

Navigational patterns and shopping cart abandonment behavior



- 1. Author.....Eric Alkema**
- 2. Student#.....1736280**
- 3. Supervisor...Dr. Feray Adigüzel**

Preface

This thesis is the result of my Master Marketing at the Vrije Universiteit Amsterdam and my interest in (online) consumer behavior. It appears that consumers show similarities in online and offline behavior. However, it is of importance for companies to recognize the differences between both worlds such as the use of shopping carts.

While working on this thesis I have received support from several people who helped me during the process. First I would like to thank my supervisor Feray Adigüzel for her support and critical feedback. Secondly, I would like to thank Reinier de Bie for providing sever log files. Finally, I also would like to thank Jori de Goede for programming the server log files into worksheets.

With kind regards,

Eric Alkema

Management summary

Despite the doubling growth rate of the Dutch e-commerce economy between 2005 and 2009, online retailers are still faced with a majority of visitors who do not fulfill their online shopping process. Approximately 60-70% of the visitors at online stores abandon their shopping cart. An issue that is important for managers at online store as it could mean the difference between a profitable online store or lost sales.

This aim of this study is to provide more knowledge on the relationship between online shoppers' navigational patterns and shopping cart abandonment using an extensive dataset of 3.438 visitors of a Dutch online store. Throughout this study we focus on the relationship between visitors (pre) visit navigational patterns in relationship to shopping cart abandonment and stage-by-stage abandonment.

Visitors coming through search engines (pre-visit) and who browse through few shopping pages (visit) are more likely to abandon their shopping cart. Prior research on shopping cart abandonment assumed that shopping carts are a functional holding space in order to make a transaction. Our findings on product placement stage abandonment complement the theory that visitors use their shopping cart for current purchases (focused search patterns) and as a shopping research and organizational tool (browsing through product pages). Shopping cart abandonment often occurs at the information providing stage of the check-out process. It appears that new visitors are more likely to abandon their shopping cart at this stage than returning visitors.

The study includes a proposition for managers, developers and marketers at online stores to design an improved online shopping cart. This cart contain functions such as recommendation system, guest check-out and save search.

Table of contents

- 1. **Introduction** 6
 - §1.1 Problem statement 7
 - §1.2 Objectives and relevance 8
 - §1.3 Delimitations 9
 - §1.4 Outline of the study 9

- 2. **Theoretical framework** 10
 - §2.1. Shopping cart abandonment behavior 10
 - §2.1.1 Prior research 11
 - §2.2 Online consumer behavior..... 13
 - §2.2.1 Online search: the entertainment value 14
 - §2.2.2 Evaluation of alternatives: motivations to use a shopping cart..... 16
 - §2.2.3. Purchase decision: trust, privacy and security 18
 - §2.3 Hypothesis and conceptual model..... 19
 - §2.3.1 Hypotheses 19
 - §2.3.2 Conceptual model 21

- 3. **Methodology**..... 22
 - §3.1 Data source..... 22
 - §3.2 Methodology design..... 22
 - §3.2.1 Shopping cart abandonment..... 23
 - §3.2.2 Referral source 23

§3.2.3	Shopping pages viewed	24
§3.2.4	Product variety	24
§3.2.5	Visitor type	24
§3.2.6	Time spent	25
§3.3	Methods of analysis.....	25
§3.4	Reliability	26
4.	Results	27
§4.1	Dataset	27
§4.2	Results hypotheses.....	27
§4.2.1	Hypothesis 1: referral source on shopping cart abandonment	27
§4.2.2	Hypothesis 2: shopping pages viewed on shopping cart abandonment.....	29
§4.2.3	Hypothesis 3: product variety on product stage abandonment	30
§4.2.4	Hypothesis 4: average time spent on product stage abandonment.....	31
§4.2.5	Hypothesis 5: visitor type information stage abandonment	32
§4.3	Summarization of results.....	33
5.	Conclusion and discussion	34
§5.1	Conclusions.....	34
§5.2	Discussion	35
§5.3	Theoretical implications	37
§5.4	Managerial implications	37
§5.5	Limitations and future research	39
6.	Bibliography	41

7. **Appendix** 44

 §7.1.1 Output for hypothesis 1..... 44

 §7.1.2 Output for hypothesis 2..... 45

 §7.1.3 Output for hypothesis 3..... 45

 §7.1.4 Output for hypothesis 4..... 46

 §7.1.5 Output for hypothesis 5..... 46

§7.2 List of tables and figures 48

1. Introduction

Despite the doubling growth rate of the Dutch e-commerce economy between 2005 and 2009 (Thuiswinkel annual report, 2010), online retailers are still faced with a majority of visitors who do not fulfill their online shopping process. According to research, the average shopping cart abandonment rate is approximately 60-70% in 2010 (Forrester Research, 2009). Shopping cart abandonment occurs when a potential customer initiates an order by starting the checkout process, but exits the website before the purchase is made. Measuring this phenomenon is important for online retailers as it could mean the difference between a profitable online store or lost sales.

In the standard bricks-and-mortar environment retailers provide physical carts or baskets as a functional holding space (utilitarian tool) in order to assist customers with collecting and storing products for immediate purchase. The study of Kukar-Kinney & Close (2009) found that besides immediate purchase intention, online shopping carts are also used for hedonic purposes such as securing price promotions, organizing items and as a 'wish list' for future purchases. This can be explained by the fact that, similarly to traditional retail shoppers, consumers shop online with utilitarian (e.g. goal-directed, task based) and/or hedonic (e.g. enjoyment gained by the shopping experience) motivations (Arnolds & Reynolds, 2003; Bridges and Florsheim, 2008). Moreover, some online shoppers never intended to buy at an online store, as they prefer to shop in the standard bricks-and-mortar environment (Choi & Park, 2006; Kaufman-Scarborough & Lindquist (2002). The study of Miyazaki & Fernandez (2001) found that these online shoppers feel inconvenient towards online shopping due to factors such as unable to touch the product, difficulty in contacting customer service personnel or shipping related issues.

Other studies focused on the influence of psychological barriers on shopping cart abandonment. Perceived risk related to privacy (e.g. sharing personal information with third parties) and security (e.g. non-delivery of products, transaction) issues, and perceived waiting time (loading time) were found to influence shopping cart abandonment (Moore & Matthews, 2006; Rajamma et al., 2009). The study by Cho et al. (2006) also found contextual factors (e.g. time pressure, uncertain need) and

consumer characteristics (e.g. attitude toward online shopping) as factors influencing this phenomenon.

§1.1 Problem statement

To our knowledge, studies on shopping cart abandonment mainly focused on the influence of psychological factors on this phenomenon (Cho et al., 2006; Kukar-Kinney & Close, 2009; Moore & Matthews, 2006; Rajamma et al., 2009). According to the study of Novak & Hoffman (2003), enormous potential exist in studying online shoppers' behavior as they navigate from page to page. Several studies examined the relationship between navigational decisions and online purchase behavior (Moe, 2003; Moe & Fader, 2004; Sismeiro & Bucklin 2003; 2004, Van den Poel & Buckinx , 2005). However, none of prior research has focused on the relationship between navigational patterns and shopping cart abandonment behavior. In this study we will focus on this relationship using clickstream data of a Dutch online store. For this study we have developed the following problem statement:

What is the relationship between visitors' navigational patterns and shopping cart abandonment behavior?

In line with the problem statement we have developed supportive sub questions. These sub questions will be answered through analyzing literature and the collected data. Based on prior research we will define shopping cart abandonment and review factors found influencing this phenomenon. The study by Kukar-Kinney & Close (2009) suggests that consumers have divergence motivations to use a shopping cart. Understanding motivations to use a shopping cart might support us in answering the problem statement.

In order to understand the relationship between navigational patterns and shopping cart abandonment, we will focus on the use of referral sources (pre-visit stage) and in-store patterns (visit stage). Moreover, the study of Cho et al. (2006) found that shopping cart abandonment behavior differ among consumers. Therefore we are also interested in shopping cart abandonment behavior among visitors of an online store.

1. What is shopping cart abandonment behavior and which factors influence shopping cart abandonment?
2. What motivates visitors to use a shopping cart?
3. Which navigational patterns (pre-visit stage/visit stage) possibly relate to shopping cart abandonment behavior?
4. How do new or returning visitors differ in their shopping cart abandonment behavior?

§1.2 Objectives and relevance

The study of Van den Poel & Buckinx (2005) state that online consumer behavior is more dynamic compared to traditional retail behavior. Therefore, online research needs to be extended in order to understand online consumer choices. The main objective of this study is to provide understanding of the relationship between navigational patterns and shopping cart abandonment. The study of Kukar-Kinney & Close (2009) apply for such future research based on clickstream data as it could provide a complementary picture of this phenomenon.

Online store managers invest time, effort and resources in order to sell their products or services to their consumers. However, they are still faced with a majority of potential customers who abandon their shopping cart. It is important to understand factors that influence these customers to abandon their shopping cart so that they can implement marketing activities that improve conversion rates as well as avoiding lost sales. Improved conversion rates increase revenues which ultimately contribute to the performance of the online store.

§1.3 Delimitations

The psychological factors influencing shopping cart abandonment have been studied in prior research (Cho et al., 2006; Moore & Matthews, 2006; Rajamma et al., 2009). This study will not focus on psychological factors that lead shopping cart abandonment such as *privacy & security issues*, *perceived risk* and *transaction inconvenience*. We are interested in the relationship between navigational patterns and shopping cart abandonment. The clickstream data has been generated by a Dutch online store and contains mainly information about Dutch visitors. Based on the products offered by Company A we expect the visitor's involvement to be moderately high. We suggest that shopping cart abandonment behavior in this study might differ compared to online stores offering low involved products.

§1.4 Outline of the study

Chapter two will review and discuss prior research on navigational patterns and shopping cart abandonment. Based on the discussion in chapter two we will formulate hypotheses and the conceptual model. Chapter three will describe the available data and the statistical techniques used in order to find support for the formulated hypotheses. The results of the formulated hypotheses will be provided in chapter four. Finally, we will discuss the findings in chapter four and compare them with comparable research. In this chapter we will also discuss the managerial and theoretical implications and possibilities for future research.

2. Theoretical framework

This chapter will review prior research on navigational patterns and online shopping cart abandonment behavior. First, we will describe shopping cart abandonment behavior and the factors influencing this phenomenon (§2.1). In order to understand the relationship between navigational patterns and shopping cart abandonment, we have applied the consumer-decision making model of Peter & Olson (§2.2).

§2.1. Shopping cart abandonment behavior

In comparison to traditional retail settings, online shoppers are faced with different tasks to complete at the 'check-out funnel' of the shopping process. The check-out funnel (figure 1) at most online stores consists of place item(s) of interest into the shopping cart, provide personal and shipping information (address of shipping), select payment method and confirmation.

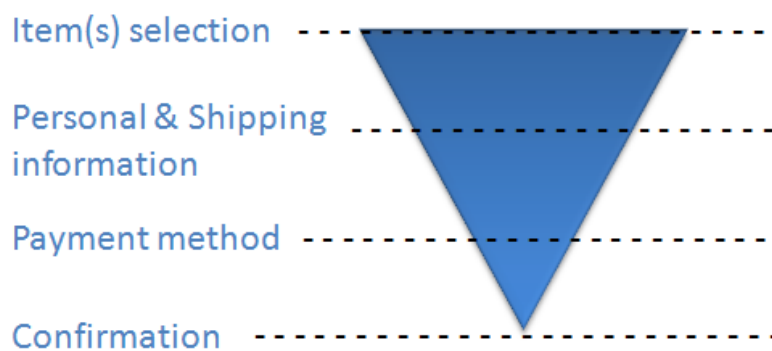


Figure 1 – Check-out funnel

The study of Rajamma et al. (2009) examined shopping cart abandonment after the visitor has decided to purchase the item(s), but before the purchase is completed (Cho et al., 2006; Moore & Matthews, 2006; Rajamma et al., 2009). The study of Cho et al. (2006) differentiated shopping cart abandonment into abandonment of the cart and hesitation at the transaction completion (payment/confirmation stage) of the check-out process.

In this study we will refer to shopping cart abandonment behavior as:

The behavior in which a visitor enters the online store's check-out process, but decides to exit the online store before confirmation.

We will decompose the check-out funnel into sequential tasks, a concept that is used by Sismeiro & Bucklin. For the online store we studied, we identified four tasks that are required to complete a purchase: (1) place item(s) in shopping cart, (2) input of personal and shipping information, (3) payment method (4) confirmation.

Based on the tasks required for purchase, we identified three stages (figure 2) at which we will examine shopping cart abandonment: (1) product placement stage, (2) information providing stage, (3) payment/confirmation stage.

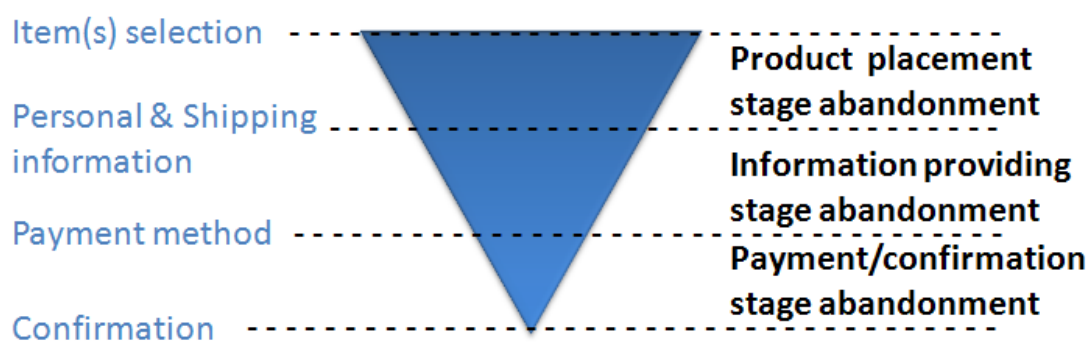


Figure 2 – Abandonment stages

§2.1.1 Prior research

Prior research mainly focused on psychological factors influencing shoppers to abandon their shopping cart. The study of Moore & Matthews (2006) focused on the influence of *perceived performance risk* on this phenomenon. They concluded that a negative site reputation strongly affect shopping cart abandonment behavior. The study of Cho et al. (2006) focused on factors influencing shopping cart abandonment (*perceived uncertainty, medium/channel innovation, contextual*) and the influence of *consumer characteristics* on the hesitation at the payment/confirmation stage.

They concluded that comparison shopping is the strongest predictor of shopping cart abandonment, while security/privacy risk is the strongest predictor of hesitation at the payment/confirmation stage.

The study of Rajamma et al. (2009) discussed shopping cart abandonment by the expectancy disconfirmation model. Based on this model they assumed that when online shoppers' experiences falls below their expectations, they are more likely to abandon their shopping cart. They have found perceived transaction inconvenience (e.g. long order forms, payment methods offered) as the

greatest driver of shopping cart abandonment. Interestingly, the study of Kukar-Kinney & Close (2009) found cognitive and behavioral reasons influencing shoppers to abandon their shopping cart. They concluded that shoppers often abandon their shopping cart for other reasons than dissatisfaction with the item(s), e-tailer or check-out process. These shoppers use their shopping cart as an organized place to store their desired items, a tool to obtain total costs and as a 'wish list' for future purchases. Moreover, they also concluded that privacy and security concerns influence abandonment at the information providing and payment/confirmation stage rather than the abandonment at the product placement stage.

Independent variables	Dependent variables	Authors
Perceived performance risk	Shopping cart abandonment	Moore & Matthews (2006)
Perceived uncertainty factors	Overall shopping cart abandonment	Cho et al. (2006)
Medium innovation factors	Cart abandonment	
Contextual factors	Cart abandonment	
Consumer characteristic factors	Hesitation at transaction completion stage	
Perceived waiting time	Shopping cart abandonment	Rajamma et al. (2009)
Perceived risk		
Transaction inconvenience		
Research & Organizational tool	Cart abandonment	Kukar-Kinney & Close (2009)
Privacy/security concerns	Decision to buy from retailer	
Entertainment value		

Table 1 - Summary of prior research on shopping cart abandonment

We can conclude that several studies focused on psychological factors influencing shoppers to abandon their shopping cart at the transaction completion stage of the check-out funnel. In addition, the studies of Cho et al. (2006) and Kukar-Kinney & Close (2009) concluded that the item(s) in the shopping cart is/are often abandoned for other reasons (e.g. comparison shopping & organizing) than dissatisfaction with the online store or check-out process. In the next paragraph we will apply the theory of consumer purchase-decision making in order to understand the cognitive and behavioral reasons for shopping cart abandonment. Moreover, we are interested in the relationship between visitors' navigational patterns and these reasons for shopping cart abandonment.

In order to understand shopping cart abandonment behavior we have applied the theory of consumer purchase-decision making process (Kotler, 2003; Peter & Olson, 2005). This model reflects the tasks or decisions that consumers face when buying a product.



Figure 3 - Purchase-decision making model (Peter & Olson, 2005)

Similar to traditional retail settings, online shoppers recognize a problem or need make decisions in order to solve this problem or satisfy their need (figure 1). The online shopper browses through web pages in order to search for information. According to the study of Kukar-Kinney & Close (2009), the consideration of alternatives occurs as shopper place item(s) of interest into their shopping cart. The item(s) in the shopping cart is reviewed and the shopper decides whether to buy or not to buy the product. In the online environment actual purchases are made at the payment/confirmation stage of the check-out funnel as described in §2.1.

§2.2.1 Online search: the entertainment value

According to Wolfinbarger & Gilly (2001), consumers shop online to fulfill diverse goal-oriented and/or experiential needs. Based on these needs, consumers are encouraged to shop online for utilitarian, goal driven motives and/or experiential motives (Arnold and Reynolds, 2003; Bridges and Florsheim, 2008; To et al., 2007; Wolfinbarger and Gilly, 2001).

Goal-driven motives include efficiency, freedom and control, which are basically focused on buying a product. (Wolfinbarger and Gilly, 2001;). Experiential (e.g. entertainment-seeking) motives contain searching and shopping for fun and to alleviate boredom (Mathwick et al., 2001). Experiential-driven shoppers are basically focused on the enjoyment gained by the shopping experience itself, rather than the task completion (Mathwick et al., 2001). The study of Kukar-Kinney & Close (2009) found these experiential-driven shoppers may place item(s) in their shopping cart for entertainment purposes or to alleviate boredom. These shoppers enjoy the interaction of clicking and placing item(s) in the shopping cart, rather than browsing passively in-store. As they may not have the financial resources or intentions to buy a product at that time, placing items in their shopping cart may provide a pleasurable substitute to buying (Wolfinbarger & Gilly, 2001). Moreover, they found that shopping cart abandonment is more likely to occur when it is used for entertainment purposes.

The study of Novak et al. (2003) focused on the influence of goal-directed and experiential activities on online flow experience. They concluded that goal-directed shoppers are characterized by directed (pre-purchase) search, while experiential-driven shoppers are characterized by non-directed (ongoing) search; browsing. The study of Detlor et al. (2003) found that goal-driven searchers often use differentiating tools such as comparison sources, while experiential-driven searchers often use starting tools such as search engines. Visitors coming through search engines are likely to browse for information (task two, figure 2), while visitors coming through comparison sources are expected to compare items in their consideration set (task three, figure 2). Based on the consumer-decision making model and the described theory we expect that visitors coming through search engines are more likely to abandon their shopping cart than visitors coming through comparison sources. That is,

visitors coming through comparison sources are one task further at the purchase-decision making model and therefore on step closer to buying.

H1: Visitors coming through search engines are more likely to abandon their shopping cart than visitors coming through comparison sources.

Several studies found that shopping pages viewed is positively related to purchase-decision making behavior (Bucklin and Sismeiro, 2003; 2004; Van den Poel and Buckinx, 2005). Bucklin and Sismeiro (2004) concluded that among the shoppers who have placed item(s) of interest into their shopping cart, the ones who viewed more shopping pages are more likely to buy the item(s). This is consistent with the theory of Moe (2003), who concluded that goal-driven shoppers are characterized by higher levels of shopping pages viewed, while experiential-driven visitors are characterized by lower levels of shopping pages viewed.

We have already concluded that experiential-driven visitors may place items in their shopping cart for entertainment purposes or to alleviate boredom. We have also concluded that shopping carts are more likely to be abandoned when they are used for entertainment purposes (Kukar-Kinney & Close, 2009). Therefore, we expect that visitors who are characterized by lower levels of shopping pages viewed are more likely to abandon their shopping cart than visitors who are characterized by higher levels of shopping pages viewed. That is, goal-driven visitors are characterized by higher levels of shopping pages viewed and less likely to abandon their shopping cart.

H2: Visitors who are characterized by lower levels of shopping pages viewed are more likely to abandon their shopping cart than visitors who are characterized by higher levels of shopping pages viewed.

§2.2.2 Evaluation of alternatives: motivations to use a shopping cart

Several studies who focused on shopping cart abandonment assume that a shopping cart is functional holding space in order to make a transaction (Cho et al., 2006; Moore & Matthews, 2006; Rajamma et al., 2009). These studies suggest that, comparable to traditional retail shopping carts, shoppers intent to buy a product once it has been placed into their virtual shopping cart. However, the study of Kaufman-Scarborough & Lindquist (2002), suggests that some shoppers also use their shopping carts to investigate future purchases.

The recent studies by Close & Kukar-Kinney (2009; 2010) found divergence motivations to use online shopping carts. Current purchase was found among goal-driven visitors. They also found that visitors use their shopping cart at the product placement stage as a shopping organizational and research tool. These visitors create a 'wish list' of items, bookmark items for potential future purchases, narrow down items for further evaluation or to obtain total cost. The study of Kukar-Kinney & Close (2009) found that visitors who use their shopping cart at the product placement stage as a shopping organizational and research tool, are more likely to abandon their shopping cart at the product stage¹. Moreover, visitors who use their shopping cart at the product placement stage for current purchases are more likely to continue to next stages of the check-out process.

Visitors who are near buying are characterized by focused search patterns which is shown by low levels of product variety and high levels of repeated product viewing (Moe 2003). In contrast, visitors who are comparing products or building their consideration set for future purchases are characterized by search across different products which is shown by high levels of product variety (Moe 2003). Based on this theory, we expect that visitors who are characterized by high levels of product variety are more likely to abandon their shopping cart at the product placement stage as they use it for comparing products or creating consideration set for future purchases (i.e. do not possess current purchase intention), while visitors who are characterized by low levels of product

¹ Note that total costs are shown at the product stage, which is the case at company X

variety are more likely to proceed to next stages as they use their shopping cart for selecting between similar products (i.e. current purchase intention).

H3: Visitors who are characterized by high levels of product variety are more likely to abandon their shopping cart at the product placement stage of the check-out process, than visitors who are characterized by low levels of product variety

Several studies focused on the relationship between time spent at the online store on purchase decisions (Lee et al., 2001; Moe, 2003, Sismeiro & Bucklin & 2004;). According to these studies, visitors are more likely to buy a product when they spend more time in-store. However, the study of Moe (2003) found that visitors who are building their consideration set for future purchases spend more time on shopping pages than visitors who are near buying; their search process is reaching an end as they remain few information to be gathered.

We have already concluded that visitors who use their shopping cart at the product placement stage as a shopping organizational and research tool are more likely to abandon their shopping cart at the product placement stage. Therefore, we expect that visitors who spend more time at the product stage of the check-out process, are more likely to abandon their shopping cart at the product placement stage. These visitors are more likely to use their shopping cart as an shopping organizational and research tool. Moreover, visitors who use their shopping cart for current purchases are expected to spend less time at the product placement stage and proceed to next stages of the check-out process. Their search process is reaching an end as they remain few information to be gathered.

H4: Visitors who spend more time at the product placement stage of the check-out process are more likely to abandon their shopping cart at the product placement stage of the check-out, than visitors who spend less time at the product placement stage of the check-out process

§2.2.3. Purchase decision: trust, privacy and security

Privacy of personal information and trust regarding online stores' security system are concerns for online shoppers (Miyazaki & Fernandez, 2001; Constantinidis, 2004). The studies of Grabner-Krauter (2002) and Donthu & Garcia (1999) found that website infrastructure, trust in an online store and privacy/security issues affect purchase behavior. In line with this study, Moore & Matthews (2006) found that a negative evaluation of the online store's reputation or website design, increase the likelihood of shopping cart abandonment.

Perceived risk regarding privacy of personal information and online stores' security system may especially become prevalent during the information providing stage of the check-out process (§2.1). At this stage, the check-out process requires to enter the visitor's personal information (Kukar-Kinney & Close, 2009; Rajamma et al., 2006). According to the study of Miyazaki & Fernandez (2001), new visitors are likely to perceive more risk regarding the online stores' privacy infringement (e.g. sharing personal information with third parties, tracking of shopping habits, being contacted without permission) and the security system (e.g. fraudulent behavior, potential for non-delivery of ordered goods) as they are not familiar with the privacy policies and security system of the online store. Moreover, returning visitors are likely to perceive less risk regarding the online stores' privacy infringement and security system as they might have ordered goods (i.e. became a customer) in the past. Therefore, we expect that new visitors are more likely to abandon their shopping cart at the information providing stage than returning visitors. That is, returning visitors are likely to perceive less risk regarding the online stores' privacy infringements and security system, and proceed to the final payment/confirmation stage of the check-out process.

H5: New visitors are more likely to abandon their shopping cart at the information providing stage than returning visitors.

§2.3 Hypothesis and conceptual model

In the previous chapter we have reviewed existing literature on browsing behavior and shopping cart abandonment. Based on this chapter we have formulated six hypotheses which will be tested in order to find evidence for these statements. Chapter four will describe the methodology used for testing these hypothesis, while the results of these hypotheses will be discussed in chapter five. In this chapter we will review the developed hypotheses and provide an overview of the conceptual model.

§2.3.1 Hypotheses

Based on the described theory we have found (pre)visit navigational patterns that we expect to influence shopping cart abandonment. We also expect visitors to differ in their shopping cart abandonment behavior, since we have concluded that new visitors are likely to perceive more risk regarding the online store's reputation, security system or website design. The theory described in the previous chapter has led to the following hypotheses.

H1: Visitors coming through search engines are more likely to abandon their shopping cart than visitors coming through comparison sources.

H2: Visitors who are characterized by lower levels of shopping pages viewed are more likely to abandon their shopping cart than visitors who are characterized by higher levels of shopping pages viewed.

We have identified divergence motivations to use a shopping cart. We have concluded that visitors who are characterized by high levels of product variety and spend more time at the product placement stage of the check-out process, are more likely to use their shopping cart as an organizational tool or 'wish list'. Therefore we expect that these visitors are more likely to abandon their shopping cart at the product placement stage of check-out process.

H3: Visitors who are characterized by high levels of product variety are more likely to abandon their shopping cart at the product placement stage of the check-out process, than visitors who are characterized by low levels of product variety

H4: Visitors who spend more time at the product placement stage of the check-out process are more likely to abandon their shopping cart at the product placement stage of the check-out, than visitors who spend less time at the product placement stage of the check-out process

We have also concluded that perceptions of risk regarding privacy and security especially become prevalent during the information providing stage of the check-out process. New visitors and are likely to perceive more risk regarding privacy and security of personal information than returning visitors. Therefore, we expect that new visitors are more likely to abandon their shopping cart at the information providing stage and payment of the check-out process.

H5: New visitors and returning visitors are more likely to abandon their shopping cart at the information providing stage of the check-out process than customers

Based on the relationships as described in the previous paragraph we have developed a conceptual model. The conceptual model is a visualization of the expected relationships which will be tested by the proposed hypothesis.

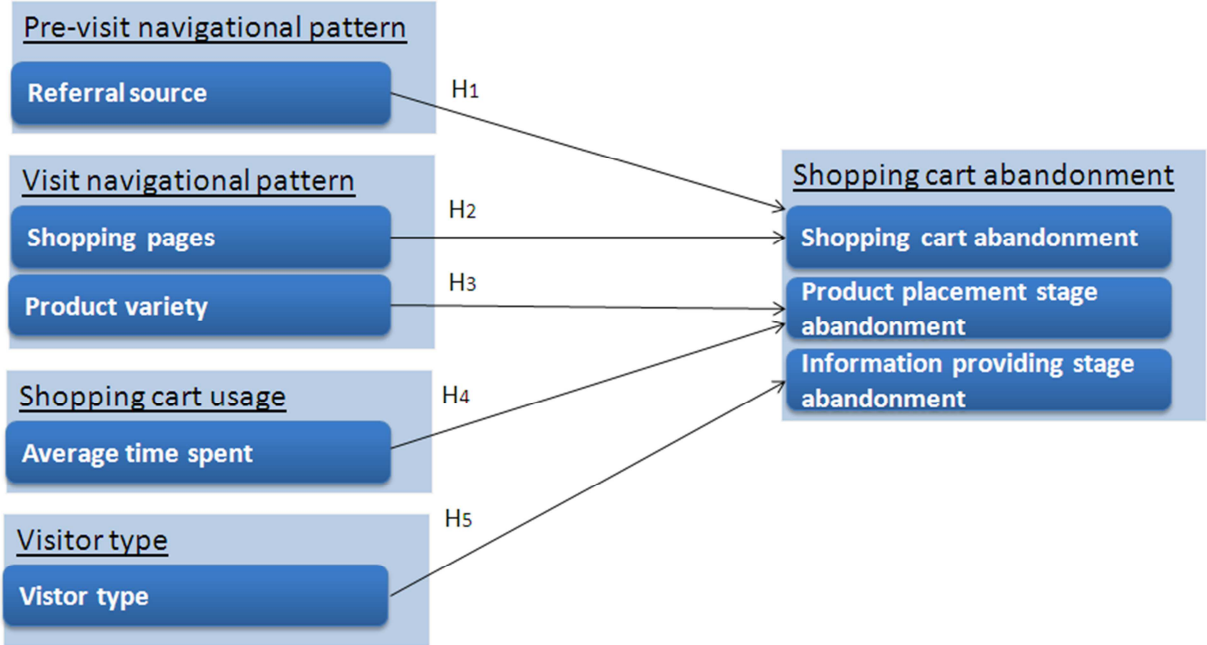


Figure 4 – Conceptual model shopping cart abandonment

As shown in the conceptual model, we will examine shopping cart abandonment (overall) and stage-by-stage abandonment: (1) product placement stage abandonment, (2) information stage providing stage abandonment.

Variables	
Shopping cart abandonment	Dependent (Y1)
Product placement stage abandonment	Dependent (Y2)
Information providing stage abandonment	Dependent (Y3)
Referral source	Independent (X1)
Shopping pages	Independent (X2)
Visitor type	Independent (X3)
Product variety	Independent (X4)
Average time spent	Independent (X5)

Table 2 – Overview of the variables in the conceptual model

3. Methodology

The purpose of this research is to find exploratory answers to our main research question. In this study we test whether some relationships exist between navigational patterns and shopping cart abandonment. In this chapter we will first describe the source of the data used (§3.1). Next we will describe the methodology design (§3.2) and the methods used for testing the formulated hypotheses (§3.3). The last paragraph contain the reliability of the data used (§3.4).

§3.1 Data source

The clickstream data used in this study is facilitated by the Dutch online store X. Clickstream data is a term used for describing visitors' navigation patterns within or across websites. Our data set consists of Server log files recorded by online store X from May 2010 until August 2010. Server log files register all the requests made by the visitor on the website of online store X. These files provide rich information for analyzing website usage and navigational patterns. The visitors requested pages are registered along associated information such as IP address, time of request, referrer and browser used. In order to obtain a meaningful dataset, we first had to eliminate requests from so-called 'web crawlers'. Web crawlers are computers that browses through the internet in a methodical and automatic approach. These crawlers are often used by search engines in order to provide up-to-date data for faster search requests².

§3.2 Methodology design

In this study we refer to a session as the visitors' requested pages within a single visit. Previous research assumed that a new session starts if the last page request was at least 30 minutes prior to the current page request (Bucklin & Sismeiro, 2004). We have adapted this assumption and modified the dataset. Moreover, we define a visit as two pages or more viewed. Due to the fact that one page visits do not represent 'browsing' and therefore influence the entire sample, we have removed them

² http://en.wikipedia.org/wiki/Web_crawler

from the dataset. In the next section we will describe the variables and their measurement based on the available data.

§3.2.1 Shopping cart abandonment

Shopping cart abandonment is measured by the check-out funnel as described in §2.1. The check-out funnel of Company X consists of place item(s) of interest into the shopping cart (ITEM), provide personal & shipping information (INFO), select payment method (PAY) and transaction (TRANS). Shopping cart abandonment (CARTABAND) is measured once the visitor has placed item(s) of interest into the shopping cart (ITEM), and abandoned the shopping cart before transaction (TRANS) is made. Product placement stage abandonment (PRODABAND) is measured once the visitor has completed ITEM and did not proceed to INFO. Information providing stage abandonment is measured once the visitor has completed ITEM proceeded to INFO and did not proceed to PAY.

Shopping cart abandonment	Values
Shopping cart abandonment (CARTABAND)	0=No 1=Yes
Product stage abandonment (PRODABAND)	0=No 1=Yes
Information stage abandonment (INFOABAND)	0=No 1=Yes

Table 3 – Shopping cart abandonment variables

§3.2.2 Referral source

Server log files register visitors by their IP address when browsing through the online store. The files contain associated information on the requested pages such as referrer (SOURCE). Based on these referrer information we are able to identify the visitor’s referral source when shopping online and the relationship with shopping cart abandonment. Every single store visit (direct visits are excluded) is registered along a referral source. Table 2 provides an overview of referral source categorization based on the registered referrer URL.

Source	Registered referrer URL
Search engine	www.google.nl www.bing.com www.vinden.nl www.yahoo.com
Comparison	www.vergelijk.nl www.koopkeus.nl www.prijsvergelijk.nl www.beslist.nl

Table 4 – Source with registered URL

§3.2.3 Shopping pages viewed

We describe shopping pages as the pages that are product related; administrative and informational pages are excluded. We have adapted the shopping pages of Moe (2003): home, category, product and search. The number of shopping pages viewed measure (SHOPPAG) is the sum of these pages viewed.

§3.2.4 Product variety

Product variety reflect the content of the pages viewed in terms of different products. Based on this variety measures we are able to analyze the relationship between content viewed shopping cart abandonment. Product variety (PRODVAR) is measured by the percentage of all product pages that were unique. If a visitor views four product pages, of which two product pages are unique, PRODVAR would be 50%. In general, the higher measure of PRODVAR, the more variety in product viewed by the visitor.

§3.2.5 Visitor type

In order to identify new or returning visitors (VISITOR) in we have used Cookie identification and IP address. Cookie identification consists of data that is sent by the server of the website (Company X) to the computer of the browser. This data is often stored on the computer of the browser and recognized by the server during the next visit. Based on this cookie identification we have differentiated unique visitors from returning visitors. In some sessions visitors could not be identified by cookies. For those visitors we have used the registered IP addresses in order to identify new or returning visitors.

§3.2.6 Time spent

In order to analyze differences in shopping cart usage we measure average time spent at the product stage (TIME). Based on prior research we expect that visitors spend more time at the product stage as they use it as an organizational tool or a 'wish list'. TIME measures the average time spent at the product stage (difference between ITEM and INFO).

Variables	Type	Values
CARTABAND	Y1(non-metric)	0=No, 1=Yes
PRODABAND	Y2(non-metric)	0=No, 1=Yes
INFOABAND	Y3(non-metric)	0=No, 1=Yes
SOURCE	X1(non-metric)	1=Search engine, 2=Comparison
SHOPPAG	X2 (metric)	# of shopping pages viewed
PRODVAR	X3 (metric)	# of product pages that were unique
VISITOR	X4 (non-metric)	1=New, 2=Returning, 3=Customer
TIME	X5(metric)	Average # of seconds spent at product stage

Table 5 – Summary of variables measured

§3.3 Methods of analysis

In the previous chapter we have developed hypotheses which will be tested in order to determine the accuracy of these hypotheses. Although there are two approaches of hypotheses testing, we will apply the classical approach; the hypothesis is rejected or fails to be rejected. Due the nature of the data we will use two statistical analysis methods.

Hypothesis 1, and 5 involve nominal data and therefore chi-square (χ^2) test is an appropriate statistical method. This technique test for significant differences between the observed distribution of data among categories and the expected distribution based on the null hypothesis. For hypothesis 1 we will test whether there is a significant difference between the use of referral sources and shopping cart abandonment behavior. We will also test whether there is a significant difference between visitor type and the abandonment at the information providing stage (H5). Hypothesis 2, 3 and 4 involve metric independent variables and therefore independent samples t-test is an appropriate statistical method. This technique calculates for significant differences among the formulated hypotheses and each individual null hypothesis, stating that no difference exist among the means of both samples. The table below provides an overview of the statistical technique used for each formulated hypothesis.

Hypotheses	
H1: Referral source on shopping cart abandonment	Chi square test (χ^2) H ₀ : O _i =E _i H ₁ : O _i ≠E _i
H2: Shopping pages on shopping cart abandonment	One-sided independent samples t-test H ₀ : $\mu_1 \leq \mu_2$ H ₁ : $\mu_1 > \mu_2$
H3: Product variety on product placement stage abandonment	One-sided independent samples t-test H ₀ : $\mu_1 < \mu_2$ H ₁ : $\mu_1 \geq \mu_2$
H4: Time on product placement stage abandonment	One-sided independent samples t-test H ₀ : $\mu_1 < \mu_2$ H ₁ : $\mu_1 \geq \mu_2$
H5: Visitor type on information providing stage abandonment	Chi square test (χ^2) H ₀ : O _i =E _i H ₁ : O _i ≠E _i

Table 6 – Summary of statistical techniques used for testing hypotheses

§3.4 Reliability

As mentioned before, log files register all requests made by visitors on a website. The accuracy and richness of this data itself significantly reduces the risks of biased validity and reliability. Moreover, the elimination of web crawlers as described in §3.2, increases the reliability of this data. Due to the type of data used in this research we have not measured reliability. In §3.2.5 we have measured visitor type (new vs returning) based on cookie identification and IP address. For this measure we have assumed that a single IP address or cookie equals an individual, and an individual use one IP address or cookie to shop online. We have to make this assumption as it is possible that multiple individuals visit the store via one IP address (i.e. one computer) and that it is also possible that an individual visit the online store via multiple IP addresses (i.e. more than one computer).

4. Results

In this chapter we will discuss the results of the hypotheses as formulated in the theoretical framework. The first paragraph contain a summary of the dataset (§4.1). The second paragraph contain the discussion of the results found for the formulated hypotheses (§4.2). The last paragraph provides an overview of the results found and their statistical significances (§4.3).

§4.1 Dataset

The dataset contain the exported server log files of company X in the period of 31st of May 2010 until 31st of August 2010. During this period we have reported 20.752 visitors on the website of which 14.347 unique visitors and 6.378 returning visitors. Table 7 provides an overview of the visitor characteristics for the final dataset. We have reported 3.396 visitors that used their shopping cart. Therefore, our final dataset contain 16% of the total reported visitors (shopping cart users/total visitors) on the website of company X.

Visitors company X	Absolute number	Percentage
Total number of shopping cart users	3.396	100%
Number of new visitors	1.986	58%
Number of returning visitors	1.413	42%

Table 7 – Frequency statistics of final dataset

§4.2 Results hypotheses

In the next paragraphs we will discuss the outcome of the formulated hypotheses based on the dataset of company X. We used SPSS 17 in order to apply the statistical techniques as described in chapter four. All the generated output for each hypothesis can be found in the appendix.

§4.2.1 Hypothesis 1: referral source on shopping cart abandonment

For the first hypothesis we are interested in the relationship between visitors' referral source and shopping cart abandonment. The table below provides an overview of frequency statistics in order to gain a more complementary picture of shopping cart abandonment and referral sources used³.

³ Note that 18,6% of the visitors who used their shopping cart enter the store directly or through other sources

Based on this table we can conclude that a majority of visitors abandon their shopping cart (70,7%). Moreover, a large group of visitors who used their shopping cart coming through search engines (69,4%)

	N	%
Shopping cart abandonment	2.401	70,7%
No shopping cart abandonment	995	29,3%
Search engine	2.356	69,4%
Comparison	408	12,0%

Table 8 – General frequency statistics of shopping cart abandonment and referral source

We have applied chi square test (χ^2) in order to measure whether there are significant differences between source used and shopping cart abandonment. It appears that there is a significant difference between visitors coming through search engines and visitors coming through comparison sources regarding their shopping cart abandonment behavior. Visitors coming through search engines abandon their shopping cart more often (73%), than visitors coming through comparison sources (55%). Based on the chi square test (χ^2) we have found significant evidence that H_1 is supported. (Chi-square=55,3; df=1; $p<0,001$).

			CARTABEND		Total
			No abandonment	Abandonment	
SOURCE	Search engine	Count	624	1732	2356
		% within SOURCE	26,5%	73,5%	100,0%
	Comparison	Count	182	226	408
		% within SOURCE	44,6%	55,4%	100,0%

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	55,291 ^a	1	,000		
Continuity Correction ^b	54,417	1	,000		
Likelihood Ratio	51,869	1	,000		
Fisher's Exact Test				,000	,000
Linear-by-Linear Association	55,271	1	,000		
N of Valid Cases	2764				

Table 9 – SPSS output: chi square test (χ^2) for H_1

§4.2.2 Hypothesis 2: shopping pages viewed on shopping cart abandonment

In the prior paragraph we found a relationship between source used in the pre-visit stage of the online shopping process and shopping cart abandonment. We also expect a relationship between shopping pages viewed during the visit stage of the online shopping process and shopping cart abandonment. Based on the theory we expect that visitors who viewed less shopping pages are more likely to abandon their shopping cart, while visitors who viewed more shopping pages are less likely to abandon their shopping cart.

CARTABEND		N	Mean	Std. Deviation	Std. Error Mean
SHOPPAG	No abandonment	995	14,0744	16,51347	,52351
	Abandonment	2401	7,4061	9,13188	,18636

	Levene's Test for Equality of Variances	t-test for Equality of Means								
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
SHOPPAG	Equal variances assumed	330,968	,000	15,010	3394	,000	6,66829	,44424	5,79728	7,53930
	Equal variances not assumed			12,000	1253,562	,000	6,66829	,55569	5,57810	7,75849

Table 10 – SPSS output: independent samples t-test for H2

We have conducted independent samples t-test in order to test whether the means of both groups (shopping pages viewed) significantly differ regarding their shopping cart abandonment behavior. According to the output we can conclude that visitors who have abandoned their shopping cart have viewed less shopping pages (mean=7), while visitors who have not abandoned their shopping cart have viewed more shopping pages (mean=14). We can conclude that we found significant evidence that H2 is supported; $t=12$, $df= 1253,56$, $p<0,025$, not assuming equal variances.

§4.2.3 Hypothesis 3: product variety on product stage abandonment

According to theory we expect that visitors have divergence motivations to use their shopping cart. We have concluded that visitors are more likely to abandon their shopping cart at the product placement stage, when they use it as a shopping organizational and research tool. The table below shows that 35,6% of shopping cart abandonments occurs at the product stage.

Stages of the check-out process	N	%
Product abandonment	855	35,6%
Information abandonment	1.171	48,8%
Payment abandonment	375	15,6%

Table 11 – General frequency statistic abandonment stages

We expect that visitors who are characterized by high levels of product variety are more likely to use their shopping cart to compare products or creating consideration set for future purchases (i.e. no current purchase intention). Moreover, visitors who are characterized by low levels of product variety (i.e. focused search pattern) are more likely to use their shopping cart for current purchases.

PRODABEND		N	Mean	Std. Deviation	Std. Error Mean
PRODVAR	No	2541	,1655	,52607	,01154
	Yes	855	,2653	,55302	,02166

	Levene's Test for Equality of Variances	t-test for Equality of Means								
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
PRODVAR	Equal variances assumed	36,474	,000	-4,178	2729	,000	-,09987	,02391	-,14675	-,05300
	Equal variances not assumed			-4,070	1046,516	,000	-,09987	,02454	-,14803	-,05172

Table 12 – SPSS output: independent samples t-test for H3

According to the t-test we can conclude that visitors who are characterized by high levels of product variety (mean=0,27) indeed abandon their shopping cart at the product stage. Visitors who proceeded to next stages of the check-out process are characterized by lower levels of product

variety (mean=0,17).Based on the output we can conclude that we have found significant evidence for the support of H3; $t=4$, $df= 1046,52$, $p<0,025$, not assuming equal variances.

§4.2.4 Hypothesis 4: average time spent on product stage abandonment

We have found significant evidence that visitors who are characterized by high levels of product variety are more likely to abandon their shopping cart at the product placement stage. We also expect that these visitors spend more time at the product placement stage as they are building their consideration set. Visitors who are near buying are expected to spend less time at the product placement stage, as their search process is reaching an end.

PRODABEND		N	Mean	Std. Deviation	Std. Error Mean
TIME	No	2541	0:00:22.869	0:01:00.827	0:00:01.208
	Yes	855	0:00:54.293	0:02:25.454	0:00:06.242

	Levene's Test for Equality of Variances	t-test for Equality of Means								
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
TIME	Equal variances assumed	113,416	,000	-8,074	3077	,000	-0:00:31.424	0:00:03.892	-0:00:39.055	-0:00:23.793
	Equal variances not assumed			-4,943	583,175	,000	-0:00:31.424	0:00:06.358	-0:00:43.911	-0:00:18.937

Table 13 – SPSS output: independent samples t-test for H4

According to the t-test we can conclude that visitors who have abandoned their shopping cart at the product stage indeed spent more time at the product stage (mean=54 seconds) than visitors who proceeded to next stages (mean=22 seconds). Therefore, we found significant evidence for the support of H4; $t=4$, $df= 583,18$, $p<0,025$, not assuming equal variances.

§4.2.5 Hypothesis 5: visitor type information stage abandonment

In §4.1 we have shown that the majority of visitors at the website of company X are unique. Moreover, we also concluded that new visitors represent 57% of shopping cart users (vs. 43% returning visitors). We are interested in the relationship between visitor type and shopping cart abandonment behavior. The table below provides an overview of visitor type and their shopping cart abandonment behavior.

Visitor type	No abandonment		Abandonment		Total	
	N	%	N	%	N	%
New visitor	476	24%	1.507	76%	1.983	100%
Returning visitor	519	37%	894	63%	1.413	100%

Table 14 – Overview of visitor type and shopping cart abandonment

According to theory we expect that differences among visitor type regarding shopping cart abandonment especially become prevalent at the information providing stage. We have stated that new visitors are more likely to abandon their shopping cart at the information providing stage than returning visitors.

We have conducted chi square test (χ^2) and found evidence that there is a significant difference between visitor type regarding information providing stage abandonment (Chi-square=102,6; df=2; p<0,001). New visitors (53,9%) are more likely to abandon their shopping cart at the information providing stage than returning visitors (35,5%). Therefore, we found evidence for the support of H5.

			INFOABEND		Total
			No	Yes	
VISITOR	New	Count	675	788	1463
		% within VISITOR	46,1%	53,9%	100,0%
	Returning	Count	695	383	1078
		% within VISITOR	64,5%	35,5%	100,0%

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	83,959 ^a	1	,000		
Continuity Correction ^b	83,222	1	,000		
Likelihood Ratio	84,741	1	,000		
Fisher's Exact Test				,000	,000
Linear-by-Linear Association	83,926	1	,000		
N of Valid Cases	2541				

Table 15 – SPSS output: chi square test (χ^2) for H5

§4.3 Summarization of results

In this chapter we used multiple statistical techniques in order to find support for the formulated hypotheses in the theoretical framework. The table below provides an overview of the formulated hypotheses and results found in this chapter. In the next chapter we will review the results and discuss the significance for both science and managers at online stores.

Hypotheses	Result
H1 Shoppers coming through search engines are more likely to abandon their shopping cart than shoppers coming through comparison sources.	Supported
H2 Visitors who are characterized by lower levels of shopping pages viewed are more likely to abandon their shopping cart than visitors who are characterized by higher levels of shopping pages viewed.	Supported
H3 Visitors who are characterized by high levels of product variety are more likely to abandon their shopping cart at the product placement stage of the check-out process, than visitors who are characterized by low levels of product variety.	Supported
H4 Visitors who spend more time at the product placement stage of the check-out process are more likely to abandon their shopping cart at the product placement stage of the check-out, than visitors who spend less time at the product placement stage of the check-out process.	Supported
H5 New visitors are more likely to abandon their shopping cart at the information providing stage of the check-out process than returning visitors	Supported

Table 16 – Summarization of hypotheses and results

5. Conclusion and discussion

The results found for the formulated hypotheses will be first discussed in the conclusions. (§5.1). In the next paragraph we will reflect on these findings with comparable prior research (§5.2). Thereafter, we will point out the relevant contributions to both science (§5.3) and managers at online stores (§5.4). The final paragraph contain limitations to this research and suggestions for future research (§5.5).

§5.1 Conclusions

The goal of this study has been to provide more knowledge on the relationship between visitors' navigational patterns and shopping cart abandonment behavior at online stores. In general we can conclude that majority of visitors who used their shopping cart, eventually abandoned their shopping cart (70,7%). Throughout this research we have focused on answering the main research question: "What is the relationship between visitors' navigational patterns and shopping cart abandonment behavior?". We applied the consumer-decision making model of Peter & Olson (2005) and found navigational patterns that relate to shopping cart abandonment behavior and to different stages of shopping cart abandonment: product placement stage and information providing stage.

First we analyzed visitors' search behavior in the pre-visiting stage of the online shopping process. We found that a large group of visitors who used their shopping cart, enters the online store through search engines (70%). Theory suggested that these visitors are more likely to abandon their shopping cart than visitors coming through comparison sources. We found significant evidence to support H1 that visitors coming through search engines (73%) more often abandon their shopping cart than visitors coming through comparison sources (55%). During the visiting stage of the online shopping process we found that the number of shopping pages viewed, significantly differ among visitors who have abandoned their shopping cart or not (H2). Shopping cart abandonment is most likely among the visitors who are characterized by lower levels of shopping pages viewed (mean=7). Moreover, visitors who made a transaction are characterized by higher levels of shopping pages viewed (mean=14). Besides the number of shopping pages viewed, we also found a relationship

between the content of pages viewed and shopping cart abandonment behavior at the product placement stage. We found (H3) that visitors who are characterized by high levels of product variety (e.g. viewed different product pages) are more likely to abandon their shopping cart at the product placement stage. In addition, it appears that these visitors also spend more time at the product placement stage (H4). Visitors who proceed to next stages of the check-out process spend less time at the product placement stage (H4) and are characterized by lower levels of product variety (H3).

Based on prior research we also expected a relationship between visitor type and shopping cart abandonment stages. If we analyze visitor type of online store X, we can conclude that new visitors (58%) represent the largest group of shopping cart users (vs. returning 42%). Moreover, new visitors (76%) more often abandon their shopping cart than returning visitors (63%). We suggested that new visitors are more likely to abandon their shopping cart at the information providing stage than returning visitors (H5). We found significant evidence for the support of H5; new visitors (54%) are more likely to abandon their shopping cart at the information stage than returning visitors (36%).

§5.2 Discussion

Our findings on the relationship between the use of referral sources in the pre-visit stage of the online shopping process and shopping cart abandonment, complement the study of Detlor et al. (2003). This study suggested that goal-driven visitors often use differentiating tools (comparison sources) and experiential-driven often use starting tools (search engines). Prior research found that goal-driven visitors view more shopping pages than experiential-driven visitors during the visit stage of the shopping process (Bucklin and Sismeiro, 2003; 2004; Van den Poel and Buckinx, 2005). In this study we found that visitors who have viewed more shopping pages are more likely to buy a product, while visitors who have viewed less shopping pages are more likely to abandon their shopping cart. Therefore, we support the notion of Kukar-Kinney & Close (2009) who suggest that experiential-driven shoppers are more likely to abandon their shopping cart since they use it for hedonic purposes rather than utilitarian purposes. They found that besides current purchase intention, visitors also use their shopping cart as a shopping research and organizational tool at the product placement stage of

the check-out process. These visitors create a 'wish list' of items, bookmark items for potential future purchases, obtain total costs or narrow down items for further evaluation.

Our findings on product placement stage abandonment complement the theory that visitors use their shopping cart as a shopping research and organizational tool. According to Moe (2003), visitors who are near buying are characterized by focused search patterns, while visitors who are building their consideration set for future purchases are characterized by search across different products. We found that visitors who abandoned their shopping cart at the product placement stage are browsing through different product pages, while visitors who proceeded to next stages show more focused search patterns. In addition, we found that visitors who abandoned their shopping cart at the product placement stage, significantly spent more time at this stage than visitors who proceeded to next stages.

Prior research on shopping cart abandonment found that this phenomenon is influenced by psychological factors such as perceived risk regarding privacy of personal information and online stores' security system (Cho et al., 2006; Moore & Matthews, 2006; Rajamma et al., 2009). These factors especially become prevalent during the information providing stage of the check-out process (Kukar-Kinney & Close, 2009; Rajamma et al., 2006). Based on the theory we expected significant difference among visitor type regarding the abandonment at the information providing stage of the check-out process. We found that new visitors are more likely to abandon their shopping cart at the information providing stage than customers. This is consequent with the theory of Miazaki & Fernandez (2001), who concluded that new visitors are likely to perceive more risk regarding the online stores' privacy infringement (e.g. sharing personal information with third parties, tracking of shopping habits, being contacted without permission) and the security system (e.g. fraudulent behavior, potential for non-delivery of ordered goods).

In this study we have not identified navigational patterns that might influence shopping cart abandonment at the payment/confirmation stage. According to the study of Rajamma et al. (2006),

we expect that shopping cart abandonment at the payment/confirmation stage is influenced by perceived transaction inconvenience (e.g. inconvenience regarding payment method, order forms).

§5.3 Theoretical implications

Several studies have shown that enormous potential exist in studying online shoppers' behavior as they navigate from page to page (Moe, 2003; Moe & Fader, 2004; Sismeiro & Bucklin; 2004, Van den Poel & Buckinx , 2005). However, prior research on shopping cart abandonment behavior mainly focused on the influence of psychological factors on this phenomenon (Cho et al., 2006; Moore & Matthews, 2006; Rajamma et al., 2009). This research expanded the topic of shopping cart abandonment behavior and found significant relationships between navigational patterns and shopping cart abandonment.

Our findings complement the theory that online shoppers use their shopping cart for current purchase intention and as a shopping research and organizational tool. This indicates that, comparable to traditional retail settings, online shopping carts are more than a functional holding space for purchases. We can also conclude that it is interesting to study the relationship between what visitors are exposed to, and how this relate to shopping cart abandonment behavior. Furthermore, a general notion is that research of consumer behavior in the offline world often depends on surveys, experiments or purchase tracking. The online world offers possibilities to collect unbiased and widespread data on online consumer behavior. Due to the richness of this data, researchers might also provide insights for consumer behavior in the offline world.

§5.4 Managerial implications

Online store managers invest time, effort and resources in order to sell their products or services to their consumers. However, they are still faced with a majority of visitors who abandon their shopping cart. Understanding shopping cart abandonment is important for online retailers, as it could mean the difference between a profitable online store or lost sales. The findings in this research has practical implications for marketers, developers and managers at online stores.

Our findings indicate that visitors coming through search engines are more likely to abandon use their shopping cart for hedonic purposes, while visitors coming through comparison sources are more likely to use it for utilitarian purposes. These findings indicate the importance of presenting the online stores' products on as many comparison websites. Moreover, online stores can develop 'dynamic' homepages. These homepages can focus on hedonic aspects (e.g. price promotions) once a visitor coming through a search engine, or focus on utilitarian aspects (e.g. fast check-outs) once a visitor enters through comparison sources.

Our findings indicate that it is important for online stores to realize that online shopping carts are a part of the online shopping experience, rather than only a functional holding space for purchases. We suggest that besides current purchase intention, shopping carts are also used as a shopping organizational and research tool. These visitors use their shopping cart as 'wish list' of items for potential future purchases, a tool to obtain total costs or narrow down items for further evaluation. Therefore, the design of the shopping cart should contain more than a functional holding space for current purchases. Based on these findings we have developed practical implications for the design of a shopping cart⁴:

Comparison function

Online shoppers may use their shopping cart at the product placement stage as a comparison tool or to narrow down items for further evaluation.

Therefore we propose that the shopping cart at the product placement stage should contain clear pictures, descriptions and prices of the items selected.

Recommendation function

Make the shopping cart part of the online shopping experience. Allow online shoppers to easily return to the page where they found the selected items. Implement a recommendation function of similar items on the product stage of the check-out process in order to easily evaluate alternatives.

⁴ Appendix 5.7.3 provides an overview of examples for the design of a shopping cart.

Save function

Allow online shoppers to save their selected items. By implementing a save function, online shoppers are able to continue evaluating their consideration set during another visit or to make 'wish lists' for future purchases.

Guest check-out

We found that online shoppers often abandon their shopping cart at the information stage. At this stage online shoppers often have to become client in order to proceed to the payment stage. Implementing a guest check-out allows online shoppers not to become a client of the online store, and thereby reducing perceived risk regarding privacy of personal information (e.g. sharing with third parties, being contacted by the online store without permission).

Total costs and security function

Online shoppers may use their shopping cart to obtain total cost. Implement total costs at the product stage of the check-out process, which also includes additional (shipping) costs. Clearly state the delivery policies and badges of payment security before the information and payment stage. Online shoppers may perceive risk regarding the security system of the online store, which can be reduced by showing delivery policies and badges of payment security before the information and payment stage.

§5.5 Limitations and future research

An important notion concerning this research is the nature of clickstream data. Based on the used server log files of company X, we were able to analyze visitors' requested pages along the check-out process. However, server log files do not contain information about item(s) selected in the shopping cart. Therefore, we suggest that future research could focus on the relationship between item(s) selection and shopping cart abandonment.

While several researchers examined demographics, such as age and gender as predictors of online consumer behavior, none of prior research analyzed the influence of gender and age on shopping cart abandonment behavior. Future research might examine this relationship along the item(s) selected in the shopping cart. Moreover, we suggest that future research could combine real

online store behavior with self-report. What is the opinion of the online shoppers regarding the online stores' check-out process? Why do they abandon a certain product at a certain time?

As several studies has focused the influence of navigational patterns on purchase behavior over time (Bucklin & Sismeiro, 2003; Van den Poel and Buckinx, 2005), it might be interesting for future research to gain more knowledge on shopping cart usage over time. In this way, research could provide insights on for example 'wish lists' made and item(s) purchased from the wish list. Finally, the study of Vijayasathy, 2002, concluded that online shoppers have different internet shopping intentions based on product type offered by the online store. Therefore, future research could focus on the differences in shopping cart abandonment along store type (e.g. computer hardware vs clothing).

6. Bibliography

- Arnold, M. & Reynolds, K. (2003). "Hedonic shopping motivations". *Journal of Retailing*, Vol. 79, No. 2, pp. 77-95
- Bridges, E. & Florsheim, R. (2008), "Hedonic and utilitarian shopping goals: the online experience". *Journal of Business research*, Vol. 61, pp. 309-314.
- Bucklin, R.E. & Sismeiro, C. (2003), "A model of web site browsing behavior estimated on clickstream data". *Journal of Marketing Research*, Vol. XL, pp. 249-267
- Bucklin, R.E. & Sismeiro, C. (2004), "Modeling purchase behavior at an e-commerce web site: a task-completion approach". *Journal of Marketing Research*, Vol. XLI, pp. 306-323
- Cho, C.H., Kang, J. & Cheon, H.J. (2006), "Online shopping hesitation". *Cyber Psychology and Behavior*, Vol 9, No. 3, pp. 261-274
- Choi, Y. & Park, J. (2006). "Multichannel retailing in Korea: effects of shopping orientations and information seeking patterns on channel choice behavior". *International Journal of Retail & Distribution Management*, Vol. 34, No 8, pp. 577-596.
- Constantinidis, E. (2004). "Influencing the online consumer's behavior: the web experience". *Internet Research*, Vol. 14, pp. 111-126
- Cooper, D.R. & Schindler, P.S. (2006) *Business research methods*. McGraw-Hill Education. New York
- Dellaert, B.G.C. & Kahn, B.E. (1999), "How tolerable is delay?: consumers' evaluation of internet web sites after waiting". *Journal of Interactive Marketing*, Vol. 13, pp. 41-54
- Detlor, B., Sproule, S. & Gupta, C. (2003), "Pre-purchase online information seeking: search vs browse". *Journal of Electronic Commerce Research*, Vol. 4, No. 2, pp. 72-84
- Forrester Research (2009), "The state of retailing online". Cambridge: Forrester Research.
- Grabner-Krauter, S. (2002), "The role of consumers' trust in online shopping". *Journal of Business Ethics*, Vol. 39, No. 1, pp. 43-50
- Hoffman, D.L. & Novak, T.P. (1996). "Marketing in hypermedia computer-mediated environments: conceptual foundations". *Journal of Marketing*, Vol. 60, pp. 50-68.

Kaufman, C. & Lindquist, J.D. (2002). "E-shopping in a multiple channel environment". *Journal of Consumer Marketing*, Vol. 19, No. 4, pp. 333-350

Kotler, P. (2003). *Marketing Management*. Pearson Education. NJ: Prentice-Hall

Kukar-Kinney, M. & Close, A.G. (2009), "The determinants of consumers' online shopping cart abandonment". *Journal of the Academy of Marketing Science*, Vol. 38, No. 2, pp. 240-250

Kukar-Kinney, M. & Close, A.G. (2010), "Beyond buying: motivations behind consumers'online shopping cart use". *Journal of Business Research*, Vol. 63, pp. 986-992

Lee, J., Podlaseck, M., Schonberg, E. & Hogh, R. (2001) "Visualization and analysis of clickstream data of online stores for understanding web merchandising". *Data Mining and Knowledge Discovery*, Vol.5, pp. 59-84.

Mathwick, C. Malholtra, N., Rigdon, E. (2001). "in Experiential value: conceptualization, measurement and application the catalog and internet shopping environment". *Journal of Retailing*, Vol. 77, pp. 39-56.

Myazaki, A.D. & Fernandez, A. (2001). "Consumer perceptions of privacy and security risks for online shopping". *Journal of Consumer Affairs*, Vol. 35, pp. 27-44

Moe, W. (2003), "Buying, Searching, or Browsing; Differentiating between online shoppers using-in-store navigational clickstream". *Journal of Consumer Psychology*, Vol. 13, pp. 29-39

Moe, W. & Fader, P.S., (2004), "Dynamic conversion behavior at e-commerce sites". *Management Science*, Vol. 50, No. 3, pp. 326-335

Moore, S. & Mathews, S. (2006), "An exploration of online shopping cart abandonment syndrome: A matter of risk and reputation". *Journal of Website Promotion*, Vol.2, pp.71-88

Novak, T.P. & Hoffman, D.L. (2003). "The influence of goal-directed and experiential activities on online flow experiences". *Journal of Consumer Psychology*, Vol, 13, pp. 3-16

Peter, J.P. & Olson, J.C. (2005), "*Consumer behavior and marketing strategy*", New York: McGraw-Hill/Irwin

- Peterson, A.P. & Merino, M.C. (2003), "Consumer information search behavior and the internet". *Psychology & Marketing*, Vol. 20, No. 2, pp. 99-121
- Rajamma, R.K., Paswan, A.K. & Hossain, M.M., (2009), "Why do shoppers abandon shopping cart? Perceived waiting time, risk, and transaction inconvenience" *Journal of Product & Brand Management*, Vol. 18, pp. 188-197
- To, P-L., Liao, C. & Lin, T-H. (2007). "Shopping motivations on the internet: a study based on utilitarian and hedonic value". *Technovation*, Vol, 27, pp. 774-787
- Van den Poel, D. & Buckinx, W. (2005), "Predicting online-purchase behavior". *European Journal of Operational Research*, Vol. 166, pp. 557-575
- Vijayarathy, L.R. (2002). "Product characteristics and internet shopping intentions". *Internet Research*, Vol. 12, pp. 411-426
- Wolfenbarger, M. & Gilly, C.G. (2001), "Shopping online for freedom, control and fun". *California Management Review*, Vol. 43, No. 2, pp. 34-55

7. Appendix

§7.1.1 Output for hypothesis 1

			CARTABEND		Total
			No abandonment	Abandonment	
SOURCE	Search engine	Count	624	1732	2356
		Expected Count	687,0	1669,0	2356,0
		% within SOURCE	26,5%	73,5%	100,0%
		% within CARTABEND	77,4%	88,5%	85,2%
		% of Total	22,6%	62,7%	85,2%
	Comparison	Count	182	226	408
		Expected Count	119,0	289,0	408,0
		% within SOURCE	44,6%	55,4%	100,0%
		% within CARTABEND	22,6%	11,5%	14,8%
		% of Total	6,6%	8,2%	14,8%
Total	Count	806	1958	2764	
	Expected Count	806,0	1958,0	2764,0	
	% within SOURCE	29,2%	70,8%	100,0%	
	% within CARTABEND	100,0%	100,0%	100,0%	
	% of Total	29,2%	70,8%	100,0%	

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	55,291 ^a	1	,000		
Continuity Correction ^b	54,417	1	,000		
Likelihood Ratio	51,869	1	,000		
Fisher's Exact Test				,000	,000
Linear-by-Linear Association	55,271	1	,000		
N of Valid Cases	2764				

§7.1.2 Output for hypothesis 2

CARTABEND		N	Mean	Std. Deviation	Std. Error Mean
SHOPPAG	No abandonment	995	14,0744	16,51347	,52351
	Abandonment	2401	7,4061	9,13188	,18636

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
SHOPPAG	Equal variances assumed	330,968	,000	15,010	3394	,000	6,66829	,44424	5,79728	7,53930
	Equal variances not assumed			12,000	1253,562	,000	6,66829	,55569	5,57810	7,75849

§7.1.3 Output for hypothesis 3

PRODABEND		N	Mean	Std. Deviation	Std. Error Mean
PRODVAR	No	2541	,1655	,52607	,01154
	Yes	855	,2653	,55302	,02166

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
PRODVAR	Equal variances assumed	36,474	,000	-4,178	2729	,000	-,09987	,02391	-,14675	-,05300
	Equal variances not assumed			-4,070	1046,516	,000	-,09987	,02454	-,14803	-,05172

§7.1.4 Output for hypothesis 4

PRODABEND		N	Mean	Std. Deviation	Std. Error Mean
TIME	No	2541	0:00:22.869	0:01:00.827	0:00:01.208
	Yes	855	0:00:54.293	0:02:25.454	0:00:06.242

	Levene's Test for Equality of Variances	t-test for Equality of Means								
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
TIME	Equal variances assumed	113,416	,000	-8,074	3077	,000	-0:00:31.424	0:00:03.892	-0:00:39.055	-0:00:23.793
	Equal variances not assumed			-4,943	583,175	,000	-0:00:31.424	0:00:06.358	-0:00:43.911	-0:00:18.937

§7.1.5 Output for hypothesis 5

			INFOABEND		Total
			No	Yes	
VISITOR	New	Count	675	788	1463
		Expected Count	788,8	674,2	1463,0
		% within VISITOR	46,1%	53,9%	100,0%
		% within INFOABEND	49,3%	67,3%	57,6%
		% of Total	26,6%	31,0%	57,6%
	Returning	Count	695	383	1078
		Expected Count	581,2	496,8	1078,0
		% within VISITOR	64,5%	35,5%	100,0%
		% within INFOABEND	50,7%	32,7%	42,4%
		% of Total	27,4%	15,1%	42,4%
Total	Count	1370	1171	2541	
	Expected Count	1370,0	1171,0	2541,0	
	% within VISITOR	53,9%	46,1%	100,0%	
	% within INFOABEND	100,0%	100,0%	100,0%	
	% of Total	53,9%	46,1%	100,0%	

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	83,959 ^a	1	,000		
Continuity Correction ^b	83,222	1	,000		
Likelihood Ratio	84,741	1	,000		
Fisher's Exact Test				,000	,000
Linear-by-Linear Association	83,926	1	,000		
N of Valid Cases	2541				

§7.2 List of tables and figures

Table 1 - Summary of prior research on shopping cart abandonment.....7

Table 2 – Overview of the variables in the conceptual model16

Table 3 – Shopping cart abandonment variables18

Table 4 – Source with registered URL19

Table 5 – Summary of variables measured20

Table 6 – Summary of statistical techniques used for testing hypotheses21

Table 7 – Frequency statistics of final dataset22

Table 8 – General frequency statistics of shopping cart abandonment and referral source23

Table 9 – SPSS output: chi square test (χ^2) for H123

Table 10 – SPSS output: independent samples t-test for H224

Table 11 – General frequency statistic abandonment stages25

Table 12 – SPSS output: independent samples t-test for H325

Table 13 – SPSS output: independent samples t-test for H4.....26

Table 14 – Overview of visitor type and shopping cart abandonment27

Table 15 – SPSS output: chi square test (χ^2) for H5.....27

Table 16 – Summarization of hypotheses and results.....28

Figure 1 – Check-out funnel5

Figure 2 – Abandonment stages.....6

Figure 3 - Purchase-decision making model (Peter & Olson, 2005)8

Figure 4 – Conceptual model shopping cart abandonment16