,505004427		150501						
					Total number of non pre-orders	17484622			
					Total number of non pre-orders	17404022			
					Total number of orders	204891			
					Total number of orders	204031			
					% pre-order w.r.t. total orders	1,172%			
					70 pre-order water total orders	1,172/0			
					Average KPI non pre-orders	98,8%			
					Average KPI non pre-orders	98,8%			
					Average KPI pre-orders	61,2%			

Figure 3. Overview of non pre-orders and pre-orders (half year).

# Appendix 4. The number of non pre-orders and pre-orders per week in September 2016

- \* Red boxes: no results are measured.
- \* Blue boxes: numbers that are used in the text (problem statement).

		Quantity		KPI Fulfilment (	%)
Weekn	um Fulfilment shipment deadline date	Non pre-orders	Pre-orders	Non pre-orders	Pre-orders
35	29-8-2016	178571	858	0,9913	0,6870
	30-8-2016	108033	740	0,9875	0,8671
	31-8-2016	104138	771	0,9864	0,7521
	1-9-2016	112185	1080	0,9852	0,8602
	2-9-2016	97520	37	0,9822	0,0556
	4-9-2016	60143	35	0,9928	0,2069
36	5-9-2016	186699	989	0,9883	0,764
	6-9-2016	108484	864	0,9850	0,9284
	7-9-2016	105126	942	0,9728	0,6655
	8-9-2016	105147	1866	0,9690	0,9027
	9-9-2016	88588	286	0,9808	0,2208
	10-9-2016	34		0,9091	
	11-9-2016	55760	119	0,8948	0,2897
37	12-9-2016	166185	586	0,9780	0,5796
	13-9-2016	99167	722	0,9674	0,9305
	14-9-2016	98228	571	0,9644	0,8788
	15-9-2016	100238	2880	0,9783	0,8761
	16-9-2016	88102	22	0,9856	0,045
	17-9-2016	1881		0,9984	
	18-9-2016	52484	74	0,9897	0,0725
38	19-9-2016	161001	1443	0,9851	0,8958
	20-9-2016	100115	2363	0,9750	0,9669
	21-9-2016	97663	1083	0,9747	0,8847
	22-9-2016	99570	7761	0,9762	0,4695
	23-9-2016	86920	299	0,9869	0,1950
	24-9-2016	1951		0,9984	
	25-9-2016	100629	456	0,9609	0,0293
39	26-9-2016	132417	1851	0,9753	0,6429
	27-9-2016	115330	3170	0,9720	0,8168
	28-9-2016	124121	35547	0,9719	0,9909
	29-9-2016	127708	3967	0,9710	0,9058
	30-9-2016	103320	240	0,9881	0,584
	1-10-2016	2026	1022	0,9960	0.035
	2-10-2016	144494	1032	0,9689	0,0353
	Week 38				
	Total non pre-orders	647849			
	Total pre-orders	13405			
	Total orders	661254			
	- Star Orders	001254			
	Average KPI non pre-orders	0,980			
	Average KPI pre-orders	0,574			

Figure 4. Overview of non pre-orders and pre-orders (weekly).

# <u>Appendix 5. The number of non pre-orders and pre-orders divided in different fulfillment categories</u>

	IndPreOrder / (Measures)							
	N		Υ					
FulfilmentCategory	KPI Fulfilment (%)	Qty	KPI Fulfilment (%)	Qty				
Cancelled	***	237,648	***	15,567				
CancelledLate	0.0000	29,188	0.0000	2,104				
FulfilledInTime	1.0000	17,029,753	1.0000	161,846				
FulfilledLate	0.0000	186,109	0.0000	24,860				
OpenLate	0.0000	1,924	0.0000	514				

Figure 5. Number of non pre-orders and pre-orders per fulfillment categories.

Appendix 6. The number of non pre-orders and pre-orders in week 38 - 2016 with filter on Overview of the number of non pre-orders and pre-orders in week 38 with the filter on fulfilled on time and fulfilled late. Also some calculations are made at the bottom of the table.

\* Blue boxes: numbers that are used in the text (problem statement).

Week 38	- 101				
Date		KPI non preorder	KPI pre-order	Quantity non pre-order	
19-9-2016	FulfilledInTime	1	1	156750	
	FulfilledLate	0	0	2058	12
20-9-2016	FulfilledInTime	1	1	96363	207
	FulfilledLate	0	0	2205	5
21-9-2016	FulfilledInTime	1	1	94125	83
	FulfilledLate	0	0	2154	26
22-9-2016	FulfilledInTime	1	1	95798	320
	FulfilledLate	0	0	2001	377
23-9-2016	FulfilledInTime	1	1	84579	5
	FulfilledLate	0	0	831	22
24-9-2016	FulfilledInTime	1	-	1909	
	FulfilledLate	0	-	1	
25-9-2016	FulfilledInTime	1	1	95847	1
	FulfilledLate	0	0	3849	42
	Total number non pr	e-orders with filte	638470		
	Fulfilled in time pre-o			625371	
	Fulfilled late pre-orde			13099	
	Total number pre-or	ders with filter			1223
	Fulfilled in time pre-o	rder			737
	Fulfilled late pre-orde	er .			485
	Fulfilled late pre-orde	er w.r.t. total pre-o	rders per week		36,23

Figure 6. Number of non pre-orders and pre-orders (week 38 2016).

# Appendix 7. KPI fulfillment pre-orders

Overview of the pre-order Key Performance Indicator fulfillment wherein the quantity delivered is compared with the delayed quantity delivered (retrieved on October 1, 2016).

KPI fulfilment pre-orders (appendix 1.9.4.)

ProductCategoryFin	ProductGroupFin	IndPreOrder	Fulfilment QtyLate (Sum)	Fulfilment QtyReportedOn (Sum)	KPI Fulfilment (%)
Baby	Baby Apparel	Υ	0	1	1.000
Beauty & Care	Personal Care	Υ	0	1	1.000
Computer & Games	Computer	Υ	1	1	0.000
Computer & Games	Computer Accessories	Υ	11	20	0.450
Computer & Games	Games Accessories	Υ	380	1,077	0.647
Computer & Games	Games Consoles	Υ	32	1,013	0.968
Computer & Games	Games Software	Υ	8,215	68,228	0.879
Domestic Appliances	Small Domestic Appliances	Υ	0	9	1.000
Dutch Books	Dutch Books Fiction	Υ	405	682	0.406
Dutch Books	Dutch Books Non-fiction AO	Υ	407	506	0.195
Dutch Books	Dutch Books Non-fiction SW	Υ	128	137	0.065
E-readers	Ereader Accessories	Υ	0	10	1.000
E-readers	Ereaders	Υ	7	124	0.94
Entertainment	Movies	Υ	3,082	54,726	0.94
Entertainment	Music	Υ	6,265	37,773	0.83
Home Improvement & Gardening	Home Improvement	Υ	0	0	
International Books	International Books Fiction	Υ	2,837	13,825	0.79
International Books	International Books Non-fiction AO	Υ	4,429	9,248	0.52
International Books	International Books Non-fiction SW	Υ	857	1,561	0.45
Mobile & Tablets	Mobile & Tablet Accessories	Υ	31	36	0.13
Mobile & Tablets	Mobile Phones	Υ	94	259	0.63
Mobile & Tablets	Tablets	Υ	2	2	0.00
Sound & Vision	Camera	Υ	11	151	0.92
Sound & Vision	Home Entertainment	Υ	0	1	1.00
Sound & Vision	Navigation	Υ	0	0	
Sound & Vision	Personal Audio	Υ	0	6	1.00
Sport & Leisure	Leisure	Υ	0	1	1.00
Sport & Leisure	Sport	Υ	1	1	0.00
Toys	Hobby & Crafts	Υ	13	14	0.07
Toys	Outdoor Toys	Υ	2	2	0.00
Toys	Toys Core	Υ	11	83	0.86
Unknown	UNKNOWN	Υ	0	0	

Figure 7. KPI fulfillment of pre-orders

## Appendix 8. Results from the analyzing program (KIP) focuses on games collected in excel

Artikei	EAN I	Release date KIP	Release date website	Quantity late	Quantity reported KPI fulfilme	nt Supplier
World of Warcraft: Legion - Collector Edition		25-8-2016	30-8-2016	836	836 0.00	Condata
(PC)	5050517105715	25 0 2010	50 0 2010	030	555 0.00	13/6: 800> 26/8: 788
(FC)						8/6: 204> 26/8: 204
						10/8: 50> 26/8: 50
						11/8: 28> C
						29/8: 12> 1/9: 12
						GAMEWOR
						28/8: ?> C
						MICROME
						30/8: 1> 31/8: 1
No Man's Sky (limited edition)	2750056843479	7-8-2016	10-8-2016	434	434 0.00	SONYPS
(PS4)	0711719814559	7-8-2010	10-8-2010	434	434 0.00	29/7: 475> 8/8: 475
NBA 2K17	2750057802192	10-9-2016	20-9-2016	146	146 0.00	CLD
(PS4)	5026555422215	10-3-2010	20-3-2010	140	140 0.00	16/9: 160> C
(P54)	3020333422213					17/9: 3> C
						-
						20/9: 1> C
						TAKETWO
	7					29/8: 150> 13/9: 140
No Man's Sky	0711719849933	42592	22-6-2016	41	2518 0.98372	SONYPS
(PS4)						13/7: 1995> 8/8: 1995
						29/7: 1000> 8/8: 1000
						5/8: 300> 9/8: 300
						5/8: 180> 10/8: 180
						9/8: 405> 12/8: 405
						8/8: 450> 12/8: 450
Fernbus Coach Simulator	4015918133968	23-8-2016	25-8-2016	28	30 0.06667	MICROME
(DVD-rom)						23/8: 23> 25/8: 15
						24/8: 2> 25/8: 2
						24/8: 3> 30/8: 3
						25/8: 55> 30/8: 55
						30/8: 1> 31/8: 1
						30/8: 3> C
LEGO Dimensions: Harry Potter – Team Pack	5051892197342	28-9-2016	28-9-2016	27	40 0.32500	WARNRHV
(Multiplatform)						26/9: 90> 28/9: 90
						26/9: 9> unreceived
						27/9: 7> unreceived
						28/9: 5> unreceived
						MICROME
						26/9: 1> unreceived
						26/9: 30> 26/9: 14 & rest unreceived
						BRANDUN
						27/9: 4> 28/9: 4
						27/9: 1> 28/9: 1
						28/9: 2> unreceived
NBA 2K17 – Kobe Legend Edition	2750057802208	10-9-2016	20-9-2016	22	22 0.00	TAKETWO
(Xbox one)	5026555358170	10-3-2010	20-3-2010	22	22 0.00	12/9: 5> C
(VPOV OIIE)	3020333330170					29/8: 20> 13/9: 20
						25/8: 20> 15/9: 20 CLD
						17/9: 2> C
						16/9: 19> C

Figure 8. Results of delivery (product from games category)

## Appendix 9. Emailcontact with a business analist of bol.com (I. Kocer)

From: Ilhan Kocer

Sent: maandag 30 januari 2017 12:51

To: Fleur van der Vliet <fvandervliet@bol.com> Subject: RE: verschil catalogus en offer release dates

## Hi Fleur,

Ik weet niet exact wat de 'catalogus' release date is. Volgens mij is dat de allereerste release date die wordt aangeleverd en in STEP wordt opgeslagen, maar hier wordt verder niks mee gedaan. Er kwamen een tijdje terug wat mails voorbij met de vraag of dit verwijderd kan worden.

De offer release date wordt continu overschreven door de meeste up-to-date release date. Oftewel: als de release date wordt aangepast van 1-2-2017 naar 1-3-2017, dan wordt de offer release date geüpdatet maar de catalogus release date niet.

Vermoedelijk is zo'n catalogus release date nog wel interessant, maar dan meer als 'initiële verschijningsdatum' of iets dergelijks. Alleen dan moet je er wel zeker van zijn dat de release ook echt op die datum was.

Anyway, daarom kunnen ze verschillen.

Groet, Ilhan

## Appendix 10. Orders of World of Warcraft placed at the supplier

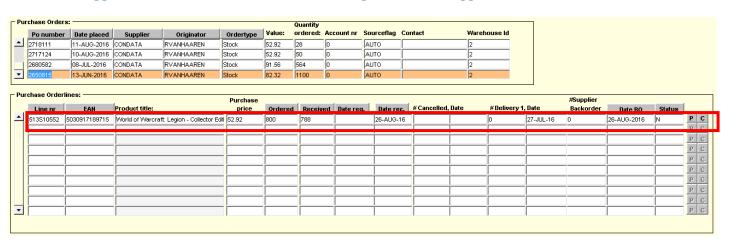


Figure 9. Overview of orders of games article: world of warcraft

## Appendix 11. Overview fulfillment game: World of Warcraft

Source: data from the analyzing program KIP



Figure 10. Overview of fulfillment of games article: world of warcraft

## Appendix 12. Indication amount of pre-orders per category

Indication amount pre-order vs total orders - Focus in Research (Music)

	IndPreOrder / Qty
ProductGroupFin	Υ
Baby Apparel	1
Camera	195
Computer	1
Computer Accessories	35
Dutch Books Fiction	753
Dutch Books Non-fiction AO	530
Dutch Books Non-fiction SW	219
Ereader Accessories	10
Ereaders	129
Games Accessories	1,347
Games Consoles	1,198
Games Software	74,399
Hobby & Crafts	16
Home Entertainment	2
International Books Fiction	14,940
International Books Non-fiction AO	10,223
International Books Non-fiction SW	1,697
Leisure	1
Mobile & Tablet Accessories	46
Mobile Phones	288
Movies	58,636
Music	40,009
Outdoor Toys	2
Personal Audio	7
Personal Care	1
Small Domestic Appliances	9
Sport	1
Tablets	2
Toys Core	104

Figure 11. Number of pre-orders per category

## Appendix 13. Indication amount of pre-orders fulfilled late (and fulfilled on time)

Indication amount pre-order vs total orders - Fulfilment category

		IndPreOrder / Qty	
ProductGroupFin	FulfilmentCategory	N	Υ
Games Software	Cancelled	5,591	6,171
	CancelledLate	330	142
	FulfilledInTime	280,540	60,013
	FulfilledLate	2,221	8,046
	OpenLate	15	27
Movies	Cancelled	13,028	3,924
	CancelledLate	864	136
	FulfilledInTime	1,211,755	51,659
	FulfilledLate	7,763	2,858
	OpenLate	61	59
Music	Cancelled	7,966	2,476
	CancelledLate	1,985	719
	FulfilledInTime	570,697	31,345
	FulfilledLate	6,515	5,352
	OpenLate	175	117

Figure 12. Number of pre-orders fulfilled late and fulfilled on time

## Appendix 14. Example: applying model on the reliability of the delivery of the orders

These are randomly orders which are placed on the given EAN. The difference in days between promised customer date (release date) and date fulfillment is calculated.

Table.1. Delivery data of 5 random orders.

Ean Ordered	Promised customer date	Date fulfilment	Release date	Difference in days	KPI Late fulfillment
9789023495468	2015-11-04 T00:00:00.000Z	2015-11-03 T00:00:00.000Z	2015-11-04 T00:00:00.000Z	0	0
5425011898203	2015-11-02 T00:00:00.000Z	2015-11-03 T00:00:00.000Z	2015-11-02 T00:00:00.000Z	2	1
0602557054583	2016-10-07 T00:00:00.000Z	2016-10-11 T00:00:00.000Z	2016-10-07 T00:00:00.000Z	5	1
4046661477917	2016-10-14 T00:00:00.000Z	2016-10-24 T00:00:00.000Z	2016-10-14 T00:00:00.000Z	11	1
8717127018857	2016-03-07 T00:00:00.000Z	2016-04-19 T00:00:00.000Z	2016-03-07 T00:00:00.000Z	44	1

The customer satisfaction of reliability based on one order is calculated in the table below, with a time window of 0 (delivery should be on release date).

*Table 2. Customer satisfaction calculated with a time window of 0 (the order should be delivered on the release date).* 

uaic).				
EAN	Difference in days	Time window (release date)	Window of the order	$\mathbf{u}^{\mathrm{r}}(\mathbf{l,t}) \to \mathbf{L} = 0$
9789023495468	0	[e, 1] = 0	$t \in [e, l]$	100%
5425011898203	2	[1, el] = 0	$t \in (e, l]$	$Exp(-a_1 * (t - l))$ Exp(-0.5*(2-0)) = Exp(-1) = 36.79%
0602557054583	5	[1, e1] = 0	$t \in (e, l]$	$Exp(-a_1 * (t - l))$ Exp(-0.5*(5-0)) = Exp(-2.5) = 8.21%
4046661477917	11	[1, e1] = 0	$t \in (e, l]$	$Exp(-a_1 * (t - l))$ $Exp(-0.5*(11-0)) = Exp(-5.5) = \frac{0.41\%}{0.00}$
8717127018857	44	[1,e1]=0	t∄[ee,el)	0%

If the time window changed from 1 day to more days, the customer satisfaction can be calculated as shown in Table 3.

Table 3. Customer satisfaction calculated with different time windows resp. +1 day and +2 days.

EAN	Difference in days	Window of the order	u <sup>r</sup> (l,t)	Time window (L=1) (release date + 1 day)	Time window (L=2) (release date + 2 days)
9789023495468	0	$t \in [e, l]$	100%	100%	100%
5425011898203	2	$t \in (e, l]$	Exp(-0.5*(2-0)) = Exp(-1) = 36.79%	Exp(-0.5*(2-1)) = Exp(-0.5) = 60.65%	100%
0602557054583	5	$t \in (e, l]$	Exp(-0.5*(5-0)) = Exp(-2.5) = 8.21%	Exp(-0.5*(5-1)) = Exp(-2) = 13.53%	Exp(-0.5*(5-2)) = Exp(-1.5) = 22.31%
4046661477917	11	$t \in (e, l]$	Exp(-0.5*(11-0)) = Exp(-5.5) = 0.41%	Exp(-0.5*(11-1)) = Exp(-5) = 0.67%	Exp(-0.5*(11-2)) = Exp(-4.5) = 1.11%
8717127018857	44	t ∄[ee,el)	0%	0%	0%
$U^{R}(L,N) = expression(3)$ whereby $L = 1$ and $ N  = 5$			(100+60.65+13.53+0.67+0) / 5 = 34.97%		
$U^{R}(L,N) = expression$	ession(3) where	eby L = 2 and  N  = 5	(100 + 100 + 22.31 + 1.11 + 0) / 5 = 44.68%		

## Appendix 15. Total number of orders from March 2016 – September 2016

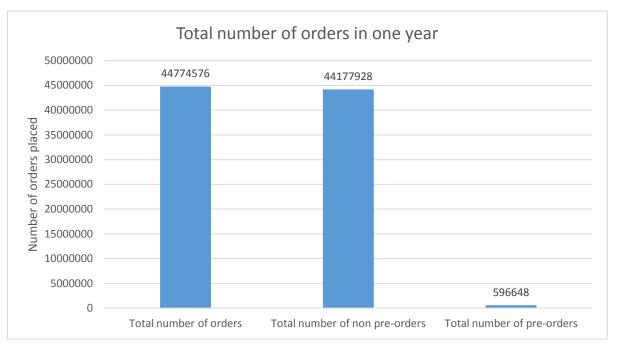


Figure 13. Total number of orders (March – September 2016).

## Appendix 16. Overall fulfillment

### Overall fulfillment

KPI Fulfilment (%)	Fulfilment QtyLate (Sum)	Qty	
0.9856	469,284	44,774,576	

Figure 14. Overall fulfillment of company bol.com.

## Appendix 17. Fulfillment pre-orders compared to non pre-orders

Fulfilment pre-orders compared to non pre-orders

IndPreOrder	KPI Fulfilment (%)	Fulfilment QtyLate (Sum)	Qty
N	0.9869	417,610	44,177,928
Υ	0.9052	51,674	596,648

Figure 15. Overall fulfillment of pre-orders compared to non pre-orders of company bol.com.

# Appendix 18. Overview with pre-order articles which were delivered late Table 4. Overview of pre-order articles which were delivered late.

Artikel (Titel)	PO number	Release date	Date ordered	Date received (Bol.com)	Supplier	Reason/Event for delivering late
		(Bol.com – site / KIP)	(Bol.com)			
Aqualung	2602140	22-04-2016	19-04-2016	22-04-2016	WARNER	Received on
(0825646487080)	2602883	20.04.2046	19-04-2016	22-04-2016	DEDTILO	release date
Paging Mr. Proust –Digi-	2607939	29-04-2016	26-04-2016	29-04-2016	BERTUS	Received on
(0083832193614)	2608806 2607965	29-04-2016	26-04-2016 26-04-2016	29-04-2016 29-04-2016	WARNER	release date Received on
Prayers For the Damned Vol 1. (0849320016922)	2607965	29-04-2016	26-04-2016	29-04-2016	WARNER	release date
Dust	2607692	29-04-2016	25-04-2016	29-04-2016	BERTUS	Received on
(5052442008903)	2007032	25-04-2010	25-04-2010	25-04-2010	DEINIOS	release date
Dark Side of the Moog	2608806	27-05-2016	26-04-2016	27-05-2016	BERTUS	Received on
(0885513014023)	2634630	27 03 2010	26-05-2016	31-05-2016	BEILLOS	release date
Good Karma	2636761	03-06-2016	30-05-2016	03-06-2016	WARNER	Received on
(5054197105524)						release date
U2 – INNOCENCE + eXPERIENCE	2628163	10-06-2016	20-05-2016	10-06-2016	UNIVERS	Received on
Live in PARIS	2647891		09-06-2016	16-06-2016	UNIVBE	release date
(0602547872951)						
Johannesburg (10 Inch Vinyl)	2641860	17-06-2016	03-06-2016	17-06-2016	BERTUS	Received on
(8717931329187)						release date
Complete Album Collection	2654229	22-07-2016	15-06-2016	C (19-07)	UNIVERS	Received on
(0602557007565)	2672875		01-07-2016	22-07-2016	BERTUS	release date
Graduated Fool –Hq-	2603583	27-05-2016	20-04-2016	27-05-2016	BERTUS	Received on
(0602547578129)	2630930		24-05-2016	27-05-2016		release date
	2633385		25-05-2016	27-05-2016		
Discouranted 14d/Disi	2634507	10.00.2016	26-05-2016	30-05-2016	DEDTUC	Desciused as
Disconnected –Ltd/Digi- (7090008319320)	2641860	10-06-2016	03-06-2016	10-06-2016	BERTUS	Received on release date
A Moon Shaped Pool (LP)	2625384	17-06-2016	17-05-2016	17-06-2016	BERTUS	Received on
(0634904079017)	2636740	17-00-2010	30-05-2016	17-06-2016	BERTUS	release date
A State of Trance Ibiza 2016	2712089	19-08-2016	05-08-2016	19-08-2016	PIAS	Received on
(8718522099465)	2713513	13 00 1010	08-08-2016	19-08-2016	PIAS	release date
A Better World	2742439	23-09-2016	02-09-2016	27-09-2016	GARDNER	Received on
(8718627224007)	2761155		(15-09-	22-09-2016	BERTUS(on	release date
			2016		time)	
Day of the Dead	2608806	20-05-2016	26-04-2016	20-05-2016	BERTUS	Received on
(0652637362428)						release date
Rain Cow	2608806	27-05-2016	26-04-2016	27-05-2016	BERTUS	Received on
(0634457245020)			26-05-2016	30-05-2016	BERTUS	release date
Op de schoorsteen staat een foto	2698824	29-07-2016	25-07-2016	31-08-2016	UNIVERS	Received late by
(7 inch vinyl)						supplier, delivered late to
(0602547945570)						consumer
Shadow Self	2701399	05-08-2016	26-07-2016	10-08-2016	BERTUS	Received late by
(4029759108573)	2,01333	05 00 2010	20 07 2010	10 00 2010	DENTOS	supplier,
(4023733100373)						delivered late to
						consumer
Wild World (LP)	2742446	06-09-2016	02-09-2016	07-09-2016	UNIVERS	Received late by
(0602557003116)						supplier,
						delivered late to
						consumer
Ajuu de Mazzel!	2657633	24-06-2016	20-06-2016	23-06-2016	PIAS	Received on time

(8713606912531)						by supplier, delivered late to consumer
Dat is de Liefde (8718456038110)	2600277	26-04-2016	16-04-2016 22-04-2016 25-04-2016	25-04-2016 26-04-2016 (alex) 26-04-2016	HEARTS HEARTS HEARTS	Received on time by supplier, delivered late to consumer
Skeleton Tree (LP) (5060454943846)	2733111	08-09-2016	25-08-2016	06-09-2016	BERTUS	Received on time by supplier, delivered late to consumer
'Hours' (0825646507528)		08-07-2016	29-06-2016 06-07-2016 07-07-2016 07-07-2016	05-07-2016 08-07-2016 08-07-2016 08-07-2016	WARNER WARNER WARNER WARNER	Purchased not enough articles
Self Pollution Radio 1995 (0823564669120)	2626542 2626706 2626758 2627553 2627718 2628084	08-04-2016	18-05-2016 18-05-2016 19-05-2016 19-05-2016 20-05-2016 20-05-2016	C (22-06-2016) C (22-06-2016) C (22-06-2016) C (22-06-2016) C (22-06-2016) 21-06-2016	BERTUS BERTUS BERTUS BERTUS BERTUS BERTUS BERTUS	Purchased the articles not on time
Thank you (Exclusieve bol.com Editie) (0889853207022)	2622352 2622531	13-05-2016	13-05-2016 13-05-2016	17-05-2016 18-05-2016	BMG BMG	Purchased the articles not on time