Yasmine Bal

Consumer mobility as a result of e-commerce

A structural equation modelling approach to estimate consumer mobility from shopping attitude and orientation preferences

TU Delft

Kennisinstituut voor Mobiliteitsbeleid

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A structural equation modelling approach to estimate consumer mobility from shopping attitude and orientation preferences

By

Yasmine Bal

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Supervisor:	Prof. dr. ir. S.P. Hoogendoorn	TU Delft
Thesis committee:	Dr. ir. R. van Nes,	TU Delft
	Dr. ir. M. Kroesen,	TU Delft
	Dr. ir. S. Hoogendoorn-Lanser,	Kennisinstituut voor Mobilteitsbeleid
	Ir. M.C. de Haas,	Kennisinstituut voor Mobilteitsbeleid

Preface

A technical approach to problems in the daily affairs of the civilized world is what entails Civil Engineering. Shopping is a part of daily business, however not obviously recognised as a problem in civil engineering. Indeed, the activity of shopping is a rather commercial issue, yet processes supporting shopping are of public interest in the civilized world and influence the way we move through the world around us. The places where we shop, the vehicle we use to get there and the route we take in order to perform the act of shopping are typically transport-related topics. Getting the right amount of goods in time at places where people shop is a logistics matter. These aspects justify shopping as a problem area related to Civil Engineering. During my master's program Transport, Infrastructure and Logistics, I studied several aspects of shopping.

From that point of view, the initial project description 'The impact of e-commerce on city traffic flows: an exploration' personally interested me a lot. The focus on e-commerce fits my interests and educational background very well. With a bachelor in Industrial Design Engineering, a product is more than just a thing to me – it is meant to serve the consumer with a specific need. In my vision, customer needs go beyond merely possessing a product. Using, buying and in some cases updating the product are part of the functionalities and service a manufacturer should offer to consumers. E-commerce is a means to serve the needs of customers. The consumer has been very important in my previous education and work – also in this thesis the consumer is central.

Another returning aspect from the bachelor is the iterative working process, instead of working linearly. In many courses and projects in both education programs, the idea of iterative processes was explained and emphasized, however it was never realized. The time span of the thesis allowed the iterative process to actually get to practice for the first time.

What has not been emphasized during previous education is doing research. In my experience the study programs are rather business-oriented instead of research-oriented. It was an explicit choice to perform the thesis in a research environment, to test whether a career in research would suit me. Kennisinstituut voor Mobiliteitsbeleid (KiM) was a very fruitful place to do so, as most of the institutes employees have an impressive background in research. The test was successful, yet with a negative outcome: I'd rather investigate a box of building blocks to actually create a construction, instead of identifying and analysing the composition of blocks in the box. Nevertheless, the months in this research environment were very pleasant. The struggles I encountered during the study process were recognised by many colleagues, which was comforting in hard times.

Overall I can say that although the project was not always fun, the topic ever suited my interest and educational career well. In the end, I am proud to present you this thesis. With minor to none experience in research and statistics, an interesting set of results was generated that confirm hypotheses and stereotypical images. Women who question themselves whether their shopping behaviour is excessive, spouses and parents who believe so, and all other interested readers – please find an analysis of consumer behaviour and mobility in this report.

Summary

In the Netherlands approximately one fifth of the total number of shopping trips is spent on shopping, together accounting for 8 percent of the kilometres travelled. The share of shopping trips with respect to the totality of trips declines, whereas e-commerce turnover in the Netherlands keeps growing. The Dutch consumer purchased products online increasingly frequent in the past decades – 46.4 percent bought any goods online in a time span of three months in 2012, compared to 62.0 percent in 2017. Although these parallel developments suggest that e-commerce and consumer mobility are negatively related, a closer study is required. The use of Internet as a shopping medium influences the mobility pattern of consumers, as with the rise of e-commerce an alternative to traditional shopping was offered which makes a trip to a store unnecessary. Although this substitutional effect seems straightforward (Mokhtarian, 2004), previous research results are ambiguous: indeed some scholars report a reduction in shopping trips due to online shopping (Cao et al., 2012), others found evidence for the complementarity effect – the total number of shopping trips would have increased since e-commerce has grown (Farag et al., 2007; Weltevreden & Rietbergen, 2007). Most previous quantitative studies however reported a neutral effect (Rotem-Mindali & Weltevreden, 2013). To understand the phenomenon of e-commerce and to create adequate policy to pursue the aim of the Dutch government to create a liveable and reachable country, policy makers require insight in the impact of e-shopping on consumer mobility.

The research goal is to provide insight in the effects of e-commerce on consumer mobility. This study presents a model constructed from consumer behavioural theories and previous mobility studies in order to explain consumer mobility in the appearance of shopping frequency, approaching the problem from the consumer's perspective. The main research question answered in this thesis is: 'How could shopping attitude and orientation preferences explain consumer mobility?'. To answer this question, offline shopping frequency is compared against online shopping frequency. Moreover, various product categories are differentiated for which different results were found.

A literature review is performed in order to assess existing literature on their contribution to the research question, as well as to recognise concepts relevant in explaining consumer mobility. The theory is used to construct a conceptual model, which serves as a framework for quantitative analyses throughout the thesis. In the transition from traditional shopping to e-commerce, consumer behavioural studies have developed in two directions: commercial consumer behaviour and consumer mobility studies. Consumer behaviour describes the psychological processes such as considerations people have when shopping and what triggers them to purchases certain products. Consumer behaviour is explained by means of the concept shopping attitude in the form of shopping value – what values are important for people in shopping? Hedonic shopping value is distinguished from utilitarian shopping value (Babin et al., 1994). Hedonic shopping value describes the extent to which consumers experience positive feelings such as joy and arousal from the activity of shopping. Utilitarian shopping value is the rather practical counterpart – amongst others efficiency in terms of money and time is an important driver for consumer behaviour. People who enjoy shopping are likely to shop more often in general, but especially in an offline retail environment (Cao et al., 2010). People adhering to utilitarian shopping value are theoretically expected to prefer online shopping (Zhen et al., 2018). The preference for offline or online shopping could apply in various stages of the shopping process. Roughly three stages are recognised in literature: pre-purchase or orientation, purchase, post-purchase or follow-up services. Many mobility studies research the first two phases. The consumer tends to maintain to the medium he started the shopping process with, as many scholars agreed (Cao et al., 2010; Cao et al., 2012; Farag et al, 2007). The mobility studies provide insight in consumer mobility metrics and characteristics, such as the number of shopping trips, distance travelled and model split. A missing link in existing consumer

behaviour studies is how shopping attitude is related to the shopping process. The effects of shopping value on orientation preferences, as well as the effects of both concepts on consumer mobility are the main concern in this thesis.

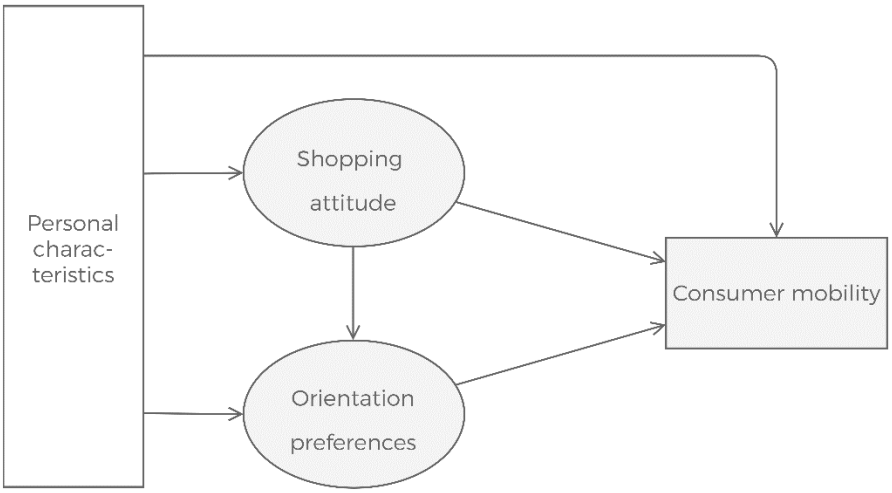

Figure i Conceptual model

Consumer behaviour is different for various product classes. Related to e-commerce, literature typically distinguishes four product classes (Peterson et al., 1997): search goods, experience goods, credence goods and commodity goods. Search goods such as books or CDs are typically suitable for e-commerce (Rotem-Mindali & Weltevreden, 2013), as the information required for buying is available on the Internet in the same way as in the shop. Experience goods such as clothing and perfume preferably are evaluated by touching, feeling or smelling the products in a physical shop and are therefore less suitable for online sales. Credence goods are products for which relatively much expert knowledge is required before buying, for example assurances or software packages. Commodity goods are described as basic goods for daily use, such as groceries and personal care products.

Shopping attitude and orientation preferences are unobservable concepts that are hard to measure directly from a survey. A means to represent these concepts as variables in a model is by approaching them as latent constructs. In a structural equation modelling procedure, a two-step approach determines how these concepts are defined and how they are related. A model as such is controlled for relevant demographic variables. The analyses are performed in IBM SPSS software for structural equation modelling, called AMOS. The relations are tested on significance and standardised coefficients are reported. The model is evaluated on four model fit indices, as is usual for structural equation modelling studies. The data used in this study is acquired from the Netherlands Mobility Panel (Mobiliteitspanel Nederland (MPN) in Dutch) survey. A special module on e-commerce includes statements on shopping attitude and orientation preferences, as well as shopping frequency in the past three months for various product categories – both in an offline and online retail setting. From 6745 respondents, 5956 cases were selected for analysis, based on the criteria of having bought at least one product in the past three months, either offline or online. Not all statements were evaluated by all selected respondents, however missing values were imputed by means of full information maximum likelihood by AMOS software.

The first step of the modelling procedure is the measurement model, to define from covariance between statements (called indicators) what statement response can be explained by the same latent

variable. Shopping attitude is represented by the latent construct hedonic shopping value and four individual statements representing utilitarian shopping value (referred to as 'presence of employees', 'compare prices easily', 'buy fast and easy' and 'time-consciousness'). Utilitarian shopping value could not be explained by one construct, since statements describing shopping utility were much divergent in their burden. Both the indicators of the latent variable as the individual statements are of the type 'how important is it for you that …'. Concerning orientation, preference for offline orientation and preference for online orientation were recognised. Unfortunately statements concerning orientation preferences were only answered by people who bought anything online in the past three months. On top of that, offline orientation preferences for offline purchases are not represented in the statements, which are of the type 'before I buy in a shop / on the Internet …' followed by orientation activities at various physical locations.

In the second step of the modelling procedure the latent constructs are examined in relation to the dependent variable shopping frequency and control variables. Table i summarises the main results. The effects from the independent variables representing shopping value on shopping frequency are of the same order of magnitude as the effects from orientation preferences, of which the first are slightly stronger. Hedonic shopping value is positively related with shopping frequency, mainly in the offline retail environment, as well as with offline orientation preferences. Utilitarian shopping values reveal higher correlation with online shopping. Orientation preferences were found related with online shopping frequency, but not for offline purchases. The newly evaluated relationship between shopping attitude and orientation preferences appeared to be relatively strong – orientation preferences are influenced by shopping attitude. However, time-related utilitarian shopping value is not significantly related with orientation. Indirect effects from shopping value to offline and online shopping frequency are calculated as the sum of products of the relation between shopping value and orientation preferences and the relation between orientation preferences and shopping frequency.

Table i Standardised regression coefficients (p-value between brackets)

	Offline shopping frequency	Online shopping frequency	Offline orientation preferences	Online orientation preferences	Offline shopping frequency	Online shopping frequency
Independent variable	**Direct effects**				**Indirect effects**	
Hedonic shopping value	0.095 (<0.001)	0.074 (<0.001)	0.149 (<0.001)	0.075 (<0.001)	0.004	-0.005
Presence of employees	0.048 (<0.001)	-0.027 (0.048)	0.170 (<0.001)			-0.006
Compare prices easily	0.035 (0.012)		0.101 (<0.001)	0.196 (<0.001)	0.011	0.029
Buy fast and easy	0.034 (0.014)	0.040 (0.003)	-0.070 (<0.001)	0.074 (<0.001)	0.006	0.010
Time-consciousness	-0.081 (<0.001)	0.053 (<0.001)				
Offline orientation preferences		-0.079 (<0.001)	-	-	-	-
Online orientation preferences	0.056 (<0.001)	0.094 (<0.001)	-	-	-	-

Apart from these structural relationships, three demographic variables are highly relevant in explaining shopping frequency: gender, age and education. Women tend to adhere stronger to hedonic shopping value and on top of that they shop more frequently in the offline shopping environment. Age is negatively associated with hedonic shopping value, whereas older people go shopping more frequently. Higher educated people dislike shopping relative to their lower educated peers, however visit shops more frequently.

Based on the number of respondents buying product categories either offline, online or both, three product classes were distinguished from the dataset: search goods, experience goods and commodity goods. The model was re-estimated for each of these classes, revealing clear differences amongst product classes concerning the relations to shopping frequency. Table ii displays the regression coefficients of significant relationships in the main model for each product class. Overall, the commodity goods model was most comparable to the main model, which can be explained by the fact that almost all consumers often buy commodity goods. The most important results were that hedonic shopping value is mainly relevant for experience goods. Indeed, search goods were bought frequently online, regardless of any shopping value. The absence of a relationship between orientation preferences and offline shopping frequency can be explained from the differences between product classes: in the commodity goods model these relationships were not found significant, whereas for search goods and experience goods they were.

Table ii Product class models – main results

			Search	Experience	Commodity
From		To	Regr. Coeff.	Regr. Coeff.	Regr. Coeff.
Hedonic shopping value	→	Offline shopping frequency		0.148	
Hedonic shopping value	→	Online shopping frequency		0.100	
Presence of employees	→	Offline shopping frequency	0.084		0.039
Presence of employees	→	Online shopping frequency		-0.042	
Compare prices easily	→	Offline shopping frequency			0.051
Compare prices easily	→	Online shopping frequency	0.041		
Buy fast and easy	→	Offline shopping frequency			0.040
Buy fast and easy	→	Online shopping frequency			0.060
Time-consciousness	→	Offline shopping frequency		-0.035	-0.108
Time-consciousness	→	Online shopping frequency		-0.053	
Offline orientation preference	→	Offline shopping frequency	0.088	0.056	-0.051
Offline orientation preference	→	Online shopping frequency	-0.087	-0.072	
Online orientation preference	→	Offline shopping frequency	-0.039		0.086
Online orientation preference	→	Online shopping frequency	0.119	0.084	

An attempt is made to test the model for consumer mobility metrics as well. From another dataset – the three-day diary data from the Netherlands Mobility Panel – the metrics shopping trips and kilometrage were used as dependent variable. As this dataset does not represent shopping frequency equal to the e-commerce survey, correlation between the variables was low and no significant relations with the dependent variables were found. However, improvements to the data acquisition method might be a starting point for a better attempt.

The concepts of shopping attitude and orientation preferences can explain consumer behaviour in terms of shopping frequency on individual level. The model as described in this thesis is capable of expressing the intention to buy either online or offline from shopping attitude and orientation preferences. Moreover, for various product categories different relations were found significant. Consumer mobility in terms of shopping trip frequency and kilometrage could not be explained from

shopping attitude and orientation preferences in this study. Additional research is required to be able to explain the effects in terms of shopping trip frequency and kilometrage.

As the average shopping trip takes just several kilometres, the results of this thesis are mostly valuable for evaluating mobility on local scale – the responsibility of local authorities, for example city municipalities. This micro-perspective study helps policy makers to understand decisions in the shopping process from the consumer's point of view. Although the number of online sales increases, almost half of the respondents adheres to hedonic shopping value to a large extent, besides many respondents prefer to orientate offline as well. Purchasing products seems to be no longer the main goal of going shopping in the city centre, orientation and shopping for pleasure are more likely to describe the new function of shopping. The advice to policy makers is to stimulate offline shopping to respect the desires of citizens as a contribution to the liveability of the Netherlands on local level. The model can be improved by specifically aiming on consumer mobility metrics, acquiring missing information and designing a survey for the specific aim of this study instead of the other way around.

Table of contents

Glossary

A list of terms frequently used throughout the thesis is provided as a reference. In some cases the term could have a different meaning in general sense, however in this document the following definitions hold:

commerce
: the activity of purchasing and selling goods

commodity goods
: product class representing raw materials and basic goods

consumer – *also: shopper*
: person who purchases goods for personal use

consumer behaviour
: activities and considerations a consumer makes during the activity of purchasing goods

consumer mobility
: traffic movements consumers make in order to perform the activity of purchasing goods

consumer mobility metrics
: standard of measurements used to express consumer mobility

e-commerce – *also: e-shopping, web-shopping, online shopping*
: online alternative for traditional commerce

error term
: number expressing the deviation of a result from its predicted value

experience goods
: product class representing goods that require visual inspection during the shopping process

hedonic shopping value
: judgement of the importance of aspects describing enjoyment from the activity of shopping

indicator
: observed variable loading on a latent construct

kilometrage
: (consumer) mobility metric expressing the number of kilometres travelled

latent construct – *also: latent variable*
: construct representing an unobservable variable inferred from indicators

measurement model
: modelling step in SEM procedure to define latent constructs

Netherlands Mobility Panel – *abbreviation: MPN – in Dutch: Mobiliteitspanel Nederland*
: household panel study monitoring mobility by means of a travel diary

orientate
: the process of gathering information, browsing and searching in the pre-purchase phase

orientation preference
: preference for performing the pre-purchase phase in an offline/online retail environment

physical shop
: shop located in a non-virtual location such as a shopping street, shopping centre or elsewhere

product category
: group of products with similar characteristics in terms of form or purpose

product class
: group of products with similar characteristics in terms of required information for purchasing

purchase
: the act of buying something

purchasing channel – *also: retail/sales/shopping channel, offline/online channel, purchasing medium*
: medium through which a purchase was made

retail environment – *also: shopping environment*
: physical or digital surroundings where the shopping process can take place

retailer
: person or company who sells products for personal use

search goods
: product class representing goods that can be bought based on a description without much risk

shopping
: the process or activity of purchasing products from shops

shopping attitude
: the appreciation of the activity of shopping

shopping frequency
: the number of times a person performed the activity of shopping in a certain period

shopping trip frequency
: the number of times a person made a trip for the purpose of shopping in a certain period

shopping value
: judgement of the importance of various aspects of the activity of shopping

spatial attributes
: spatial characteristics of a consumer's physical shopping environment

structural equation modelling – *abbreviation: SEM*
: statistical method to estimate relations between observable and unobservable variables

structural model
: modelling step in SEM to estimate relations between variables

traditional commerce
: commerce taking place in a physical retail environment

utilitarian shopping value
: judgement of the importance of aspects describing functionality of the activity of shopping

1. Introduction

In this thesis the impact of e-commerce on consumer mobility is studied. The first chapter briefly introduces the reader with the research by discussing the research problem addressed, the approach towards the problem and the relevance of the study.

1.1. Background

Commerce is defined as the activity of buying and selling ("commerce | Definition of commerce in English by Oxford Dictionaries," n.d.) and describes the interplay of an individual having a desire for a certain product or service and a vendor offering the desired product. Throughout the centuries commerce has evolved from the interchange of goods on household level towards large scale international business between companies and consumers (The Gale Group, 2004).

With the rise of e-commerce from the 1980's on, an online equivalent for traditional commerce has been offered (Mokhtarian, 2004). The trend of the Internet being used as a shopping medium is apparent from several data sources: MPN- and OViN-data revealed that around 62 percent of respondents bought any product online in the previous three months, the latter reporting this percentage to have grown from 46 percent in 2012 (CBS Statline, 2018b). Thuiswinkel.org appoints 84 percent of the Dutch citizens as e-shoppers in 2017, together having spent 22.50 million euros on e-commerce. The yearly turnover increased over the past years, albeit at a declining rate (Ecommerce Foundation, 2018). E-commerce influences consumers' mobility patterns, since purchasing a product does no longer necessarily require a trip to a shop (Weltevreden & Rotem-Mindali, 2009).

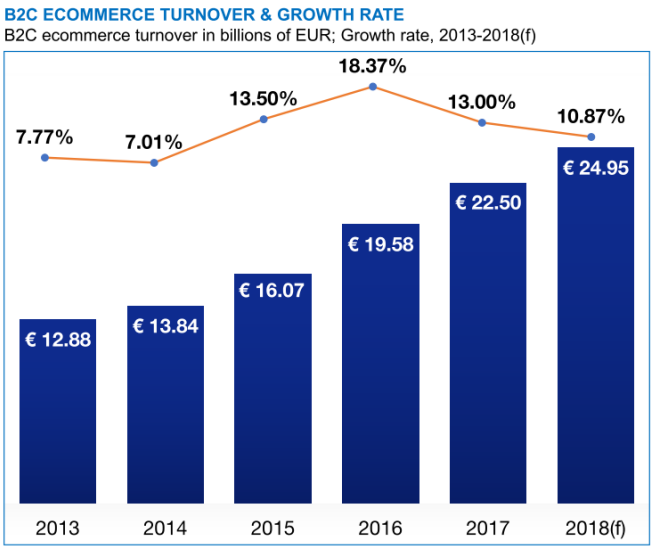

Figure 1 E-commerce turnover and growth rate (Ecommerce Foundation, 2018)

1.2. Problem statement and research goal

The Ministry of Infrastructure and Water Management strives for liveability and accessibility in the Netherlands. E-commerce influences consumer mobility and by that accessibility, yet the effects of e-commerce on mobility patterns of consumers are unclear.

As the research field is very complex, research in the past decades has led to very different and inconsistent results (Rotem-Mindali & Weltevreden, 2013). The research field involves amongst others different phases in a shopping process and differences between product categories – all in both an online and offline shopping setting. Various researchers have attempted to clarify relationships in the study field (Cao et al., 2012; Farag et al., 2007; Weltevreden, 2007; Zhai et al., 2017; Zhou & Wang,

2014). Integrated insight on how e-commerce influences consumer mobility for different product categories however still remains.

The research goal of this thesis is to explain consumer mobility by means of concepts from consumer behaviour studies. A model combining shopping attitude and orientation preferences is used in order to provide insight in the effects of e-commerce on offline and online shopping frequency for various product classes. The results are envisioned to be of use to advise in policy-making for area development.

1.3. Research questions

The goal of this study is attempted to be met by answering the central research question:

'How could shopping attitude and orientation preferences explain consumer mobility?'

Several sub questions are of help in answering the central research question:

1. How are the fundamental concepts shopping attitude and orientation preferences defined?
2. What is the theoretical relationship between shopping attitude, orientation preferences and consumer mobility?
3. How could shopping attitude and orientation preferences be represented by data?
4. What is the empirical relationship between the fundamental concepts and shopping frequency?
5. What are the differences between product classes?
6. How could the model be applied for explaining consumer mobility?

1.4. Scope

The complex research field is narrowed down to 'orientation and purchase of products in both an online and offline retail environment'. The consumer and its buying behaviour and mobility pattern are the main research object. Shopping frequency is considered as the mobility measure. Only purchases from professional retailers are included in the study.

Although e-commerce obviously affects logistics traffic movements to a large extent – products are shipped to the consumer instead of the retailer, for example – logistics traffic streams are not part of the scope of this thesis. These effects can not be neglected when studying the total effects of e-commerce in the transport system, however this research focusses on the effects for the individual consumer.

1.5. Methodology

The problem is approached by means of literature study and structural equation modelling (SEM). This statistical method suits the goal of verifying theories and previous study results and allows the researcher to estimate complex concepts involved with consumer behaviour. A sequence of modelling steps leads to quantification of relationships between fundamental concepts and consumer mobility.

The research in this thesis includes the following phases in order to answer the main research question:

1. Literature review
   From traditional consumer behaviour studies, research has evolved in various directions. In a literature review consumer behaviour theories and consumer mobility in the transition from offline to online shopping are studied. Relevant concepts are selected and combined in order to define the conceptual model for explaining the effects of e-commerce on consumer mobility.
2. Structural equation modelling
   Consumer behaviour studies typically involve complex, unobserved concepts. By means of structural equation modelling both the definition of these concepts, as well as the relationships between them are estimated. Structural equation modelling is typically used to confirm theory.

In thesis SEM is selected as a method to provide clarification in the wide variety of results of previous research in the field of e-commerce and consumer mobility.

   a. Measurement model
      In a measurement model confirmatory factor analysis is applied in order to define unobserved concepts *shopping attitude* and *orientation preferences* (constructs) from observed variables.
   b. Structural model
      The empirical relationship between constructs and the dependent variable *shopping frequency*, as well as control variables are estimated.

3. In-depth analyses
   The model is applied on different dependent variables in order to examine the applicability to multiple product categories. Also, an investigation is done on the applicability of the model for determining the effects on consumer mobility.

The model is estimated based on data from the Netherlands Mobility Panel. A questionnaire dedicated to e-commerce including 5956 useful results of Dutch respondents is used to perform the analyses as described.

1.6. Relevance

This research on the impact of e-commerce on consumer mobility is relevant in societal as well as scientific perspective.

In this research the activity of shopping in an offline or online setting is analysed from the perspective of the consumer. This approach is in the interest of the Dutch citizen in the role of the consumer. By investigating the impact of e-commerce and the order of magnitude in which consumer mobility is affected, the responsibility of policy-making can be determined. The liveability and accessibility of the Netherlands is of continuous interest for the Dutch government (Ministerie van Infrastructuur en Milieu, 2012), which emphasizes the societal relevance.

Scientifically, this research builds upon previous work as existing theories and results of quantitative studies are validated in a new conceptual model by means of a representative sample of the Dutch population.

1.7. Document overview

A reader's guide to this document is visualised in Figure 2. Throughout six chapters the sub questions and ultimately the main research questions are investigated. In the figure, grey boxes represent rather supportive chapters. Orange boxes refer to chapters in which the main contribution of the thesis is reported.

After the introduction, the thesis starts with literature research, resulting in an overview of previous relevant literature. The chapter is concluded with a conceptual model, which is the basis for further analysis in the thesis. Chapter 3 introduces structural equation modelling as the methodology to analyse data from the Netherlands Mobility Panel. In chapter 4 the model estimations are presented for the measurement model and structural model. The models examine relations between fundamental concepts and shopping frequency, rather than consumer mobility measures. A more in-depth investigation of the results is presented in chapter 5. Segregation on product characteristics explains differences between product classes, also an attempt to approach consumer mobility in terms of the number of trip kilometres is discussed. The thesis is concluded and evaluated in chapter 6.

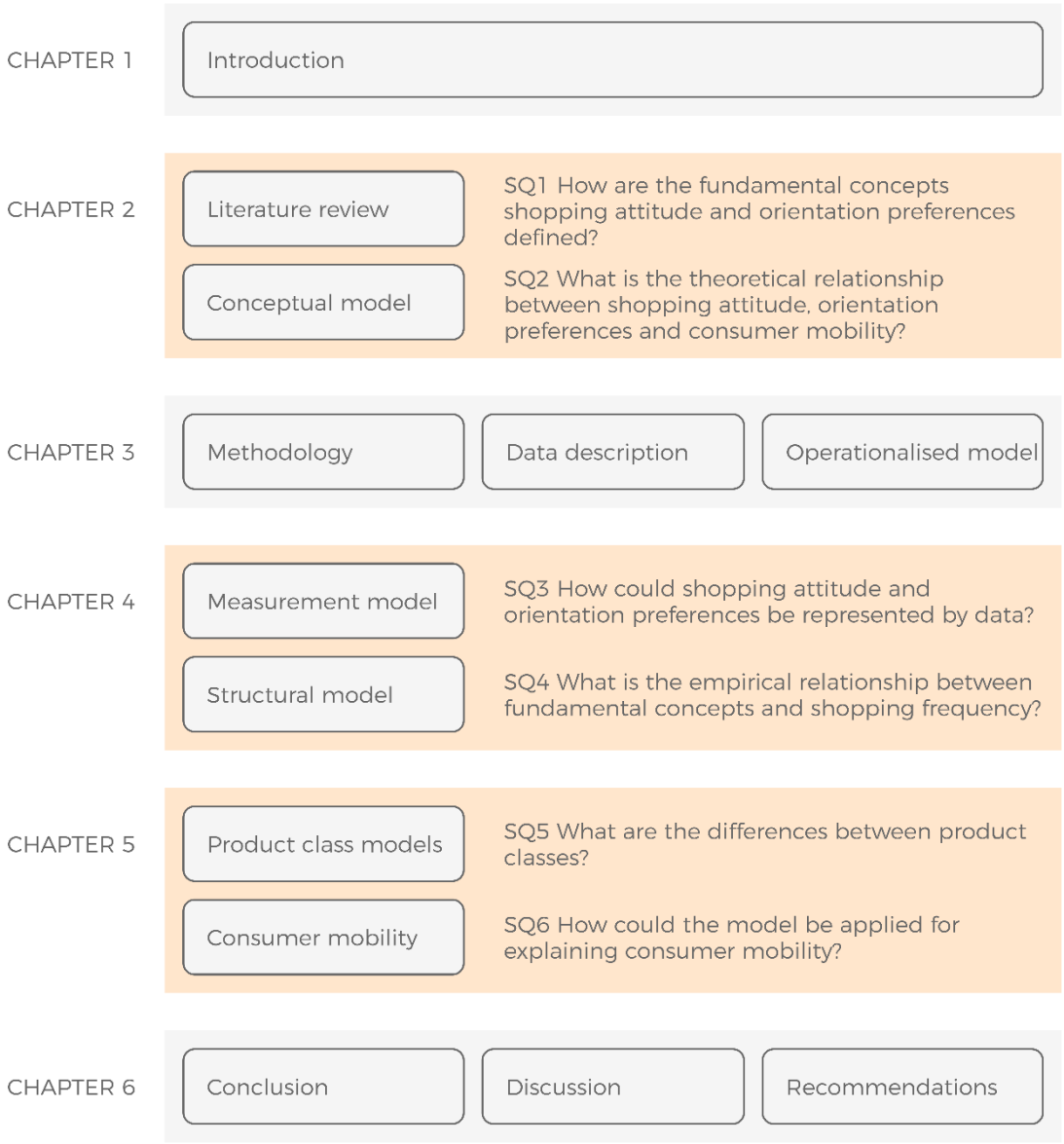

Figure 2 Document overview

2. Literature research

A literature review is performed to investigate what research has been done before in the study field of e-commerce and consumer mobility. In this chapter fundamental concepts and theories are first introduced and an overview of previous studies is provided.

The goal of the literature study is threefold. From previous research in several fields the main concepts relevant in explaining consumer mobility are recognized. The commercial concept *shopping attitude* is studied focussing on shopping value, *mobility* studies provide insight in passenger travel for the purpose of shopping. Secondly, the papers selected for literature review are assessed to what extent they cover the main research question in this thesis. From an overview of what topics are included in these studies, the knowledge gap in existing literature is identified. The third goal is to interpret results from previous research to understand empirical relations that have been studied before and hypothetical relations that will be revealed in this study, all together assembled in the conceptual model.

A general introduction to e-commerce is given in section 2.1, followed by a description of relevant literature developing in the field of consumer mobility in 2.2. Section 2.3 focusses on product classification in the context of e-commerce. Insights from literature are input for the conceptual model as presented in section 2.4. The hypothesized relationships are explained by means of literature and substantiated assumptions. The literature overview appointing the research contribution of this thesis is provided in section 2.4 as well.

2.1. E-commerce

In the first section fundamental concepts in the study field of e-commerce are introduced: commerce, the shopping process and consumer mobility effects.

2.1.1. Commerce

Since the origin of civilization commerce has been a crucial societal concept. Originally people used to exchange or give away overproduce and later specialized enterprises produced goods for trade (The Gale Group Inc., 2004). The concept of money as a medium of exchange was introduced some time later. The activity of trading traditionally took place at market places and later in shops or stores.

Generally the individual – from now on called ‘consumer’ – and the product are located with a particular distance between them. The form of trade in which the consumer moves from one place to another to purchase any goods for a certain price, from now on is referred to as ‘traditional commerce’. With the rise of information technology in the 80s of the 20th century, an alternative to traditional commerce appeared in the form of e-commerce. In a traditional commerce setting the distance is to be overcome by the consumer visiting the vendor’s place to buy products, thus generating individual transport movements. E-commerce offers the buying process in an online setting followed by home delivery of the products, affecting individual traffic movements besides logistics transportation (Mokhtarian, 1990). Figure 3 illustrates the difference between traditional commerce and e-commerce. Since 97.7 percent of the Dutch citizens of twelve years and older were connected to the Internet in 2016 (CBS Statline, 2018a), the option of shopping in an online retail environment was available for almost all consumers.

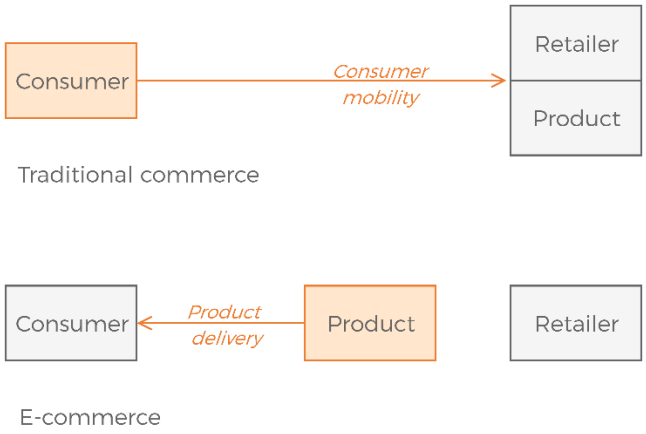

Figure 3 Traffic movements resulting from traditional (above) and e-commerce (below)

The attentive reader notices that the concept of home delivery is nothing new. In fact, the introduction of a new technology reintroduces a century-old retail system: in the past fresh produce such as milk was delivered at houses by the milkman himself. Although the service now is performed by specialized companies, home-delivery these days again is interesting to many consumers as it saves them time and effort compared to traditional shopping.

Retailers provide their customers with more comfort and expand their market by offering products via e-commerce. The reasons for retailers to sell through the online channel as well are evident: overcome barriers of space and time, save costs in personnel and real estate and embed Internet-based marketing features in retail channels (Khurana, 2018). Although the advantages for consumers appear obvious as well, e-commerce is not yet embraced by the majority of consumers. This gives reason to investigate the shopping process from the consumer's point of view more in detail.

2.1.2. Shopping process

The shopping process of traditional and online commerce is not as straight-forward as presented in the previous paragraph. Indeed, products are ultimately transferred from the retailer to the consumer, however multiple steps are distinguished in this process. The shopping process is used in consumer behaviour studies for understanding decision-making of consumers throughout different shopping phases. Consumer behaviour studies have a wide application for marketing purposes, but also provide insight in consumer mobility – traffic movements consumers make in order to perform the act of shopping.

Both in traditional shopping and its remote alternative of e-commerce, researchers distinguish different shopping phases, roughly subdivided in pre-purchase, purchase and post-purchase activities. Couclelis (2004) applies her theory of *fragmentation of activities* to shopping and thereby recognises twelve steps in the shopping process for which an offline step can be substituted by an online alternative. In Table 1 the steps are displayed.

Table 1 Fragmentation of the activity of shopping (from Couclelis (2004)*)*

Pre-purchase	Purchase	Post-purchase
1. Become aware of need or want	5. Inspect alternatives	9. Track status (if an order)
2. Gather information about the options	6. Decide on item to be purchased	10. Get item to base (usually home)
3. Search/browse	7. Decide on vendor	11. (Eventually) return/exchange item
4. Seek advice/expert help	8. Purchase (order/pay)	12. Seek post-sales service

The travel patterns consumers can take throughout the pre-, post- and purchase phase are expected to prevent customers from visiting physical stores, which is unbeneficial from a traditional retailer's perspective (Couclelis, 2004). Not only the place (a physical shop or an online alternative) where products are bought changes, but also the time and by that the position of the activity of shopping in a sequence of events might differ from before the information technology revolution.

For marketing purposes this detailed fragmentation is very helpful in studying consumer behaviour. Consumer mobility however requires far fewer shopping phases. Mostly the two phases pre-purchase and purchase are considered in consumer mobility studies for determining the effects of e-commerce. Mokhtarian (2004) describes possible changes in shopping behaviour for the shopping phases desire, information gathering, product trial, evaluation, transaction, delivery, use and return.

2.1.3. Mobility effects

Each step in the shopping process could be performed in-store (offline) or online (Mokhtarian, 2004), which has impact on the traffic movements consumers make in order to perform the act of shopping – referred to as consumer mobility. Four effects of e-commerce on consumer mobility are recognised and supported by various studies:

- *Substitution* is the effect in which online purchases replace traditional shopping – ultimately resulting in a decrease in shopping trips.
- *Complementarity* is the effect where e-commerce generates additional shopping trips.
- A trip is *modified* whenever the introduction of e-commerce changes the characteristics of the shopping trip, for example by becoming part of a trip chain instead of a single trip or vice versa.
- *Neutrality* refers to purchases where shopping behaviour is changed, but does not affect shopping trip frequency.

Early studies from the first years of this millennium qualitatively explain different contradictory relationships between online shopping and consumer mobility. In the literature review of Rotem-Mindali & Weltevreden (2013) both research proving substitutional effects of e-commerce, as well as neutral or complementary effects are elaborated upon. Later, the first attempts for quantitative models gave similar contradictory results. Whereas Cao et al. (2012) report evidence for the substitution effect, research of Farag et al. (2007) and Weltevreden & Rietbergen (2007) supports a complementarity effect. The majority of the reported studies in the literature review of Rotem-Mindali & Weltevreden (2013) however reported a rather neutral effect. They mention the lack of consistency in definitions of both e-commerce and consumer mobility amongst the variety of studies as the most important factor explaining the ambiguity in results.

The effects enumerated above can be expressed in multiple consumer mobility metrics, to name a few: the number of products bought, shopping frequency, shopping trip frequency, kilometrage for the purpose of shopping. The variety of consumer mobility metrics used in previous research causes

difficulties in interpreting the effects in a consistent manner. Some metrics give more detailed information about the effects than others, however debates amongst scholars are going on about what mobility metric is most appropriate.

Methodological consistency in terms of data requirements is crucial for the development of research in any research field.

2.2. Developments in consumer behaviour research

The starting point of this part of the literature research is traditional consumer behaviour – shopping behaviour in a traditional commerce setting. Figure 4 illustrates the development of consumer behaviour research by two of many divergent research areas relevant in this literature study. The research areas each entail fundamental concepts for explaining consumer mobility as a result of e-commerce.

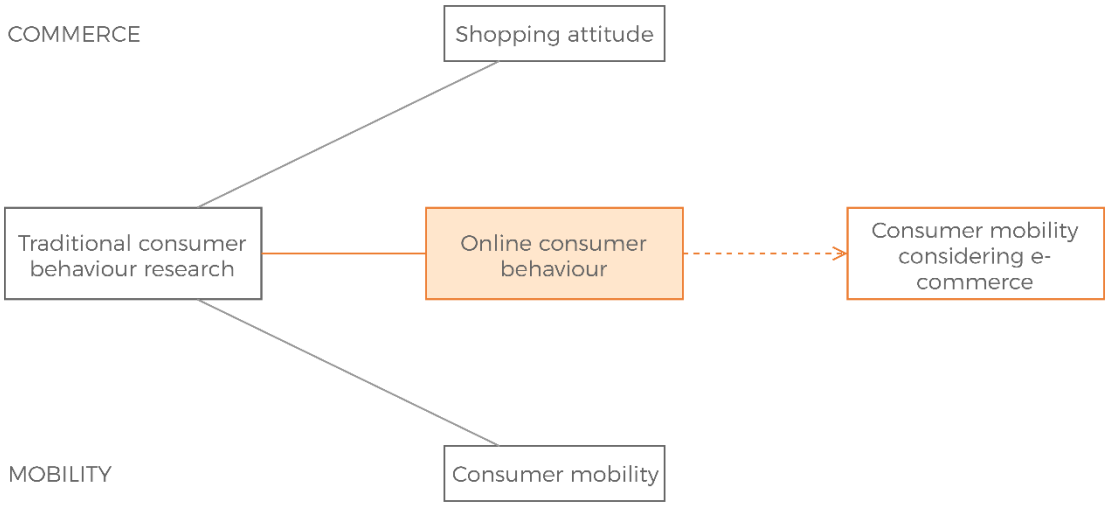

Figure 4 Development in consumer behaviour research

The rather commercial research area is *shopping attitude*, studying psychological drivers for consumers in order to manipulate consumers in their buying behaviour and finally generate more sales. Mobility studies focussed on *consumer mobility* have provided insight in the frequency and kilometrage for the purpose of shopping in traditional shopping. Attempts have been made to quantify consumer mobility as a result of e-commerce as well.

A combination of those study fields has to our knowledge not been provided yet, whilst in the transition from traditional commerce to e-commerce it is vital to understand the incentives of consumers to shop either online or offline in order to estimate their mobility behaviour. The combination of study fields – referred to as *online consumer behaviour* – has great potential for understanding consumer mobility patterns in a retail environment where both online and offline options are offered, as is studied in this thesis.

In this section relevant theories and results of research in both study fields – shopping attitude and consumer mobility – are elaborated upon.

2.2.1. Shopping attitude

The activity of shopping includes more than retrieving a product by purchasing it in a shop. 'The action of buying goods from shops' as The Oxford Dictionary defines shopping, is appreciated and experienced

differently by various consumers – some people shop for pleasure, whereas others experience shopping as rather stressful, for example.

Differences between consumers in this sense are in literature approached by means of the concept 'shopping attitude'. By aggregating stated or revealed preferences researchers have been able to classify consumers as having a certain attitude towards shopping. Often latent class analysis is used.

In Zhen et al. (2018) five consumer types were recognised: novelty-seeking consumer, shopping enjoyment consumer, time-conscious consumer, cost-conscious consumer and spontaneous consumer. The novelty-seeking consumer enjoys shopping for getting new ideas for products to buy. This type of shopper was also recognised by Farag et al. (2007), as well as the adventurous shopper. The shopping enjoyment consumer perceives shopping as an enjoyable activity, as was recognised by Cao et al. (2012) and Farag et al. (2007) too. Time- and cost-conscious shoppers experience a limit to their freedom in shopping, namely because of time- and cost constraints (Cao et al., 2012; Zhen et al., 2018). Spontaneous shoppers buy products although they did not previously intended to do so (Cao et al., 2012; Zhen et al., 2018). Cao et al. (2012) found relationships between shopping attitude and online searching behaviour. No significant effect on online and offline purchasing was found for time-conscious shoppers, however enjoyment shoppers were proven to shop more frequently offline and less frequently online. Farag et al. (2007) showed similar results.

The underlying concept explaining shopping attitude is shopping value, defined as the judgement of the importance of various aspects of the activity of shopping. Shopping values could for example be the reason behind an intrinsic preference for shopping in a physical store, even though certain product categories would be more appropriate for e-shopping. The concept of shopping value relates to the full experience of shopping, including contact with shop employees (Bradley & Lafleur, 2016), the shopping environment and the benefits a consumer experiences from having purchased the product (Diep & Sweeney, 2008).

Shopping attitude represents the combined phenomenon of shopping value and buying behaviour. In this thesis shopping value is considered rather than shopping attitude, since the effects of shopping value on shopping frequency is studied. In traditional consumer behaviour literature, hedonic shopping value is distinguished from utilitarian shopping value (Babin et al., 1994) – a distinction that holds throughout the various aspects of the activity of shopping. The next paragraphs explain on these types of shopping value.

2.2.1.1. Hedonic shopping value

Hedonic shopping value describes the extent to which consumers experience joy from the activity of shopping. Hedonic shopping value represents the potential entertainment and emotional value shopping involves (Bellenger et al., 1976). Babin et al. (1994) developed a scale of statements referring to hedonic shopping value against the appreciation of shopping as an activity. They found that statements with high factor loadings are highly correlated with positive appreciation of shopping. Examples are: '*This shopping trip was truly a joy', 'Compared to other things I could have done, the time spent shopping was truly enjoyable'* and *'While shopping, I felt a sense of adventure'*. Consumers evaluating the statements positively are assumed to perform the activity of shopping according to hedonic values.

The statements mentioned are related to personal experience of shopping. Later research also recognises social motives for shopping as hedonic shopping value (Davis & Hodges, 2012; Kim et al., 2014). Social interaction can both serve as the goal or as a limiting condition: on the one hand, shopping is seen as a way to spend time with family and friends (Davis & Hodges, 2012; Kim et al., 2014; Dholakia, 1999), on the other hand the judgement of family and friends are considered as a criterium for

successful shopping (Dholakia, 1999). On top of that, Arnold and Reynolds (2003) speak of the motive role shopping, in which the consumer serves friends and family – for example by accompanying them, taking over the task of shopping or buying them a present.

Other aspects of the shopping experience that are discussed here are the shopping environment and the benefit a consumer experiences from having bought the product. Hedonic value of the shopping environment includes the ambiance in a shop or shopping area, such as music, scent and light in a particular shop and safety in a shopping area. On product level, hedonic value can be interpreted as the utility resulting from emotional value and the image associated with owning the product (Diep & Sweeney, 2008).

2.2.1.2. Utilitarian shopping value

Utilitarian shopping value describes to what extent a consumer gets satisfaction from the activity of shopping. Shopping is in this context considered as a task or mission (Babin et al., 1994) and utilitarian shopping value thereby represents the work mentality to reach the goal of purchasing (Davis & Hodges, 2012). Typical statements for consumers adhering to utilitarian shopping values are according to Babin et al. (1994): *'While shopping, I found just the items I was looking for'* and *'I was disappointed because I had to go to another store to complete my shopping'*.

Satisfaction in the first place comes forth from achieving the original goal, besides that from costs in terms of time, money and effort (Dholakia, 2009; Davis & Hodges, 2012; Kim et al., 2014) and the functional benefits of receiving the products (Diep & Sweeney, 2008). The shopping experience is in several studies considered positive whenever the consumer is able to find his way through a shop easily, is able to complete the act of purchasing relatively fast, and will probably experience a financial benefit in the form of promotions or sales (Dholakia, 1999; Davis & Hodges, 2012). In popular terms, utilitarian shopping value describes the extent to which consumers consider shopping as 'a hassle'.

Kim et al. (2014) distinguish utilitarian shopping value from costs in the form of time, money and mental effort. The time investment to retrieve a specific product, the costs of parking and travelling and psychologically disturbing factors such as crowds and noise in the shopping environment define shopping costs.

The concept of shopping value is a means to identify a consumer's shopping attitude. Other concepts can be used as well to describe shopping attitude, yet in this study hedonic and utilitarian shopping value are considered fundamental.

2.2.2. Consumer mobility

Consumer mobility is studied in order to determine the impact of the activity of shopping on the traffic system. In this paragraph relevant consumer mobility metrics are discussed, as well as spatial attributes in terms of shopping location, and characteristics of shopping trips.

Relevant metrics in determining the impact of commerce are the frequency of shopping trips and the kilometres travelled for shopping. Shopping trip frequency explains how often a consumer performs a trip in order to buy products in a physical store. Kilometrage is the number of kilometres travelled to do so. Caution is required with interpreting quantitative results, as the metrics can be expressed per product bought, purchase made or trip performed, as well as per time unit – weekly kilometrage for the purpose of shopping, for example. For various purposes, these basic units can be translated into related metrics such as emission rate (Beckx et al., 2013) or economic metrics.

Shopping trip frequency and kilometrage are amongst others dependent of spatial attributes of both the retailer and the consumer. In several foreign studies specific remote areas are subject of research (Calderwood & Freathy, 2014). Although no area in the Netherlands can be considered remote in

comparison to foreign countries, five urbanisation levels – based on the number of inhabitants per square kilometre – are generally used in spatial contexts (CBS, n.d.). In paragraph 3.2.2 the levels of urbanisation are discussed in more detail. The spread of shop types throughout urbanisation levels has consequences for consumer mobility (Gonzalez-Feliu & Peris-Pla, 2017): large supermarkets or food wholesalers are not located in city centre, for example. Also the availability of goods within shops increases the need to travel further: products sold out in one store branch might be available in another; particular specialised shops may only be located in a specific town. Scarcity of particular shops and their supply induces more kilometres travelled.

Spatial attributes of the consumer in terms of the location of living and working (Zhen et al., 2018), as well as the preferred transport mode and car ownership (Farag et al., 2007) were studied on being determinant for consumer mobility in previous studies. Results are however contradictory – whereas Cao et al. (2010) found that people who live in urbanized regions go shopping more frequently, Zhou & Wang (2014) found a negative relation between urbanity level and offline shopping frequency.

Two phenomena complicate measuring shopping trips or kilometrage in surveys. First, several national governments perform a household survey in which respondents are asked to report all trips made during a period of a few days. As many people shop less frequently than once every few days, or perform the act of shopping on specific days of the week, shopping frequency can not be directly interpreted from travel diaries (Zhou & Wang, 2014). On top of that, shopping trips are mostly part of a trip chain, which makes it hard to determine how many trips or kilometres are spent for shopping only (Mokhtarian, 2004). Data sets from national data collections via household questionnaires generally are much representative for the population, thereby expected to include both people who buy online and offline.

2.2.2.1. Consumer mobility in the Netherlands

Consumer mobility can be described by several metrics, as was mentioned before. The Dutch government monitors the travel behaviour of its citizens by means of the extensive mobility study Onderzoek Verplaatsingen in Nederland (OViN). In this paragraph some core numbers describing consumer mobility from the OViN data, follow-up studies or MPN-data are given.

Figure 5 is translated from the Mobility Report of 2017, composed by Kennisinstituut voor Mobiliteitsbeleid (2017). 18.9 percent of the trips performed by Dutch citizens in 2016 are for the purpose of shopping, accounting for 8.0 percent of the total number of passenger kilometres. The year after, this average distance was not altered significantly. Nevertheless, in eleven years of time the number of passenger kilometres spent for shopping has dropped by 11 percent, indicating that the number of shopping trips decreased as well. The data used for the Mobility Report comes from OViN.

The analyses throughout this thesis are based on data from the Netherlands Mobility Panel, so is Figure 6. The diagram compares the number of trips and total distance travelled for the purpose of shopping daily groceries and shopping other product types. The spread of shopping trips and kilometres travelled are plotted per day of the week to investigate differences between weekdays and weekends. A detailed description on the Netherlands Mobility Panel is provided in section 3.3.

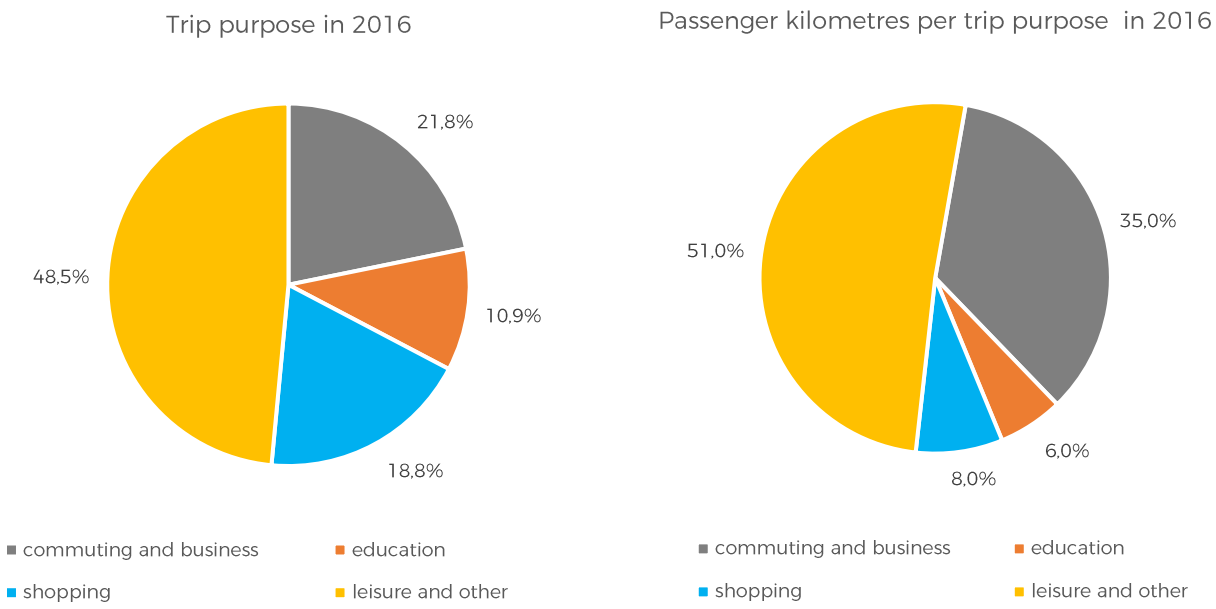

Figure 5 Number of trips (left) and kilometres (right) split according to trip purpose (translated from Kennisinstituut voor Mobiliteitsbeleid, 2017*)*

In Figure 6 the number of trips and kilometres travelled are plotted against the days of the week. The numbers are displayed for daily groceries, shopping for non-daily goods and the total of these two purposes. For daily groceries the number of trips and kilometres travelled are nearly equal from Monday to Friday. Saturday typically is a day for going shopping for non-daily goods, as the peak on Saturday suggests. In total, on Friday and Saturday approximately 1.5 times as many shopping trips for the purpose of shopping are performed than during weekdays. Although on Sunday the number of trips are lower, especially the kilometres travelled for purchasing non-daily goods is much higher than on other days.

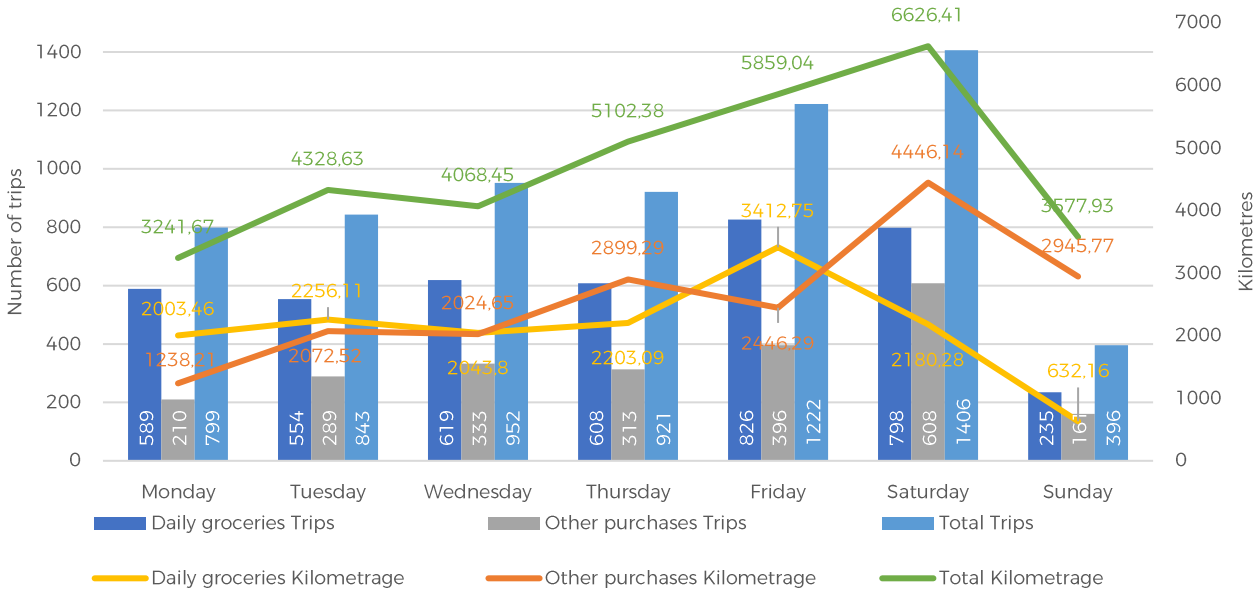

Figure 6 Number of shopping trips and total distance travelled per day of the week

For kilometres travelled, a complicating factor for interpreting consumer mobility appears. In the three-day diary through which data is collected, respondents report a trip and name its purpose. As shopping – especially for daily groceries – is often part of a chain of trips, the amount of kilometres reported for the shopping trips might not correctly display the magnitude of this trip purpose.

2.2.3. Online consumer behaviour

Quantitative studies (Cao, 2012; Cao et al., 2012; Zhen et al., 2018) aim to reveal the relation between online and offline shopping behaviour in different phases of the activity of shopping. Consumers tend to maintain to the same medium in different phases of the shopping process, especially the medium through which a consumer got aware of the product is determinant for the actual sales medium (Cao, 2012; Cao et al., 2012; Farag et al., 2007). Cao et al. (2012) also found a direct positive effect from Internet searching to in-store shopping, as well as an indirect positive effect through Internet buying to in-store shopping related amongst a group of Internet users from Minneapolis – St Paul, meaning that online sales channels stimulate people to buy offline.

Although most relevant studies consider the two shopping phases orientation and purchase, the phase of delivery would also be very interesting for evaluating consumer mobility. An online purchase does not necessarily lead to fewer shopping trips, since consumers can also choose to pick up online ordered goods at a delivery point. By means of specific surveys this behaviour can be studied, however from household surveys this information generally can not be derived.

Other studies focus on psychological drivers for shopping trip frequency in the particular phase of transaction, based on the attitude towards amongst others shopping in general, online shopping, Internet use or technology adoption (Farag et al., 2007; Lee et al., 2017). Zhen et al. (2018) show explanatory factors for consumer mobility in both the pre-purchase and purchase phase, whereas Lee et al. (2017) consider shopping in one term as 'the act of purchasing, browsing or conducting product research'.

Demographic variables explaining online orientation and purchasing were studied by Zhou & Wang (2014), Cao et al. (2012) and Farag et al. (2007). Age, gender, household income, employment (full-time or part-time), education level and urbanisation level of the consumer's residence turned out significant in these studies.

Some relationships in online consumer behaviour are consistent throughout previous research, whereas for others contradictory results were proven by various studies.

2.3. Product classification

In research on the effects of e-commerce often several product types are considered. Researchers recognise differences between products and their characteristics that make them to various extents suitable for online sales. In this section product classification is described, as well as the expected differences between them in terms of consumer mobility. In section 5.1 an appropriate product classification for the dataset used for this study is selected.

Literature speaks of product categories and product classes, where the former refers to groups of products with somewhat the same form or purpose (for example books, clothing, kitchen appliances), and the latter to groups of products having the same characteristics in terms of urgency of retrieval and required information during the purchase (search goods, experience goods, credence goods, commodity goods).

A commonly used product classification differentiates search goods, experience goods, credence goods and commodity goods. In Peterson et al. (1997) search goods are described as products of which the

characteristics can be evaluated from externally provided information, such as books and CDs. Experience goods require personal inspection or trial before purchasing. Clothing and shoes are typical experience goods, as well as perfume. Products and services that require specialized knowledge (for example legal or financial services, or interior design advice) are considered as credence goods. A fourth class is commodity goods. Commodity goods are defined as raw materials or basic goods. In consumer behaviour research the product categories groceries and daily-use goods can be interpreted as commodity goods.

2.3.1. Purchasing channel per product category

The categorisation of products appears to be applicable for analysing shopping medium, as the preferred purchasing channel differs per product category. Theoretically, search goods are more suitable for online purchasing than experience goods, as a customer's risk for buying search goods such as books are less than for buying experience goods such as clothing in terms of satisfaction with the product (Rotem-Mindali & Weltevreden, 2013). Bock et al. (2012) studied the relation between online trust and online purchasing and found trust development via offline channels rather than online for experience products, which underlines the previous statement.

Many researchers compare search goods with experience goods by questioning consumer behaviour for a purchase in either of these classes (Bock et al., 2012; Chiang & Dholakia, 2003; Rintamäki & Kirves, 2017; Schmid & Axhausen, 2018; Zhen et al., 2018). Quantitative studies show significantly higher online shopping rates for books than for perfume (Chiang & Dholakia, 2003) or clothing (Zhai et al., 2017; Zhen et al., 2018), where the product category of books represents search goods and perfume or clothing is considered as an experience good. Concepts earlier in the causal chain differ per product category as well, as (Rintamäki & Kirves, 2017) found – fashion shoppers adhere more to hedonic shopping values, whereas electronic products are bought by people who adhere to rather functional shopping value.

Although the classification of search and experience goods provides useful insights, the need for a more detailed classification is presumed in several studies that already include various product types – books, groceries, clothing and music (Tonn & Hemrick, 2004); daily items and financial products (Weltevreden & Rotem-Mindali, 2009). From the large variety of 27 product categories Weltevreden (2007) recognises differences in purchasing channel for three distinguishable classes. Electrical appliances as well as entertainment media (such as books and CDs) were mainly bought at online retailers by the Internet users. Clothing, shoes and furniture were at the time mainly bought via mail order services by Internet users. Products that remained being bought at traditional retailers are groceries, do-it-yourself products and personal care items. Groceries are also studied as a distinct category by Comi & Nuzzolo (2016) and Schmid & Axhausen (2018), albeit in the latter interpreted as experience goods, and found to be significantly different from search goods as well in terms of consumer behaviour. Food for example was bought more frequently than clothing by adult consumers.

An appropriate product classification appears from the investigation of consumer mobility metrics. In chapter 5 the results of data analysis in order to determine the product classification for this thesis is described.

2.4. Conceptual model

The analyses in this thesis are performed according to the conceptual model as presented in this paragraph. The model is constructed from previous research in various fields relevant for consumer mobility. Insights from literature are translated into the conceptual model. Relations in the model are hypothesized based on literature as well. The interplay between main concepts are discussed, as well as the supposed relationships between personal characteristics and shopping attitude, orientation

preferences and consumer mobility. Relations that were not yet found significant in literature, but are expected to have a role in the model are explained with assumptions.

The conceptual model serves as a theoretical framework according to which the quantitative analyses performed in this study are designed.

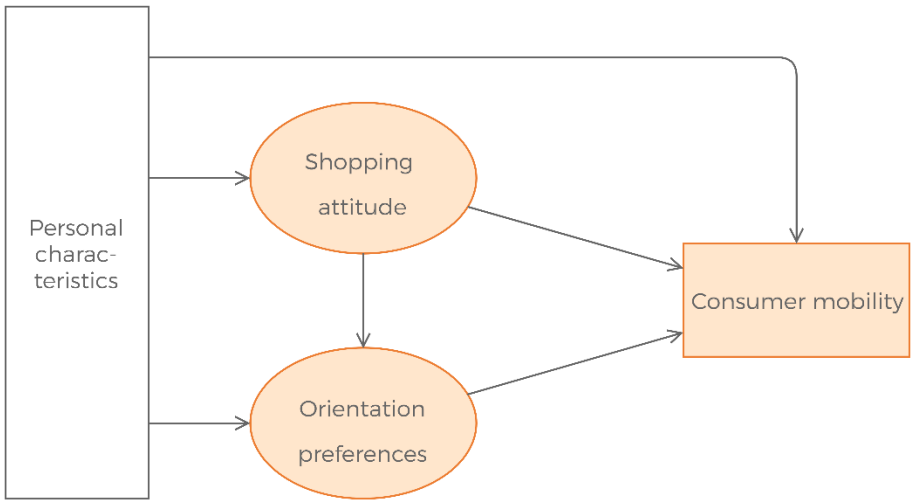

Figure 7 Conceptual model

The attitude of consumers towards traditional shopping, as well as their orientation preferences are the main explanatory factors for consumer mobility, defined as:

- *Shopping attitude* is a construct representing how respondents appreciate the activity of in-store shopping. This variable includes hedonic and utilitarian shopping values, as already widely used in traditional consumer behaviour studies.
- *Orientation preferences* refers to how respondents tend to orientate for buying goods either online or offline.

The presumed relation between the two is that orientation preferences are a consequence of shopping attitude: a consumer who complies with hedonic shopping values has different orientation preferences than a pragmatic shopper. Shopping attitude determines the preference for online or offline orientation rather than the other way around. Consumers adhering to utilitarian values – such as time-conscious shoppers or functional shoppers – appreciate the benefits of e-commerce during the orientation phase, whereas people who like shopping would prefer offline orientation.

Consumer mobility is the dependent variable. Shopping attitude influences consumer mobility. People who appreciate the activity of shopping positively, visit physical shops more often (Cao et al., 2010). Time-conscious consumers are expected to reveal different mobility patterns than adventurous shoppers (Zhen et al., 2018).

A relation between orientation preferences and consumer mobility exists, according to the study of Cao et al. (2012) that showed people tend to retain to the same shopping medium throughout the shopping process. This implies that people who prefer to orientate online, will visit physical shops less frequently. Theoretical effects such as travelling more kilometres for a physical shop as a result of online awareness or centralisation of shops, as recognised by Mokhtarian (2004), are explained by this relation.

2.4.1. Research contribution

The conceptual model as displayed in Figure 7 is a derivative from literature study as described in section 2.2. The concepts were studied by various researchers, however studies including all concepts are little. As a recap, Table 2 gives an overview of the relevance of the papers mentioned in literature study to the concepts of interest – shopping attitude, orientation preferences, consumer mobility and product categories. Papers are listed on year of publication. An overview of the main results of the selected papers is given in attachment A.

Table 2 Literature overview

Publication		Sample		Shopping attitude	Orientation preferences	Consumer mobility	Product categories	# main concepts included
Dholakia	1999	USA	N = 1600	x			x	2
Chiang & Dholakia	2003	Rhode Island, USA	N = 147	x			x	2
Tonn & Hemrick	2004	Tennessee, USA	N = 118			x	x	2
Farag et al.	2007	Utrecht, The Netherlands	N = 1210	x	x	x		3
Weltevreden	2007	The Netherlands	N = 3218		x	x	x	3
Weltevreden & Rietbergen	2007	The Netherlands	N = 3074	x	x			2
Diep & Sweeney	2008	Australia	N = 500	x				1
Weltevreden & Rotem-Mindali	2009	The Netherlands	N = 1231			x	x	2
Cao et al.	2010	Minnesota, USA	N = 591	x				1
Cao	2012	Minnesota, USA	N = 570		x			1
Davis & Hodges	2012	USA	N = 16	x				1
Kim et al.	2014	USA	N = 1200	x				1
Zhou & Wang	2014	USA				x		1
Hoogendoorn-Lanser et al.	2015	The Netherlands	N = 1231		x	x		2
Bradley & Lafleur	2016	USA	N = 884	x			x	2
Comi & Nuzzolo	2016	Rome, Italy	N = 2347			x	x	2
Lee et al.	2017	California, USA	N = 2000+	x				1
Rintamäki & Kirves	2017	USA – Finland – Japan	N = 2466	x			x	2
Zhai et al.	2017	California, USA	N = 952	x	x		x	3
Zhen et al.	2018	Nanjing, China	N = 1032	x	x	x	x	4

Boxes are ticked whenever a paper was considered to include the topics in the corresponding column. Studies including shopping attitude at least include a variable representing an expression of (dis)favour of the activity of shopping. Orientation preferences is indicated as included if multiple steps of the shopping process are considered. Consumer mobility is considered in papers that describe consumer behaviour in terms of shopping trips, often these studies are based on travel survey data. Whenever more than one product categories are compared, a box in the last column is ticked.

In our knowledge, only one research covers all four main concepts. Zhen et al. (2018) performed a study with the same objective as the study presented in this thesis: to examine the effects of e-commerce on consumer mobility, considering shopping attitude and product categories. Interestingly, Zhen et al. (2018) explicitly mention an additional aim of their publication – to perform the study for a data sample representing Chinese consumers, as much existing literature describes consumer mobility for Dutch or

other Western country's consumers. The focus on Chinese consumers in that paper justifies the choice to perform a comparable study on Dutch consumers.

Another three previous studies include three out of four main concepts. The data sample used in Zhai et al. (2017) represents USA citizens and therefore is quite relevant for the Dutch population, even though the study only provides insight in shopping frequency rather than consumer mobility. Farag et al. (2007) and Weltevreden (2007) both used a data sample of Dutch consumers, however both studies were performed over ten years ago. A new study as presented in this thesis provides updated insight in consumer mobility of the Dutch population.

2.5. Conclusion

The development of research in the field of consumer behaviour and mobility studies has resulted in a few main concepts as focus areas in this study. Shopping attitude and orientation preferences relate to consumer mobility, influenced by personal characteristics.

The concepts as introduced in this chapter relate to each other in a sequence that summarizes the line of reasoning throughout the study. The causal chain, as the sequence is referred to, is fundamental in the execution and documentation of this research. Figure 8 visualises the causal chain.

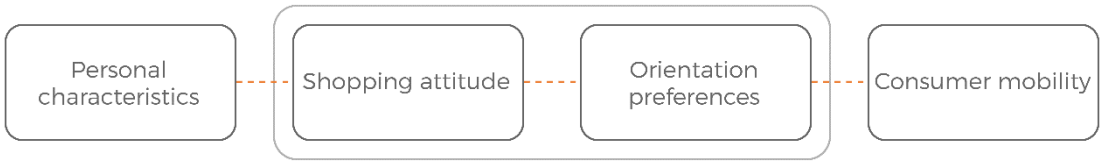

Figure 8 Causal chain

Relations between concepts in the chain are hypothesized and tested. In Figure 7 the outcome of the literature review is visualised as the conceptual model. The most important relations are the effects of shopping attitude on both orientation preferences and consumer mobility, as well as the direct effect of orientation preferences on consumer mobility.

The conceptual model will be prepared for statistical analysis, resulting in the operationalised model as explained in chapter 3. Hypothesized relationships were tested and described in chapter 4, then again verified in literature.

3. Methodology

In order for the conceptual model to be quantifiable, data from the Netherlands Mobility Panel is selected to represent the studied concepts in a statistical analysis. In this chapter the statistical method structural equation modelling and the Netherlands Mobility Panel survey are introduced. An overview of how the conceptual model is operationalized by means of observed variables is provided in this chapter.

3.1. Structural equation modelling

The statistical method used in this thesis to estimate the impact of e-commerce on consumer mobility is structural equation modelling (SEM). The main purpose of SEM is to test theory. Another characteristic of the method is that it enables the researcher to include complex concepts as latent variables in the analysis. Both characteristics of SEM suggest that the method is suitable to approach the problem in this thesis.

A typical procedure for a study using the structural equation modelling involves the following steps:

1. Literature research on the topic studied
2. Create a theoretical framework in which all relationships are specified in terms of direction and sign
3. Define latent variables and indicators to be tested, as well as control variables and dependent variables
4. Design a survey to retrieve the data required
5. Estimate the measurement model in order to verify the latent constructs
6. Estimate the structural model in order to verify supposed relationships between variables
7. Evaluate model fit

In this section step 4 to 7 of the traditional SEM methodology are explained in detail. In order to understand the data processing steps, the paragraph 3.1.1 introduces the reader with variable types used in the model. In paragraph 3.1.2 the analytical process to estimate the measurement model and structural model are explained. The software tool that is used to perform SEM in this thesis is AMOS, which is discussed in paragraph 3.1.3.

3.1.1. Variable types

Various variable types play a role in structural equation modelling. The terms observed variable, dependent variable, control variable and latent variable are often used throughout the thesis.

Observed variable

The data used in this study was gathered via an online survey. Every question answered by respondents is an observed variable. Observed variables can take three forms in SEM: as an indicator in latent variables, as dependent variable in the structural model or as control variable. In figures observed variables are generally visualised as a rectangular.

Dependent variable

All regression coefficients in the structural model are related to the dependent variable – be it a direct or indirect effect. The dependent variable is an observed variable.

Control variable

Some data does not have an explicit role in the structural model, but is expected to explain effects in the system. Control variables are observed variables and often characterise the respondents in terms of demographic data and personal characteristics.

Latent variable

A latent variable is a representation of a set of observed variables, expressing a certain unobservable variable. The observed variables captured in latent variables are called indicators. The relationship between indicators and latent variables can be explained as: a respondent's score for a particular indicator is a result of the score for the latent variable. The deviation of a respondent's individual indicator score from the relationship between the latent variable and the indicator is referred to as the error term (ε), which is unique for each indicator.

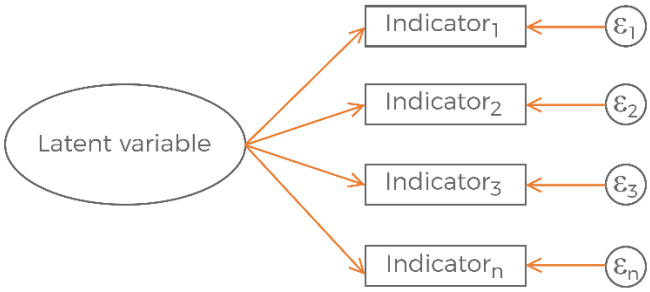

Figure 9 Latent variable

3.1.2. Model estimation

The research questions are primarily answered by means of statistical analysis. The theoretical model that will be quantitatively evaluated has been proposed in chapter 2. Before moving over to operationalisation of the model, this paragraph explains the statistical methods behind estimation of the measurement model and structural model. The description of the methodology is based on the two chapters of the book *Multivariate Data Analysis* by Hair et al. (2010). Figure 10 helps in understanding the two-step SEM procedure.

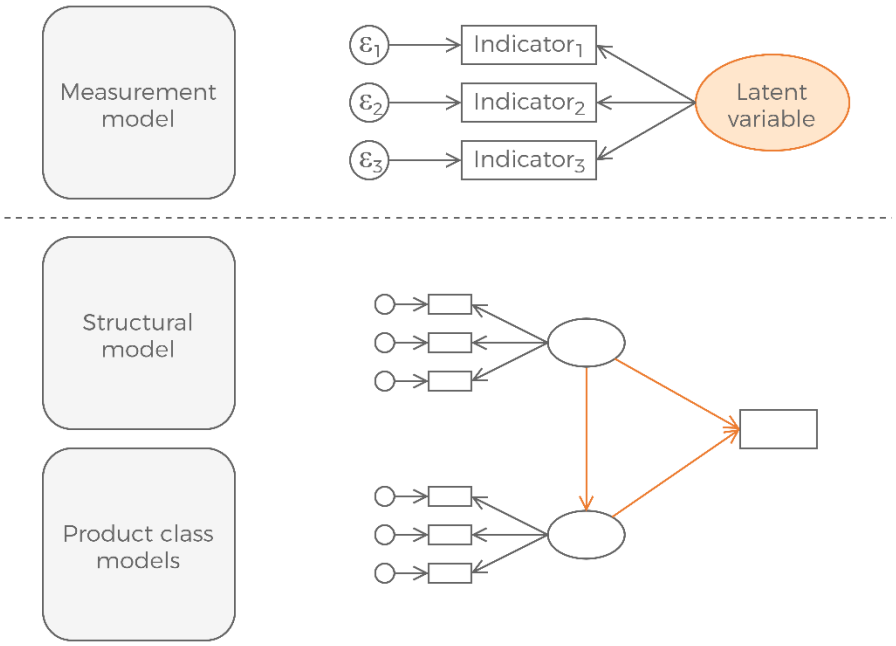

Figure 10 Model estimation methodology

In SEM visualising, some standard variable representation is used. Squares represent observed variables, oval shapes represent latent variables and error terms are visualised as small circles. Relations are represented by straight arrows with one head, bowed arrows with two heads represent correlation between two variables. As is visualised in Figure 10, the definition of latent constructs is analysed by means of the measurement model. The dependent relationships between latent constructs and other, observed variables are estimated during the structural model phase. The next paragraphs explain the statistical methods to perform model estimation.

The model is applied for different product classes. No additional modelling steps were taken, apart from rerunning the general model for different dependent variables.

Measurement model

Complex concepts can not directly be questioned by means of a survey. By evaluating covariance between multiple observed variables an approximation of a latent variable representing a complex construct can be performed. Latent variables can either be endogenous or exogenous in a structural model: exogenous variables are those variables that affect other variables without being affected themselves, exogenous variables are those that are affected by other variables.

In the measurement model of a SEM procedure the loads of indicators on the latent variable are estimated. Confirmatory factor analysis (CFA) is traditionally applied in SEM. In factor analysis, the extent to which a set of observed variables is represented by the latent construct is estimated based on variance and covariances of these variables. In CFA the loadings of a set of statements expected to be represented by the same latent construct are confirmed. An additional analysis is the reliability analysis, expressed by Cronbach's alpha. This measure expresses the representativeness of latent constructs.

The analysis for the measurement model as performed in this study is different from a conventional SEM procedure. Survey design and data generation was done before specifying the model and methods of the study. As a result, the statistical method for the measurement model was exploratory factor analysis instead of confirmatory factor analysis. Instead of confirming hypothesized latent constructs, in exploratory factor analysis relevant latent constructs are revealed from the data. Two approaches are possible – 1) find the optimal number of factors based on Eigenvalue and 2) find a predefined number of factors. In paragraph 4.2.1 the EFA in this study is explained more in detail.

Structural model

The structural model is estimated by means of multiple regression analysis. Dependency relations between latent constructs and observed variables are assessed by means of maximum likelihood estimation. Different from other dependency techniques in SEM a construct can be both dependent and independent in one model. The total effect on the dependent variable as a result of individual relations can be expressed in Equation 2. The parameters a and b are a quantitative expression for direct effects between variables (Y is the dependent variable, W represents independent variables and X has the function of both independent and dependent variable). W, X and Y can either be latent variables or observed variables. The parameters – also called regression weights – are the output of the structural model in SEM analysis. By multiplying the parameters the indirect effect is computed.

$$Y = a_1 * X_1 + a_2 * X_2 + \cdots$$

$$X_1 = b_{11} * W_{11} + b_{12} * W_{12} + \cdots$$

Equation 1 Direct effects

$$Y = a_1 * [b_{11} * W_{11} + b_{12} * W_{12} + \cdots] + a_2 * [b_{21} * W_{21} + b_{22} * W_{22} + \cdots] + \cdots$$

Equation 2 Total effect

The direct effects from an independent variable to a dependent variable could be altered after adding an additional variable in between both variables. The direct parameters could either be lowered – which is referred to as a mediator effect, or altered – whenever sign change occurs in the parameters the added variable has a moderator effect.

A general risk of statistical analysis is the presence of spurious relationship. Relationships could be statistically proven, however theoretically illogical. Often spuriousness is a result of multicollinearity in predictor variables. In order to check for multicollinearity, correlation between variables in the same level in the causal chain is evaluated.

The model in this study is characterised as recursive. Relationships are hypothesized from one variable to another, whereas non-recursive models would entail two relationships between two constructs in two directions. The study is cross-sectional, since data from one moment in time is used for estimating the model.

Step 6 and 7 are repeated for various product categories in order to determine the applicability of the model to a variety of product types.

Goodness of fit

The goodness of fit of a model describes how well a model fits the data set. The indices of goodness of fit are different for various statistical methods. In SEM a large variety of model fit indices is available, however four of them are generally considered as important for examining model fit (Hooper et al., 2008).

Three out of four crucial model fit indices are absolute fit indices – the model fit is evaluated in comparison to a situation with no model at all. Comparative fit index (CFI) is an incremental fit index. Incremental fit indices compare the model with a baseline model.

- Model chi-square (χ^2)
  The discrepancy between the sample and fitted covariance matrix is tested by means of model chi square. The discrepancy is undesired, hence an insignificant result on this test is aimed for: $p > 0.05$
- Root mean square error of approximation (RMSEA)
  In RMSEA tests the fit of the model's parameter estimates with respect to the populations covariance matrix is evaluated, taking into account the desire for a model with less parameters. The lower the RMSEA score, the better: RMSEA < 0.08.

$$RMSEA = \sqrt{\frac{(\chi^2 - df_k)}{(N-1)}}$$

Equation 3 Root mean square error of approximation

- Standardised root mean square residual (SRMR)
  Measures the difference between the actual covariance matrix of the sample and hypothesized covariance model. The index threshold for a good model is SRMR < 0.08. However, models with many parameters and large samples will lead to lower SRMR, which should be taken into account when interpreting this model fit index.
- Comparative fit index (CFI)
  Assuming latent constructs in a model to be uncorrelated, this independent model is compared to the sample covariance matrix. The independent model is a model in which indicators of latent constructs are included, yet uncorrelated. CFI should be larger than 0.95.

$$CFI = 1 - \frac{(\chi_k^2 - df_k)}{(\chi_N^2 - df_N)}$$

Equation 4 Comparative fit index

3.1.3. AMOS software package

The technique of SEM can be applied by means of complex, sequential programming steps in conventional statistical analysis software. Fortunately, convenient and easy-to-use software packages are developed. IBM provides an additional package to its widely used SPSS software for Structural Equation Modelling – AMOS.

The graphical interface allows users to directly visualise the supposed conceptual model in the form of a path diagram. Elements in the path diagram can directly be configured with variables from a dataset. Relations and correlations are easily constructed by drawing arrows from one element to another. A built-in editor for VB.NET and C# programming is included in the package. In this study, the graphical interface was used to specify the model. By modifying the model through the graphical interface, a program is automatically generated.

AMOS applies common factor analysis to estimate the measurement model. Squared multiple correlation of indicators indicates the share that the variance in the indicator is accounted for by the latent construct. The structural model is approached by means of linear regression. In this phase sample variances and covariances, as well as regression weights and variances are estimated.

The estimations AMOS makes are based on basically all data available – regardless of any missing values. Estimates are calculated based on maximum likelihood models, thereafter missing values are derived. The method is called Full Information Maximum Likelihood (FIML) and is typically used in SEM.

Other software packages available for SEM analysis are amongst others LISREL, CALIS (from SAS Institute) and open source packages lavaan and sem (both available for R). The graphical interface and the compatibility with SPSS statistical analysis software (both packages are offered via TU Delft as well) were reason to select AMOS as the analysis tool.

3.2. Operationalisation

Concepts in the theoretical model are recognised as specific SEM variable types as described in section 3.1. Consumer mobility is the dependent variable and personal characteristics function as control variables. Shopping attitude and orientation preferences are unobservable variables, thus approached as latent variables in the analysis. This section describes which data from the Netherlands Mobility Panel (Mobiliteitspanel Nederland (MPN) in Dutch) survey is used to quantify the conceptual variables, which is summarized in Figure 11.

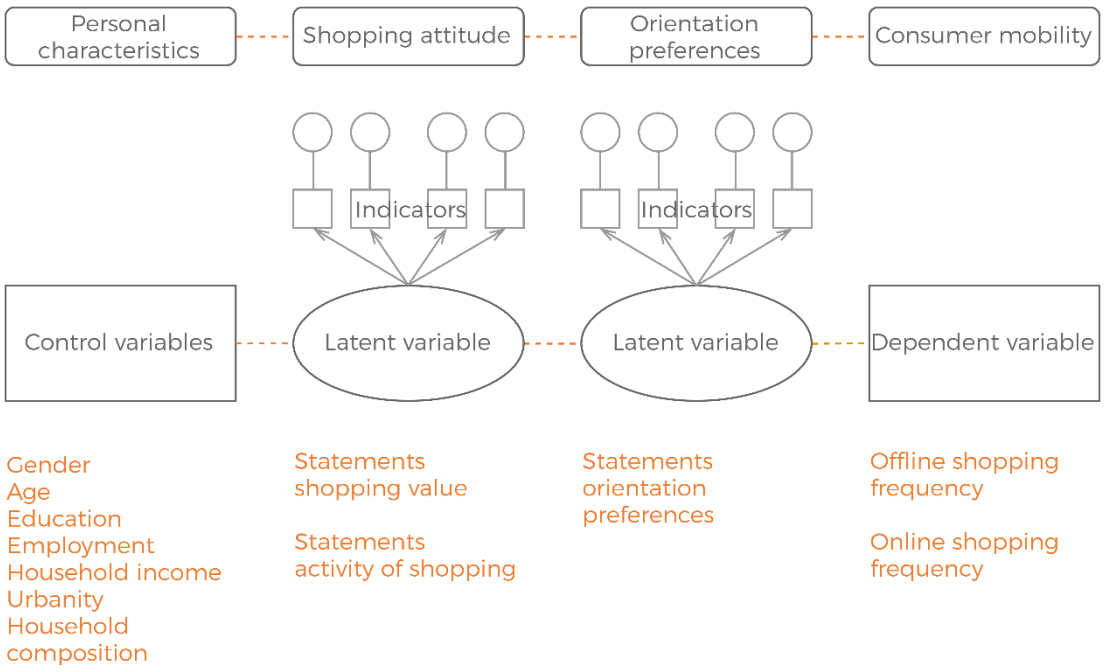

Figure 11 Operationalisation of variables

3.2.1. Dependent variables

The dependent variable in the model is shopping frequency. Although the interest in this research is consumer mobility, data availability is limited to shopping frequency as a reliable consumer mobility measure. Shopping frequency is relevant in this research since offline purchases inevitably lead to shopping trips and online purchases do not necessarily require any. By using shop frequency as dependent variable, shopping trip frequency for the phase of purchasing is approached in a reliable way. However, by evaluating trip frequency and kilometrage also other shopping phases could be approximated. An attempt to interpret shopping trip frequency and kilometrage from diary data is described in chapter 5.

In the e-commerce survey respondents were asked how many times in the past three months they bought a product, for both online and offline retail environments. Important to note is that the highest frequency people could select is '5 times or more', which could represent a rather large range.

The question was asked for ten product categories. In the main model discussed in this thesis, offline shopping frequency of all categories was summed to compute the total offline shopping frequency. The same computation was done to determine total online shopping frequency. Separate models were estimated for product classes, as is elaborated upon in section 5.1. For these models, offline and online shopping frequency of relevant product categories were summed in order to compute the total offline and online shopping frequency per product class.

3.2.2. Control variables

Table 3 gives an overview of what control variables were considered in the papers discussed in section 2.2. In this paragraph the relevance of this selection of control variables is explained. Relevant control variables are included in the model estimation phase.

Table 3 Control variables from literature

Publication		Gender	Age	Education	Employment status	Household income	Urbanity	Internet usage	Household composition	Vehicle availability	Preferred transport mode
Dholakia	1999	x	x	x	x	x					
Tonn & Hemrick	2004	x	x	x	x	x		x	x		
Farag et al.	2007	x	x	x		x	x	x	x	x	
Weltevreden	2007	x	x	x				x			
Weltevreden & Rietbergen	2007	x	x	x			x	x			
Diep & Sweeney	2008	x									
Weltevreden & Rotem-Mindali	2009	x	x				x				
Cao et al.	2010	x	x	x	x	x	x			x	
Cao	2012	x	x	x	x	x				x	
Davis & Hogdes	2012	x	x		x						
Zhou & Wang	2014	x	x	x	x		x	x	x	x	x
Bradley & Lafleur	2016	x	x	x		x					
Comi & Nuzzolo	2016	x	x		x				x	x	
Lee et al.	2017	x			x	x	x	x	x	x	x
Rintamäki & Kirves	2017	x	x								
Zhai et al.	2017	x	x	x	x		x	x			
Zhen et al.	2018	x	x	x		x	x	x	x		x
		17	15	11	9	8	8	8	6	6	3

In almost all of seventeen studies the demographic variables gender and age were considered. The majority of the selected papers considers education, employment status, income and urbanity as relevant control variables. Internet usage was recognised as an important variable as well, however in the MPN survey this information was not captured sufficiently to include in the model as well. Household composition was found significant in most studies that handle consumer mobility (see Table 2 and Table 3). Although vehicle availability and preferences were considered by various researchers, no substantiated expectation concerning the effects could be derived from literature.

Seven control variables are selected for analysis in this thesis: gender, age, education, employment, household income, urbanity and household composition. In the following enumeration the variables and their expected effects are explained.

- Gender
  Women tend to appreciate shopping more than men do. Both in the orientation and purchase phase women are therefore expected to choose offline shopping channels, whereas men will prefer online alternatives for the activity of shopping.
- Age
  Young people are more open to online orientation and purchasing (Cao et al., 2012; Farag et al., 2007; Zhou & Wang, 2014). Also, older people are expected to value aspects of traditional shops more than younger people do, such as the presence of employees.

- Education
  Education is found positively related with online orientation and shopping in previous research. The expectation for this model is that higher educated people reveal stronger preferences for online shopping alternatives compared to lower educated people.
- Employment
  People who work full-time have less time to spend on shopping. A relationship between employment and shopping attitude is expected, especially on utilitarian shopping value. Besides that, online orientation and sales are positively correlated with employment (Cao et al., 2012).
- Household income
  The results of the research of Cao et al. (2012) and Farag et al. (2007) concerning income were contradictory: whereas the former reported more online searching and sales for higher income households, the latter reported a negative relationship. Also, a relation between income and shopping attitude is expected to be significant, as spending money for shopping can be rather stressful for lower-income households.
- Urbanity
  Contradictory, yet significant results were found in literature regarding the urbanity level of respondents' residences and e-commerce, yet there is no unambiguous expectation of the role of urbanity. Urbanity was represented in terms of distance to nearest shop, shops per square kilometre or inhabitants per square kilometre. Although the Netherlands is not characterised by large differences in spatial attributes, urbanity levels based on the number of inhabitants per square kilometres can be used as a measure of urbanity.
- Household composition
  The composition of households is found significant in six of the selected papers. Some focus on the number of household members or children in the household, whereas others only distinguish single person households.

Control variables are inserted in the model as dummy variables, since the effects of categorical variables are expected to not be linear. The considerations for determining the categorisation of control variables is described in attachment B.

The suggested relationships are tested in the structural model. Besides that, correlation between variables in the same level in the causal chain is analysed. Correlation between control variables could result in multicollinearity: a relation between education and consumer mobility could really exist on its own, but could also be partly explained because age and education are possibly correlated.

3.2.3. Latent variables

The unobservable concepts in the model are approached as latent variables. In this paragraph the approach of shopping attitude and orientation preferences are discussed. The latent constructs explain the response to various statements.

3.2.3.1. Shopping attitude

Shopping attitude is defined as the appreciation of the activity of shopping. Two sets of statements in the questionnaire can be used as indicators in the measurement model. Ten statements starting with 'How important is it for you that …' and ending with phrases including utilitarian and hedonic *shopping values* were rated on a Likert scale from 1 to 5 (1 = very unimportant; 3 = neutral; 5 = very important). Another two statements regarding *the activity of shopping* are again evaluated on a Likert scale from 1 to 5 (1 = strongly disagree; 3 = neutral; 5 = strongly agree). A list of all statements included in the analysis is to be found in attachment E.

The only statements relevant for shopping attitude represent either hedonic or utilitarian shopping values. Due to the distinct character of these types of shopping values, the concept of shopping attitude is expected to be represented in two latent constructs – hedonic shopping value and utilitarian shopping value. Usually in a measurement model of a SEM approach these expectations are tested with hypothesized latent constructs. In this thesis a rather exploratory approach is performed to determine valid constructs, of which the results are to be found in chapter 4.

3.2.3.2. Orientation preferences

Orientation preferences is questioned by means of thirteen statements, respectively. Respondents express to agree on a Likert scale from 1 to 5 (1 = strongly disagree; 3 = neutral; 5 = strongly agree). The statements all start with 'Before I buy this product via Internet, …' for online purchases and 'Before I buy this product in a physical store' for offline purchases, and end with phrases regarding the search medium, e.g. '… I compare products in a physical store' and '… I look up product information via Internet'.

For answering questions on orientation medium, respondents were instructed to keep in mind their most recent purchase in a particular product category that was assigned to them. This means that *orientation preferences* should be interpreted as 'orientation preferences for a specific product category'.

3.3. Data description

The data used for the analyses performed in this thesis comes from the Netherlands Mobility Panel. In this section both the data collection instrument and the composition of the sample are described.

3.3.1. Netherlands Mobility Panel (MPN)

The dataset used as primary source for this research comes from the Netherlands Mobility Panel (MPN) – a collection of households whose travel behaviour is monitored in the form of household surveys. Besides logging all traffic movements in a period of three days, respondents fill out a questionnaire on specific topics related to mobility.

A module dedicated to e-commerce is included in the first, third and fifth wave of MPN questionnaires. The dataset from the fifth wave includes shopping trip frequency in both the online and offline environment for a variety of product categories, as well as consumer behaviour and motivation aspects. The dataset is a valuable source to analyse consumer mobility segmented for product categories. Since offline purchases are merely questioned in wave 5, online purchases in comparison to offline purchases can only be analysed cross-sectionally.

The dataset is well suited for providing up-to-date insights in e-commerce and consumer mobility in the Netherlands, as data has been gathered amongst Dutch households in 2017 (wave 5). Since the dataset is to a large extent suitable in space and time, conclusions from this research are highly valuable for Dutch authorities in constructing transport policy regarding e-commerce.

3.3.2. Sample composition

The e-commerce survey conducted in wave 5 was completed by 6745 respondents. For this research only respondents who bought any product in either an offline or online retail setting in the past three months were relevant objects of study. This narrowed the dataset down to 5956 respondents.

3.3.2.1. Missing values

Indicators that are used to estimate latent variables were unfortunately not available from all respondents. Statements (see paragraph 3.2.3 for a more detailed explanation) concerning shopping

attitude were filled out by all 5956 respondents, yet statements concerning orientation preferences are only available from respondents who ever bought something online. This is a consequence of the aim to expose respondents only to questions relevant to them. Only 3984 of 5956 (66.8 per cent) respondents did answer questions concerning online shopping, as they stated to have bought any of the product categories online in the past three months. Although all respondents answered questions concerning shopping in general, not all response is valuable. The answer option 'does not apply' was recoded into a missing value. Attachment D gives an overview of the sequence of questions, as well as the number of missing values per variable.

Missing values were handled in AMOS software by means of full information maximum likelihood (FIML). Instead of neglecting observations with incomplete response completely (listwise deletion) or for selected estimations (pairwise deletion) or completing data based on other observations' means (data imputation), AMOS complements missing values after model estimation. The underlying assumption for this method is that missing values are missing at random. This assumption does however not hold for questions concerning online shopping. This issue is discussed closer in section 6.2.

3.3.2.2. Sample representativeness

From literature, a number of variables are acknowledged as determinants for both orientation preferences and offline shopping attitude. Besides, some variables have a direct influence on shopping frequency. Table 4 gives an overview of the composition of the selected sample in terms of gender, age, income, employment, education, urbanity level and household composition. These variables are considered in this research as control variables, as is explained in paragraph 3.2.2.

Table 4 Sample composition

Variable	Mean/Frequency	Valid percent	Gouden Standaard 2017
Gender			
Male	2545	42.7	49.3
Female	3411	57.3	50.7
Age			
16-17	108	1.9	2.9
18-24	467	7.8	10.5
25-34	1074	18.0	15.1
35-49	1453	24.3	24.6
50-64502+486	1517	25.5	25.3
65-75	970	16.3	12.8
75+	367	6.2	8.8
Employment (hr/wk)			
Unemployed	1608	27.2	41.6
0 to 12	859	14.5	6.7
12 to 35	1605	27.1	21.1
35 or more	1841	31.2	30.6
Education			
Low education	1775	29.8	31.5
Medium education	2234	37.6	32.4
High education	1940	32.6	27.1
Household income (euro)			
Lower than average (< 40.000)	2471	48.8	43.9
1-2x modal (40.000 – 67.000)	1686	33.3	28.5
2x modal or more (>= 67.000)	911	18.0	27.4
Urbanity (inhabitants/km^2)			
Non-urban (0 – 1500)	2819	47.3	45.9*
Urban (1500+)	3137	52.7	54.1*

Household composition			
Single person household	1406	23.9	17.3
Couple	1951	33.1	39.4
Couple with children	2112	35.9	Total children 43.3
Single parent household	339	5.8	
Other	78	1.3	

The extent to which this data sample is representative for the Dutch population is examined by means of the so-called Gouden Standaard. This guideline is a set of measures determined by Statistics Netherlands (CBS) describing the demographic composition of the Dutch population. The last column of Table 4 displays the percentages of demographic data in the Dutch population older than 16 years old. In the data sample used for this study, part-time employed (0 – 12 hours per week) people are overrepresented, as well as medium and high educated people. Household with a yearly income below modal and highly above modal are underrepresented. A large number of respondents did not want to report their household income, which could well have been higher income households. In the Gouden Standaard no distinction is made between single parent households and couples with children. Single person households are overrepresented in the MPN survey, couples are underrepresented. The discrepancies of the used dataset from the Dutch population should be kept in mind when interpreting the results for policy-making.

3.4. Conclusion

A step-wise approach is taken in order to reveal the relationships in e-commerce and consumer mobility. Complex, unobserved variables are estimated as latent constructs by measurement model estimation. In the structural model, relationships between latent constructs and other observed variables are estimated.

The conceptual model requires some changes due to availability and usefulness of the data. The operationalised model in Figure 12 has undergone the following relevant changes:

- Consumer mobility was expressed as shopping trip frequency for both offline and online retail environment separately.
- For online purchases preferences for offline orientation and online orientation were captured. For offline purchases online orientation preferences are included, however offline orientation preferences lack from the data.

As explained in paragraph 3.1.2, EFA is performed in order to specify the factors representing the latent constructs shopping attitude and orientation preferences. In chapter 4 this analysis is discussed as the measurement model.

The data limits this model to estimating relations between shopping attitude, orientation preferences and shopping frequency. In chapter 5 an attempt to estimate mobility measures, such as shopping trip frequency and kilometrage is described. Additional data was selected, as will be presented in chapter 5 as well.

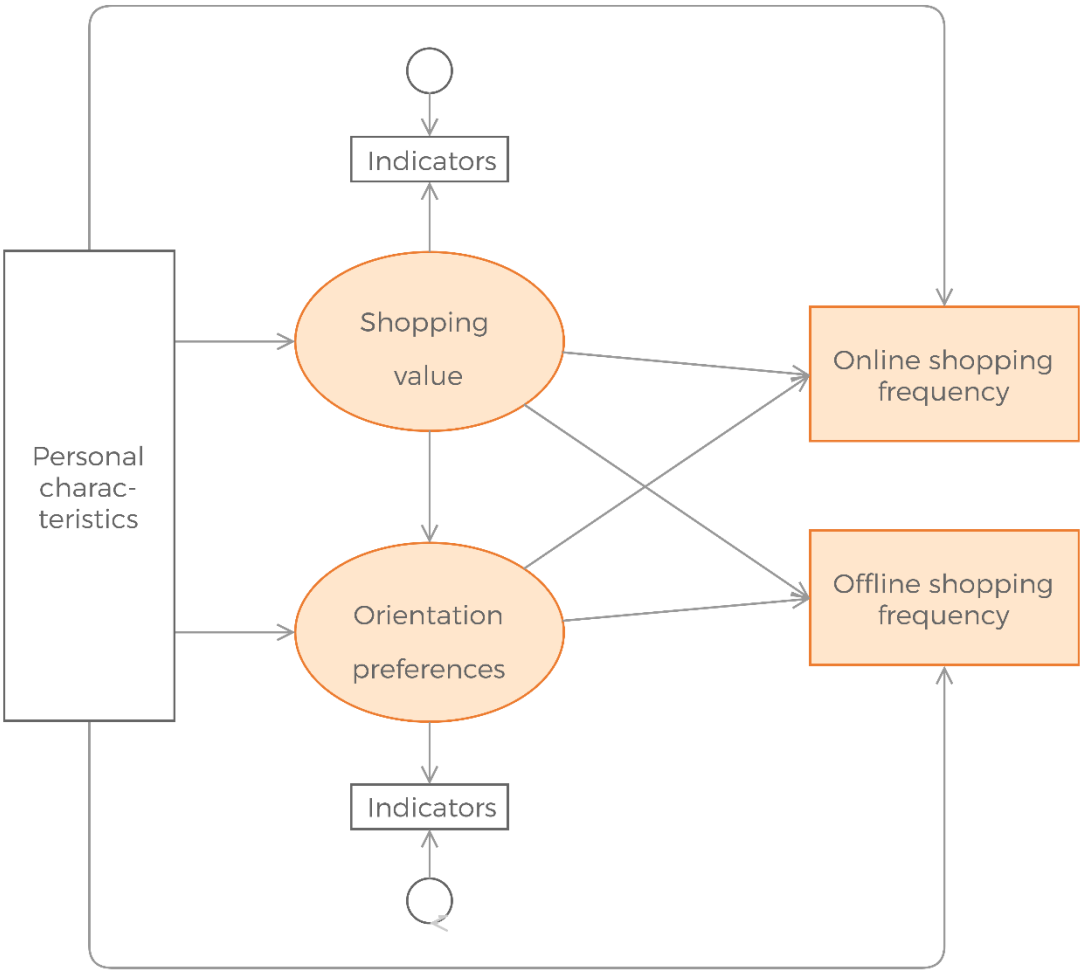

Figure 12 Operationalised model

4. Results of structural equation modelling analysis

In a data analysis hypothesized relations between theoretical concepts are studied by means of an actual data set. This thesis describes a structural equation modelling (SEM) approach to analyse the statistical relations between shopping value, orientation preferences and shopping frequency. In chapter 3 the method, MPN data set and operationalised model are explained. This chapter describes the results for analysis of the total shopping frequency in two steps: the measurement model and structural model. First, the goodness of fit of this main model is examined.

4.1. Goodness of fit

The goodness of fit of the models is measured by four model fit indices as introduced in paragraph 3.1.2. After presenting the indices in Table 5, the goodness of fit of the main model is evaluated.

Table 5 Model fit indices

Index	Threshold	Measurement model	Structural model	Structural model with control variables
Chi Squared		6128.510	8676.273	8971.978
p-value	> 0.05	0.000	0.000	0.000
CFI	> 0.95	0.863	0.836	0.905
RMSEA	< 0.08	0.087	0.075	0.048
SRMR	< 0.08	0.0447	0.0403	0.0290

The indices of the model's RMSEA and SRMR are considered good as they are smaller than the commonly accepted thresholds. Given the models parameters, the hypothesized covariance matrix does not differ much from the actual covariance matrix of the sample, as SRMR indicates. The trade-off between model fit and parsimony is assessed by the RMSEA score and evaluated as just sufficient.

The model's Chi Squared value should be larger than 0.05 to retain the null-hypothesis that the sample covariance matrix does not significantly differ from the fitted covariance matrix. A p-value of 0.000 confirms the null-hypothesis, which could indicate a bad model fit. Nevertheless, debates are going on whether this model fit index is a good indicator since in large data samples (N > 400) the p-value will most likely be smaller than 0.05. The data sample used in this thesis includes 5956 respondents, suggesting that the sample size is the reason for this score.

Comparative fit index of 0.905 means that the model with latent constructs is for 90.5 percent different from the independent model. An index of 0.905 is a little too low in comparison to the threshold of 0.95. The final model is compared with the measurement model to investigate the origin of the low index and potential options to improve the goodness of fit. Table 5 reports the comparison between these models. The measurement model has a lower CFI value, which suggests that the problem originates from the measurement model. A problem in the measurement model could in the traditional SEM approach be fixed by changing the composition of indicators on latent constructs. However, since in this study the measurement model is approached by means of exploratory factor analysis rather than confirmatory factor analysis, the measurement model already is to be considered as optimal.

Overall, the model is considered sufficiently fitting the data set, even though the data was not generated for the purpose of this research specifically. In the next sections the results of the analyses are discussed.

4.2. Measurement model

In this section the first quantitative modelling step of SEM is described. Three latent constructs were recognised – hedonic shopping value, offline orientation preference and online orientation preference. Factor loads of observed variables in the form of statements about shopping in general and orientation for online purchases are displayed in tables.

4.2.1. Exploratory factor analysis

Usually in SEM the measurement model is determined by means of confirmatory factor analysis. The procedure is as follows: from theory a latent variable is recognised and constructed from observable variables. A survey is designed in order to retrieve the required observable variables, which are then tested on their covariance within the latent construct.

In this research however, the survey was designed and conducted before the measurement model was constructed. Therefore, the measurement model is estimated by means of exploratory factor analysis. Statements selected from the survey to be analysed in the factor analysis are listed in attachment E.

According to the conceptual model, the latent variables shopping attitude and orientation preferences were expected to be revealed from the analysis. Shopping attitude was expected to appear in two separate latent variables: hedonic shopping value and utilitarian shopping value. Orientation preferences are expected to appear in a single variable measuring the willingness to use Internet for the purpose of orientation for online purchases.

The exploratory factor analysis resulted in three latent variables. Paragraph 4.2.2 describes the latent variables by means of AMOS results. Since only relevant statements are included in the AMOS results, the loads slightly differ from EFA results from SPSS analysis. The results from SPSS analysis can be found in attachment E.

4.2.2. Confirmatory factor analysis

In Table 6, Table 7 and Table 8 the observed variables loading on the latent constructs hedonic shopping value, offline orientation and online orientation, respectively, are listed. Statements that were not assigned to any construct, but are expected to have a significant relationship with shopping frequency are listed in Table 9.

Table 6 Latent construct Hedonic shopping value

Indicator	Description	Response	Load
WB1	How important is it for you that shopping is enjoyable?	Likert scale 1-5 (1 = very unimportant; 5 = very important)	0.643
WB3	How important is it for you that shopping gives a break from your daily routine?	Likert scale 1-5 (1 = very unimportant; 5 = very important)	0.679
WB4	How important is it for you to shop with friends?	Likert scale 1-5 (1 = very unimportant; 5 = very important)	0.726
WB6	How important is it for you that the shopping environment is enjoyable?	Likert scale 1-5 (1 = very unimportant; 5 = very important)	0.564
WB8	How important is it for you that your family likes to join shopping?	Likert scale 1-5 (1 = very unimportant; 5 = very important)	0.684
WS2	Shopping is an outing to me	Likert scale 1-5 (1 = completely disagree; 5 = completely agree)	0.731
WS3	Shopping is a way to spend time with friends and family	Likert scale 1-5 (1 = completely disagree; 5 = completely agree)	0.722

Table 7 Latent construct Offline orientation preference

Indicator	Description	Response	Load
WI9	Before I buy this product through the Internet, I like to have seen the product in a shop	Likert scale 1-5 (1 = completely disagree; 5 = completely agree)	0.886
WI10	Before I buy this product through the Internet, I like to go to a shop for advice	Likert scale 1-5 (1 = completely disagree; 5 = completely agree)	0.799
WI11	Before I buy this product through the Internet, I compare products in a physical shop	Likert scale 1-5 (1 = completely disagree; 5 = completely agree)	0.719

Table 8 Latent construct Online orientation preference

Indicator	Description	Response	Load
WI1	Before I buy this product in a physical shop, I find ideas through the Internet for new products to buy	Likert scale 1-5 (1 = completely disagree; 5 = completely agree)	0.579
WI2	Before I buy this product in a physical shop, I search for product information through the Internet	Likert scale 1-5 (1 = completely disagree; 5 = completely agree)	0.831
WI3	Before I buy this product in a physical shop, I view reviews of other users or experts through the Internet	Likert scale 1-5 (1 = completely disagree; 5 = completely agree)	0.817
WI4	Before I buy this product in a physical shop, I compare prices through the Internet at various vendors	Likert scale 1-5 (1 = completely disagree; 5 = completely agree)	0.782
WI6	Before I buy this product through the Internet, I search for product information through the Internet	Likert scale 1-5 (1 = completely disagree; 5 = completely agree)	0.751
WI7	Before I buy this product through the Internet, I view reviews of other users or experts through the Internet	Likert scale 1-5 (1 = completely disagree; 5 = completely agree)	0.781
WI8	Before I buy this product through the Internet, I compare prices through the Internet at various vendors	Likert scale 1-5 (1 = completely disagree; 5 = completely agree)	0.772
WI12	Before I buy this product through the Internet, I compare products through the Internet	Likert scale 1-5 (1 = completely disagree; 5 = completely agree)	0.809

The observed variables in Table 9 did not show enough covariance to be captured in a single latent construct. Although the statements all express utilitarian values, the intended utilitarian goals (time saving, price incentive, effort saving) differ too much to be considered as defining an overarching shopping attitude.

Table 9 Other relevant statements

Indicator	Description	Response
WB5	How important is it for you that shopping takes as little time as possible?	Likert scale 1-5 (1 = very unimportant; 5 = very important)
WB9	How important is it for you to have contact with shop employees?	Likert scale 1-5 (1 = very unimportant; 5 = very important)
WB10	How important is it for you to be able to buy products fast and easy?	Likert scale 1-5 (1 = very unimportant; 5 = very important)
WB11	How important is it for you to be able to compare price and quality of products easily?	Likert scale 1-5 (1 = very unimportant; 5 = very important)

Figure 13 is a visualisation of the operationalised model after factor analysis, in which shopping attitude is split in the latent construct hedonic shopping value and four individual relevant observed variables. Orientation preferences are modelled in the two latent constructs online and offline orientation. The model contains three types of relations between the main concepts: direct effects from shopping attitude and orientation preferences to shopping frequency, as well as direct effects between the two exogeneous variables. For the figure's clarity, only the relations from hedonic shopping value are displayed. The grey arrows in the figure represent relations of either of the three types. Dotted arrows represent the relationships between control variables and other variables in the model.

The latent constructs and selected individual shopping value statements are used in the structural model to study the relationship between shopping value, orientation preferences and the dependent variable shopping frequency.

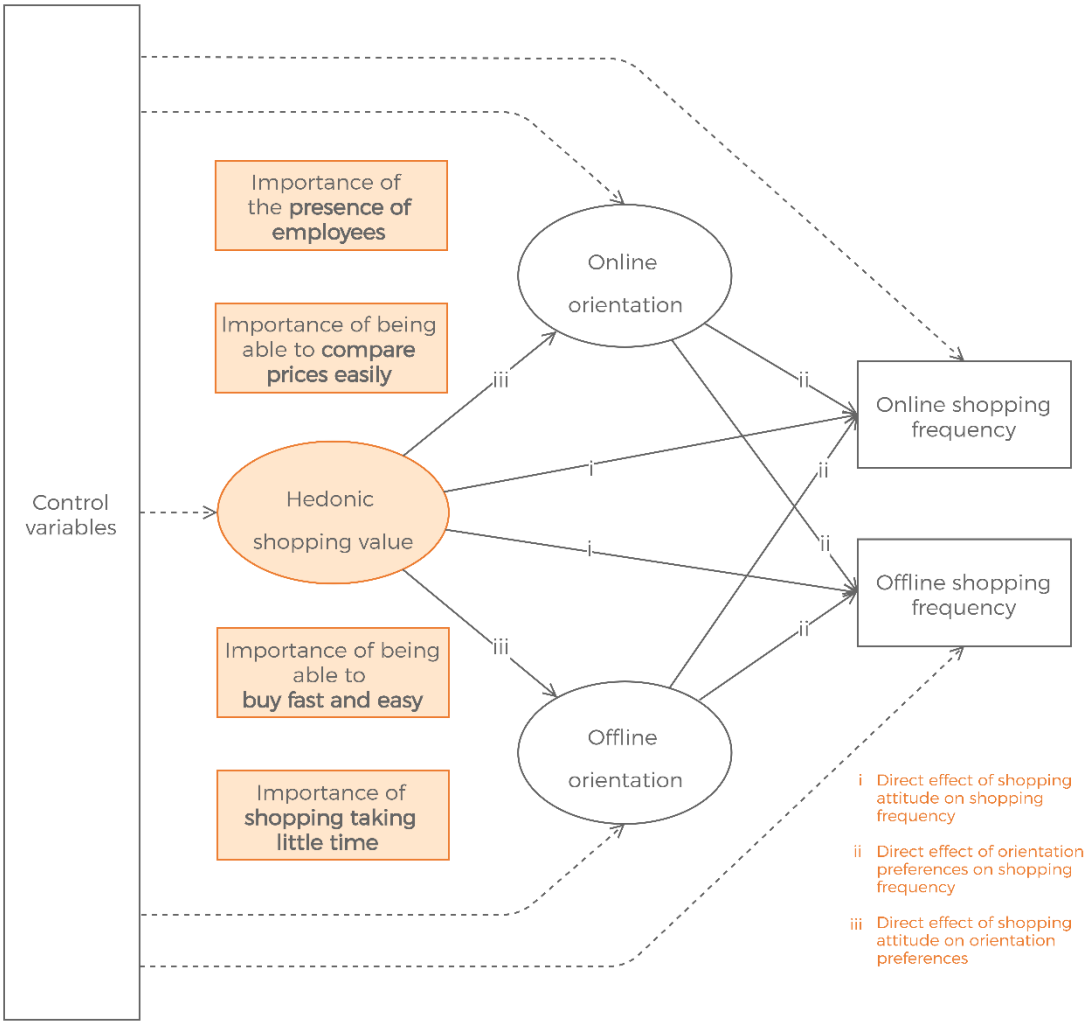

Figure 13 Operationalised model after factor analysis

4.3. Structural model

The second quantitative modelling step of SEM is described in this section. The relationships between the latent constructs, dependent variables and control variables are tested by means of linear regression. Results of the overall structural model including control variables are explained step-wise and displayed in tables.

4.3.1. Offline and online shopping frequency

In previous literature, the aim of consumer mobility studies is to find evidence for any of the four mobility effects of e-commerce described by Mokhtarian (2004): substitution, complementarity, modification or neutrality. Although from this study such a statement on the effects of e-commerce on consumer mobility can not be given, the relation between offline shopping frequency and online shopping frequency could be evaluated by means of the correlation between both observed variables.

The correlation between the number of purchases made offline and online in a period of three months show a correlation of 0.070. This positive correlation between the two implies that a person who frequently shops in an offline retail environment is likely to shop more frequently in an online retail environment as well. Since the correlation coefficient is rather low, the effect in this model is very weak. In previous research a positive relationship was found as well, although these papers captured a causal structure between offline and online shopping frequency (Cao et al., 2010; Farag et al., 2007; Zhou & Wang, 2014).

As offline and online shopping frequency are hardly related and no causality can be proven from the model in this analysis, both dependent variables should be evaluated separately in the structural model. Both variables can be related differently with other variables in the model.

4.3.2. Shopping value and orientation preferences

The concepts shopping value and orientation preferences are of main focus in this thesis. In this parapraph the relations describing the impact of these variables are presented. First, the direct effects from shopping value and orientation preferences on shopping frequency are described. An addition to existing literature is the direct effect from shopping value on orientation preferences, as well as the indirect effect on shopping frequency resulting from that.

In this step of the data analysis relations are estimated based on variances and covariances of the latent and observed variables in the structural model. Standardised regression coefficients are an interpretation of these values, expressing the relations on a neutral scale.

Direct effects on shopping frequency

Significant relations describing a direct effect of the concepts shopping value and orientation preferences on shopping frequency are presented in Table 10 and Table 11.

Table 10 Significant direct relations between shopping value and shopping frequency

From		To	Stand. Reg. Coeff.	p-value
Hedonic shopping value	→	Offline shopping frequency	0.095	<0.001
Hedonic shopping value	→	Online shopping frequency	0.074	<0.001
Presence of employees	→	Offline shopping frequency	0.048	<0.001
Presence of employees	→	Online shopping frequency	-0.027	0.048
Compare prices easily	→	Offline shopping frequency	0.035	0.012
Buy fast and easy	→	Offline shopping frequency	0.034	0.014
Buy fast and easy	→	Online shopping frequency	0.040	0.003
Time-consciousness	→	Offline shopping frequency	-0.081	<0.001
Time-consciousness	→	Online shopping frequency	0.053	<0.001

Both hedonic shopping value and utilitarian shopping value have a direct effect on shopping frequency. People who express a higher appreciation of hedonic shopping value, shop more frequently in an offline retail setting. Other scholars found similar results (Cao et al., 2010; Farag et al., 2007; Lee et al., 2017). Three out of four utilitarian values – contact with shop employees, being able to compare prices easily and being able to buy products fast and easy – appear to be reasons for consumers to visit physical shops as well.

A relatively strong relation is found significant for hedonic shopping value for online shopping frequency as well. Consumers who adhere to hedonic shopping value tend to purchase more in both purchasing channels, albeit to an even larger extent in the offline retail environment. This finding is in line with Zhai et al. (2017), however contrary to what other researchers found (Cao et al., 2010; Lee et al., 2017; Weltevreden & Rietbergen, 2007). The utilitarian shopping value of being able to buy products fast and easy explains for both shopping frequencies too.

The appreciation of the shop employees' presence is found negatively related with online shopping frequency, although the relationship is not convincingly significant. The Internet is used less for shopping by people who highly appreciate the presence of shop employees.

No significant relation was found between the value of comparing prices easily and shopping frequency, meaning that people who highly value the ability to compare prices easily do not show distinct behaviour from people who do not.

The utilitarian value describing the importance of shopping taking as little time as possible (from now on referred to as 'time-conscious') is related with shopping frequency in a different manner. The value is negatively associated with offline shopping frequency and positively associated with online shopping frequency. People who highly value time in the context of shopping buy less frequently offline and more frequently online. These findings support the theory on the substitution effect of e-commerce.

Table 11 Significant direct relations between orientation preferences and shopping frequency

From		To	Stand. Reg. Coeff.	p-value
Offline orientation preference	→	Online shopping frequency	-0.079	<0.001
Online orientation preference	→	Offline shopping frequency	0.056	<0.001
Online orientation preference	→	Online shopping frequency	0.094	<0.001

The relations described in Table 11 should be interpreted with caution. As response for statements loading on the constructs offline orientation preference and online orientation preference is only available for people who bought something online in the past three months, offline shoppers are underrepresented.

A negative relation between the preference for offline orientation for online shopping purchases and online shopping frequency resulted from data. People who prefer to orientate in shops before buying any product online, tend to buy less frequently online. No significant relation was found between offline orientation preferences and offline shopping frequency for the total sum of purchases, however.

Both offline and online frequency can partly be explained by online orientation preferences. A positive relation between the preference for online orientation and both shopping frequencies could be interpreted as: people who prefer to orientate online are likely to shop more frequently in both an offline and online retail environment.

The findings for relationships between orientation preferences and shopping frequency support previous findings of various scholars (Cao, 2012; Cao et al., 2010; Farag et al., 2007; Zhai et al., 2017).

Indirect effect on shopping frequency

The relations as listed in Table 10 and Table 11 have been studied before. Although the statements representing utilitarian shopping value were not literally questioned in previous research, hedonic shopping value and the orientation phase are.

New in this analysis is the examination of relationships between shopping value and offline and online orientation preferences. In Table 12, significant relations between shopping value and orientation preferences are presented, followed by a description of the results. Again, the precaution of interpreting the relations in Table 12 correctly holds. The statements loading on online and offline orientation preference were not evaluated by people who only bought offline in the past three months.

Table 12 Significant direct relations between shopping value and orientation preferences

From		To	Stand. Reg. Coeff.	p-value
Hedonic shopping value	→	Offline orientation preference	0.149	<0.001
Hedonic shopping value	→	Online orientation preference	0.075	<0.001
Presence of employees	→	Offline orientation preference	0.170	<0.001
Compare prices easily	→	Offline orientation preference	0.101	<0.001
Compare prices easily	→	Online orientation preference	0.196	<0.001
Buy fast and easy	→	Offline orientation preference	-0.070	<0.001
Buy fast and easy	→	Online orientation preference	0.074	<0.001

The preference for orientating offline for online purchases, as well as the preference for orientating online for online purchases can be explained by the appreciation of hedonic shopping value. This is an interpretation of the positive relationships from hedonic shopping value to offline and online orientation preferences. People who like the activity of shopping tend to appreciate offline orientation more than people who do not. Also online orientation is more appreciated by people who like the activity of shopping, albeit to a lesser extent. A similar positive effect was found by Weltevreden & Rietbergen (2007) and Zhen et al. (2018).

From respondents who bought anything online in the past three months, those who value the presence of shop employees highly, prefer to orientate offline. No significant relation was found between the value concerning the presence of shop employees and online orientation preferences.

People who highly appreciate the utilitarian value of being able to compare prices easily, express strong preferences for offline and online orientation. The relationship between this value and online orientation preferences is stronger, indicating that the Internet is a much relevant medium for orientation purposes.

For the purpose of buying goods fast and easy, people prefer to orientate online rather than offline. The negative relationship with offline shopping frequency and the positive relationship with online shopping frequency support the theory of substitution. As these relations reinforce each other – people who find it important that products can be bought fast and easy clearly reveal a preference for the online medium in the pre-purchase phase. Consequently, these people are not likely to perform a trip for orientation, whereas they might have done so when e-commerce did not provide them with an online alternative.

Nevertheless, shoppers who highly value time in the context of shopping express no preference for either medium in the orientation phase. The relationships between this utilitarian shopping value and

shopping frequency turned out to be insignificant, which could be interpreted as a lack of interest in orientation for people who shop time-consciously.

The relations between shopping value and orientation preferences are relatively strong compared to the values Table 10 and Table 11. The impact on consumer mobility however can only be assessed from indirect effects, which can be calculated as the sum of products of the relation between shopping value and orientation preferences and the relation between orientation preferences and shopping frequency (see Equation 2 in paragraph 3.1.2). In Table 13 the direct effects from shopping value on shopping frequency are compared against indirect effects and the summed effects for each shopping value. A calculation matrix explaining the derivation of indirect and summed effects is provided in attachment G.

Table 13 Direct, indirect and summed effects from shopping value on shopping frequency

From		To	Direct effects	Indirect effects	Summed effects
Hedonic shopping value	→	Offline shopping frequency	0.095	0.004	0.099
Hedonic shopping value	→	Online shopping frequency	0.074	-0.005	0.069
Presence of employees	→	Offline shopping frequency	0.048		0.048
Presence of employees	→	Online shopping frequency	-0.027	-0.006	-0.033
Compare prices easily	→	Offline shopping frequency	0.035	0.011	0.046
Compare prices easily	→	Online shopping frequency		0.029	0.029
Buy fast and easy	→	Offline shopping frequency	0.034	0.006	0.040
Buy fast and easy	→	Online shopping frequency	0.040	0.010	0.050
Time-consciousness	→	Offline shopping frequency	-0.081		-0.081
Time-consciousness	→	Online shopping frequency	0.053		0.053

Since some relations between shopping values and offline or online shopping frequency were not proven significant, no indirect effect can be calculated for those relations. Similar, a direct effect from 'compare prices easily' to online shopping frequency is not present, yet an indirect effect can be calculated. Summing the direct and indirect effect results in the total effect of the variables representing shopping value on the dependent variables offline and online shopping frequency.

The indirect effects of shopping value via orientation preferences to shopping frequency are in general smaller than the direct effects. All indirect effects had the same sign as the corresponding direct effect, despite the effect of hedonic shopping value on online shopping frequency. As the effect of hedonic shopping value on offline orientation preference is twice as strong as on online orientation preference, the negative regression coefficient from offline orientation preference on online shopping frequency was stronger represented in the indirect effect.

The indirect effects are calculated from relationships that were found highly significant, which resulted in highly significant indirect effects as well – whereas equivalent direct effects in some cases were found less convincingly significant.

Ultimately, the indirect effects strengthened direct effects up to 31 percent (in the relationship between the value of comparing prices easily and offline shopping frequency). When comparing the summed effects on shopping frequency with the direct effects from both shopping value and orientation preferences (see Table 10, Table 11 and Table 13), the order of magnitude of the regression coefficients is rather equal.

4.3.3. Control variables

The effects between main concepts are controlled for by seven demographic variables. A significant relationship between a control variable and any other variable should be interpreted as an effect in the

data that occurs despite other existing relations between the fundamental concepts. The control variables are included in the model in the form of dummy variables, as is explained in section 3.3. In Table 14 significant relationships are listed. The relations are discussed per control variable.

Table 14 Control variable effects (p-value between brackets)

	Hedonic shopping value	Time-consciousness	Presence of employees	Buy fast and easy	Compare prices easily	Offline orientation preference	Online orientation preference	Offline shopping frequency	Online shopping frequency
Gender (reference male)									
Female	0.286 (<0.001)	-0.160 (<0.001)	0.074 (<0.001)	-0.069 (<0.001)	(0.074)	(0.659)	-0.106 (<0.001)	0.094 (<0.001)	(0.082)
Age (reference 16 to 17)									
18 to 24	(0.568)	(0.886)	-0.063 (0.030)	(0.407)	(0.711)	(0.317)	(0.885)	0.057 (0.042)	(0.974)
25 to 34	(0.104)	(0.112)	(0.411)	(0.864)	(0.648)	(0.734)	(0.310)	0.209 (<0.001)	0.103 (0.008)
35 to 49	-0.135 (0.003)	(0.074)	(0.660)	(0.796)	(0.295)	(0.544)	(0.376)	0.222 (<0.001)	0.111 (0.009)
50 to 64	-0.156 (<0.001)	(0.564)	(0.222)	-0.097 (0.030)	(0.556)	(0.798)	(0.223)	0.173 (<0.001)	(0.323)
65 to 74	-0.207 (<0.001)	(0.275)	(0.736)	-0.159 (<0.001)	(0.337)	(0.142)	(0.382)	0.161 (<0.001)	(0.093)
75+	-0.175 (<0.001)	(0.289)	(0.657)	-0.102 (<0.001)	(0.124)	(0.581)	(0.613)	0.082 (0.002)	-0.051 (0.050)
Education (reference level low)									
Medium	-0.046 (0.007)	(0.068)	(0.132)	0.035 (0.032)	(0.344)	(0.346)	(0.598)	0.075 (<0.001)	0.052 (<0.001)
High	-0.125 (<0.001)	0.080 (<0.001)	-0.049 (0.006)	0.039 (0.028)	(0.136)	-0.068 (<0.001)	(0.659)	0.169 (<0.001)	0.100 (<0.001)
Employment (reference 0 hours per week)									
0 to 12	-0.032 (0.037)	(0.868)	(0.469)	-0.040 (0.007)	(0.144)	(0.975)	(0.610)	(0.941)	(0.883)
12 to 35	(0.662)	0.078 (0.046)	(0.203)	(0.329)	-0.066 (<0.001)	0.055 (0.017)	(0.745)	0.035 (0.045)	(0.350)
35 or more	(0.622)	0.107 (0.016)	(0.112)	(0.544)	-0.064 (0.002)	0.048 (<0.001)	(0.416)	(0.173)	(0.196)
Income (reference lower than average)									
1-2x average	(0.099)	(0.077)	(0.539)	(0.904)	-0.038 (0.048)	(0.172)	(0.455)	(0.169)	(0.194)
> 2x average	(0.062)	(0.482)	(0.122)	(0.076)	(0.065)	-0.057 (0.002)	(0.714)	(0.191)	0. 089 (<0.001)
Urbanity (reference non-urban)									
Urban	-0.067 (<0.001)	(0.926)	-0.045 (<0.001)	(0.560)	(0.291)	(0.863)	(0.155)	(0.210)	0.037 (0.003)
Household composition (reference couple)									
Single	-0.051 (0.003)	(0.172)	(0.190)	(0.062)	(0.133)	-0.084 (<0.001)	(0.075)	(0.884)	(0.069)
Single + kids	-0.038 (0.014)	0.037 (0.020)	(0.080)	(0.932)	-0.040 (0.008)	(0.081)	(0.584)	(0.112)	0.042 (0.003)
Couple + kids	0.041 (0.025)	(0.965)	(0.092)	-0.038 (0.033)	-0.041 (0.023)	(0.056)	(0.857)	(0.156)	0.068 (<0.001)

As the stereotypical idea implies, gender has significant effects in explaining shopping frequency. A positive relationship between gender and hedonic shopping value shows that women appreciate the activity of shopping more than men do. On top of that, time is not that much of the concern related to shopping for women, given the negative relationship with the utilitarian shopping value of being able to purchase goods fast and easy and the value representing time-consciousness. The negative relationship between gender and online orientation preferences indicates the disfavour of women to use the Internet as the orientation medium for online purchases. Also, women tend to shop more frequently in an offline setting, although this effect is not extreme. No relationship between gender and offline orientation was found.

For the control variable age the relations that were found are clearly not linear. Four variables of the structural model are affected by age, all revealing a rather curved graph (see Figure 14). In all four relations the pivot point lies around 75 years old.

Shopping value as represented by the latent construct hedonic shopping value and the value of being able to compare prices fast and easy show negative coefficients coming with age. Younger people value shopping as an activity higher on the hedonic scale, but also value efficiency more than older people do.

Shopping frequency for the online and offline retail environment show peaks around the age of 25 to 49. For offline sales, the reference group is not representative, as all other age categories have higher coefficients for this variable. This could be due to the fact that the reference group usually does not shop for the whole household, but just for themselves. Online shopping frequency however is well represented by the reference group as three out of six other age groups show no significantly different relation with online shopping frequency. This result is very interesting for developing strategies to either promote or reduce online shopping.

Contradictory to what was expected, the presence of employees was not significantly valued higher by elderly people. The significant relation that was found for the age group 18 to 24 could be a result of specific product categories. In paragraph 5.1.2 this will be discussed further.

Figure 14 Age effects (reference 16 to 17)

The regression coefficients describing relations between high education level and the concepts in the structural model are relatively high. Higher educated people dislike shopping relative to their lower

educated peers and value time and fastness more. Nevertheless, strong direct effects on shopping frequency for both online and offline shopping are not in line with these shopping value appreciations. Higher educated people show distinct behaviour from the main model, thus could be considered as a distinct target group for policy making.

Employment rate has a highly positive relation with the utilitarian value that the activity of shopping should take less time. People who work a lot would rather not spend their time on shopping. The effects on shopping frequency however were not proven convincingly significant.

Also higher incomes are acquainted with more online oriented shopping behaviour. People with a higher household income disfavour offline orientation for online purchases, as the negative relationship between household income and orientation preferences implies. The positive effect on online shopping frequency emphasizes their preference for the online sales channel.

The impact of urbanity level on consumer behaviour throughout the shopping process is rather small: a relatively low negative regression coefficient was found between urbanisation level and online shopping frequency. The higher the urbanisation level of the residential area, the less online purchases a consumer does. People living in urbanised regions appreciate the activity of shopping a little less than people living outside of cities, as well as the presence of shop employees. This could be an effect of high density of shops in urbanised regions to which they got used, however these speculations are beyond the scope of this study.

The dummy variables representing household composition distinguish singles from couples and households with children from households without. Singles' households expressed a dislike towards shopping and orientating offline, as is represented by the negative relationship on hedonic shopping value and offline orientation preferences. Households with children appear to score higher on the hedonic scale, however this could be due to the fact that some statements in this latent construct concern family situations. The presence of children in a household also affects the appreciation of the value of being able to compare prices in a negative way. Households with children more frequently bought goods online than households without children.

The results in Table 10 to Table 13 were generated simultaneously from the model including the main concepts and control variables. A preliminary model including merely the main concepts shopping value, orientation preferences and shopping frequency revealed significant relationships between main concepts that became insignificant after adding control variables. Whereas some effects on the main concepts can be completely explained by control variables, in other relations the main concepts serve as a moderator – for example: an effect from a control variable on shopping frequency can be explained via orientation preferences. The results for the preliminary model are to be found in attachment H. The effects in Table 10 on online shopping frequency were found weaker and less convincingly significant in the full model – emphasizing the significant explanatory role of control variables in this part of the causal chain. Only the importance of being able to buy goods fast and easy was not at all affected by control variables. Regression coefficients listed in Table 13 were proven more convincingly significant, where utilitarian shopping value statement effects became weaker and hedonic shopping value effects got somewhat stronger.

4.4. Conclusion

The model as presented in this thesis is accepted to fit the data set sufficiently, as model fit indices were found within acceptable threshold (see Table 5). Three latent constructs represent the complex concepts of shopping attitude and orientation preferences, complemented by four individual variables. Significant relations between latent constructs and other observed variables were found in the

structural model. The main results are summarized in paragraph 4.4.1, a number of reflective comments are given in paragraph 4.4.2.

4.4.1. Main results

Both direct effects from shopping value and orientation preferences on shopping frequency, as well as indirect effects result from data analysis. In summary, the following outcomes were proven:

- Shopping frequency can be explained from shopping attitude as a direct effect, as well as an indirect effect via orientation preferences.
- Hedonic shopping value has a stronger effect on consumer behaviour than utilitarian shopping value. Hedonic shopping value is related to the offline shopping process, whereas utilitarian shopping value primarily is associated with online shopping – both purchasing and orientation.
- Utilitarian shopping value was represented by various statements. Especially for orientation preferences, different effects were revealed for various utilitarian shopping value statements. People who appreciate the ability to compare prices easily value orientation options highly, whereas time-conscious shoppers didn't express any interest in orientation. This variety in results gives reason to study these utilitarian shopping values more closely in future research.
- The effects from shopping value on orientation preferences are stronger than the direct effects from shopping value and orientation preferences on shopping frequency. The indirect effects from shopping value on shopping frequency are however lower than the direct effects – the indirect effects account for up to 31 per cent of the summed effects.
- Based on demographic data, three personal characteristics are recognised as explanatory for consumer behaviour in the model. Various age classes reveal different effects for shopping attitude and shopping frequency. On top of that, women and higher educated people revealed distinct behaviour from other respondents in the sample.

4.4.2. Interpretation of results

In this paragraph an evaluation of results is provided. The sample and its generalisability for the Dutch population is evaluated, followed by an interpretation of the content of results.

- The results as presented in this chapter are based on the survey response of 5956 respondents who ever bought any product in the past three months – either offline or online. People who shop less frequently are excluded from analysis.
- Not all variables in the model were available from all respondents. Data that was available for all respondents were the statements on shopping value and shopping frequency for online and offline retail. The statements on orientation preferences were only available for people who used the Internet for buying at least one product in the past three months. This structurally missing information is handle by means of Full Information Maximum Likelihood, complementing missing values based on the available data – thus the orientation preferences of online shoppers. This means that the orientation preferences of the merely offline buying consumer are not represented in this study, whereas their orientation preferences for offline purchases are relevant as well in explaining consumer mobility.

The criteria on which the sample is selected has the consequence that the results in this chapter are only generalisable for people who shop at least once every three months. All results related to orientation preferences strictly only apply for online shoppers, as these results are based on their response to the MPN survey.

The composition of the respondent group is slightly different from the composition of the Dutch population, especially concerning the control variables employment, income and household composition. The differences are not important for the interpretation of results on individual level,

however there are consequences for generalising the results for the Dutch population. The overall consumer mobility effects for the Dutch population can be estimated by segregating the results in this analysis on demographics in order to calculate the weighed sum according to the composition of the Dutch population.

For the substantive interpretation of the results as presented in this chapter, the following issues should be considered:

- The estimation of effects on shopping frequency are based on the reported number of purchases in-store and online in a period of three months. The answer options to these questions require explanation: the maximum frequency a respondent could select is '5 times or more'. This phrase immediately raises the question what the exact number was, especially since the other options are 'x times' with x being an exact number lower than five. For some product categories the expected shopping frequency in three months certainly is higher than five – for example concerning food and groceries. Were the integer number of purchases made online and offline included in the model rather than a maximum of five, the effects on shopping frequency are expected to be stronger, however significance can be affected too. The effects on orientation preferences are the only regression weights that are not affected by this issue.
- The statements on which the latent construct hedonic shopping value loads mainly describe the activity of shopping. Shopping environment and the benefit of possessing the product purchased are relevant aspects of hedonic shopping value as well, however these aspects are not represented in the statements in the MPN survey. The latent construct hedonic shopping value can therefor only be interpreted as the extent to which one experiences enjoyment from the activity of shopping. Since the statements are much focussed on shopping with family, it is no surprise that single person households evaluate hedonic shopping value lower than couples.
- The construct offline orientation only loads on statements concerning purchases made via the Internet, thus the construct represents offline orientation for online purchases. Offline orientation for offline purchases is not questioned in the survey.

In the next chapter the main model as described in this chapter is applied for three product classes in order to examine whether consumer behaviour is different for these categories. The data analysis in this chapter provides insight in the relationships between shopping value, orientation preferences and shopping frequency; thereby focussing on consumer behaviour rather than consumer mobility. The impact of these relations on consumer mobility is likely to show different parameters. The application of the model for consumer mobility is further discussed in chapter 5.

5. In-depth analyses

In the previous chapter the concepts shopping value and orientation preferences are found to be useful for explaining offline and online shopping frequency. The effects of the main concepts and control variables on the sum of purchases for the offline and online shopping medium were examined. In this chapter the relations are re-examined by in-depth analyses on the applicability for two additional purposes.

The first purpose is segregation on product classes. Consumer behaviour in terms of buying offline or offline is expected to be different for various product classes, as is described in section 2.3. In the first section of this chapter an appropriate product classification is constructed, after which the model as presented in chapter 4 was rerun for the three classes.

The second in-depth analysis is aimed on investigating the applicability of the model for other consumer mobility measures. Shopping value and orientation preferences were found significant for explaining shopping frequency, in section 5.2 the model was rerun with the number of shopping trips and kilometrage as dependent variables.

5.1. Product classification

The effects of e-commerce on consumer mobility is expected to be different amongst product classes. In this section product categories are classified as search goods, experience goods or commodity goods – based on the shopping medium used for purchasing these products. Then, the model as described in previous sections is applied to each product class. Results are presented here as well.

5.1.1. Classification

The MPN-survey includes ten product categories distinguished by several characteristics. Products differ by size, shape, weight, texture, purpose, frequency of use and so on. Another characteristic relevant for e-commerce is the extent to which products can be judged on a distance.

Respondents were asked through what shopping medium they purchased products from each category in the past three months – online, offline or both. Results were plotted in Figure 15 in terms of percentages of reported shopping medium.

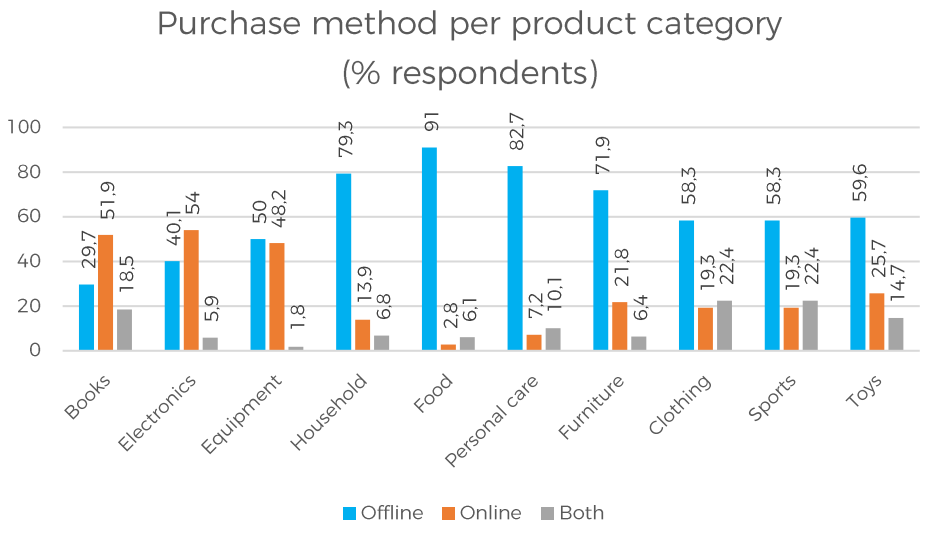

Figure 15 Shopping medium per product category

Three product classes with theoretically comparable characteristics are distinguished. The classification is in line with classifications as described by Peterson et al. (1997).

- Search goods
  For providing sufficient information on search goods for a consumer to buy the product, the Internet offers an equivalent alternative to a physical shop. A physical shop has no benefits over an online shop for this type of products, as the information provided is the same through both shopping media.
  The bar charts in Figure 15 show a high percentage of online sales for search goods. Product categories that are assigned to the product class of search goods are: books, music, movies and games and consumer electronics (such as television, mobile phone, vacuum cleaner).
- Experience goods
  When purchasing experience goods, consumers require additional information from what can be read and seen on screen. By means of trying and sensing the products, a complete judgement can be generated in order to choose whether or not to buy the product. In Figure 15 a relatively large share of purchases is performed offline, however a relevant share is purchased online. These products are widely offered through the Internet with flexible return policies. Product categories from the MPN survey considered as search goods are: shoes, clothing and accessories; sports and hobby goods and toys.
- Commodity goods
  In consumer goods, the term commodity goods can be interpreted as basic items to fulfil life needs. Products are generally available at relatively low cost and are frequently bought compared to other product classes.
  Commodity goods are mostly bought offline, as can be recognised from the bar charts in Figure 15. Food and groceries; personal care and health items and household items are assigned to the product class of commodity goods in this analysis.

The classification is underlined by distinct developments of the percentage of consumers ever having bought products from these product classes online (CBS Statline, 2018b). Search goods and experience goods developed similarly in terms of the average growth percentage from 2012 to 2017 – both classes experienced a growth of around 60 percent in five years. For search goods this is mainly due to the category of household equipment, as the percentage of people who ever bought books and movies online did not grow to a large extent. Experience goods are however bought by more than half of the Dutch population in 2017, as the percentage grew from 31.2 to 52.0. The biggest growth was seen in the commodity goods class – the percentage grew by 250 percent in five years of time, especially from 2015 on.

Shopping frequency for product categories belonging to one class were summed in order to run the model for each product class separately. Again a note should be made that shopping frequency per product category was limited to five, as the maximum response option was ‘five or more times in the past three months’. On top of that, no clear boundaries of the product categories were given. The interpretation of respondents of their purchases in either of the product categories was not validated.

Two product categories were not assigned to either of the recognised classes: large household equipment (such as refrigerator, washing machine) and furniture. The low frequency of buying these goods and dissimilar shopping medium patterns of these categories were reason to exclude them from analysis.

5.1.2. Product class models

Based on the percentage of people who bought certain product categories either offline, online or both, a product classification is constructed (see paragraph 5.1.1). The sum of purchases for the product categories belonging to a class serve as the dependent variable for each the three product class models. The model as described in chapter 4 was rerun with different sets of dependent variables: online shopping frequency and offline shopping frequency were replaced by summed shopping frequencies for each of the three product classes, both for online and offline purchases.

In Table 15 to Table 17 the results are displayed. Models were indeed different for each product class. Although many relations did not or slightly change, in others the standardised regression coefficient appeared to be rather different or insignificant. Only the outstandingly differed relationships are presented here, a complete overview of relationships is to be found in attachment I. An interpretation of results is given.

Overall, the product class that is the most comparable to the overall model is the class of commodity goods. Five relations were found insignificant in the commodity goods model, in comparison to seven for both search goods and experience goods. As the sample did not change, only direct effects of shopping value, orientation preferences control variables on shopping frequency changed throughout the product class models. Two relations maintained in all three models: the effects of age and gender on online shopping frequency.

Table 15 Effects of shopping attitude on shopping frequency in product class models

			Search		Experience		Commodity	
From		**To**	**Regr. Coeff.**	**p-value**	**Regr. Coeff.**	**p-value**	**Regr. Coeff.**	**p-value**
Hedonic shopping value	→	Offline shopping frequency		0.125	0.148	<0.001		0.061
Hedonic shopping value	→	Online shopping frequency		0.230	0.100	<0.001		0.980
Presence of employees	→	Offline shopping frequency	0.084	<0.001		0.104	0.039	0.004
Presence of employees	→	Online shopping frequency		0.432	-0.042	0.002		0.773
Compare prices easily	→	Offline shopping frequency		0.373		0.556	0.051	<0.001
Compare prices easily	→	Online shopping frequency	0.041	0.002		0.694		0.745
Buy fast and easy	→	Offline shopping frequency		0.163		0.358	0.040	0.005
Buy fast and easy	→	Online shopping frequency		0.161		0.148	0.060	<0.001
Time-consciousness	→	Offline shopping frequency		0.175	-0.035	0.021	-0.108	<0.001
Time-consciousness	→	Online shopping frequency		0.120	-0.053	<0.001		0.074

Hedonic shopping value is only convincingly significant in explaining shopping frequency for experience goods. The relation between hedonic shopping value is slightly stronger for offline shopping frequency than for online frequency in this model.

In the product class of search goods also the appreciation of the presence of shop employees is found significant in explaining offline shopping frequency. Apparently people who like the presence of

employees visit the store more frequently for buying books and electronics. The same relation was found in the product class of commodity goods, however this could be result of the fact that almost all consumers shop for this product type more than 5 times in three months, almost all of them offline. The only negative relationship concerning the presence of shop employees appears in the product class of experience goods: people who appreciate the contact with shop employees tend to buy these type of goods less frequently online.

The effects of the appreciation of being able to compare prices quick and easy differ much amongst product classes. This utilitarian value is positively related to offline shopping frequency for search goods and positively related to offline shopping frequency for commodity goods. People who find it important to be able to do so, purchase search goods more frequently online, whereas they buy commodity goods more frequently in an offline retail environment. The Internet appears to provide a better comparison method for search goods.

In the commodity goods model the utilitarian value of being able to buy products quick and easy is found positively related with both online and offline shopping frequency. The effect is stronger for online than for offline shopping – people who adhere to this value are those who buy commodity goods more frequently.

People who find it important that shopping takes as little time as possible apparently shop less frequently for experience goods, as well as for commodity goods. This could be interpreted in two ways: people who highly value time have a smaller need to go shopping; or people who highly value time shop more efficiently. As the data does not provide insights in the amount of products bought, this could not be evaluated.

Table 16 Effects of orientation preferences on shopping frequency in product class models

			Search		Experience		Commodity	
From		**To**	**Regr. Coeff.**	**p-value**	**Regr. Coeff.**	**p-value**	**Regr. Coeff.**	**p-value**
Offline orientation preference	→	Offline shopping frequency	0.088	<0.001	0.056	0.001	-0.051	0.007
Offline orientation preference	→	Online shopping frequency	-0.087	<0.001	-0.072	<0.001		0.127
Online orientation preference	→	Offline shopping frequency	-0.039	0.028		0.411	0.086	0.007
Online orientation preference	→	Online shopping frequency	0.119	<0.001	0.084	<0.001		0.847

The absence of a significant relationship between offline orientation preferences and offline shopping trip frequency in the main model is a result of the differences between product class models. For commodity goods a negative relationship was found, whereas for both search goods and experience goods a positive relation holds. People who prefer to orientate offline for online purchases appear to shop more frequently offline for search goods and experience goods. The effect is opposite in the commodity goods model – these people buy offline less frequently for the class of commodity goods. The line of reasoning here is questionable, since the result could also be interpreted as if people who do not frequently buy commodity goods offline have a higher preference for offline orientation for online purchases.

The effects of orientation preferences for online shopping frequency were only found significant for buying search goods and experience goods. An underlying reason could be that at the time of data

acquisition, the online options for buying commodity goods were limited. Only few online purchases were reported for commodity goods, hence significant results do not occur.

Also the positive relationship between online orientation preferences and offline shopping frequency for commodity goods could be a result of the absence of online options for this class. For search goods the effect of preferences for online orientation on offline shopping frequency is as expected – people who prefer to orientate online for online purchases shop less frequently in an offline retail environment. For search goods no significant relation was found, meaning that people who prefer to orientate online do not show different behaviour from people who did not express a strong preference for online orientation.

The demographic variables for which the main model was controlled show different effects as well for offline and online shopping frequency. In Table 17 the results are listed for all product class models. Significant relationships were highlighted in grey.

Table 17 Effects of control variables in product class models (p-value between brackets)

	Main model		Search goods		Experience goods		Commodity goods	
	Offline shopping frequency	Offline shopping frequency	Offline shopping frequency	Online shopping frequency	Offline shopping frequency	Online shopping frequency	Offline shopping frequency	Online shopping frequency
Gender (reference male)								
Female	0.094 (<0.001)	(0.082)	(0.874)	-0.093 (<0.001)	0.091 (<0.001)	0.070 (<0.001)	0.094 (<0.001)	0.036 (0.010)
Age (reference 16 to 17)								
18 to 24	0.057 (0.042)	(0.974)	(0.192)	(0.759)	(0.938)	(0.700)	0.101 (<0.001)	(0.507)
25 to 34	0.209 (<0.001)	0.103 (0.008)	-0.089 (0.030)	(0.051)	0.104 (0.009)	0.123 (0.002)	0.264 (<0.001)	0.138 (<0.001)
35 to 49	0.222 (<0.001)	0.111 (0.009)	(0.064)	(0.197)	0.087 (0.045)	0.103 (0.016)	0.297 (<0.001)	0.149 (<0.001)
50 to 64	0.173 (<0.001)	(0.323)	-0.092 (0.040)	-0.139 (0.001)	(0.774)	(0.155)	0.269 (<0.001)	(0.203)
65 to 74	0.161 (<0.001)	(0.093)	(0.187)	-0.168 (<0.001)	(0.178)	(0.131)	0.209 (<0.001)	(0.492)
75+	0.082 (0.002)	-0.051 (0.050)	(0.088)	-0.137 (<0.001)	(0.244)	(0.089)	0.149 (<0.001)	(0.349)
Education (reference level low)								
Medium	0.075 (<0.001)	0.052 (<0.001)	0.086 (<0.001)	0.041 (0.009)	0.041 (0.009)	(0.084)	0.055 (<0.001)	0.045 (0.005)
High	0.169 (<0.001)	0.100 (<0.001)	0.178 (<0.001)	0.144 (<0.001)	0.098 (<0.001)	0.053 (0.002)	0.134 (<0.001)	0.053 (0.003)
Employment (reference 0 hours per week)								
0 to 12	(0.941)	(0.883)	(0.822)	(0.678)	(0.333)	(0.897)	(0.486)	(0.923)
12 to 35	0.035 (0.045)	(0.350)	(0.694)	(0.392)	(0.160)	(0.304)	0.037 (0.037)	(0.689)
35 or more	(0.173)	(0.196)	(0.926)	(0.052)	(0.097)	(0.671)	(0.163)	(0.301)

Income (reference lower than average)								
1-2x average	(0.169)	(0.194)	(0.052)	(0.900)	(0.331)	(0.207)	(0.463)	(0.152)
> 2x average	(0.191)	0. 089 (<0.001)	0.040 (0.046)	0. 049 (0.012)	(0.054)	0. 075 (<0.001)	(0.978)	0. 076 (<0.001)
Urbanity (reference non-urban)								
Urban	(0.210)	0.037 (0.003)	(0.871)	(0.988)	(0.183)	(0.144)	(0.389)	0.048 (<0.001)
Household composition (reference couple)								
Single	(0.884)	(0.069)	0.063 (<0.001)	0.080 (<0.001)	(0.056)	(0.755)	(0.637)	(0.780)
Single + kids	(0.112)	0.042 (0.003)	(0.508)	(0.199)	(0.390)	0.047 (<0.001)	-0.037 (0.011)	(0.084)
Couple + kids	(0.156)	0.068 (<0.001)	(0.586)	(0.848)	0.060 (<0.001)	0.106 (<0.001)	-0.073 (<0.001)	(0.105)

Also for control variable the similarity between the main model and the model for commodity goods is large. Although the effects of household income were similar in all product models, the effects of employment rate and urbanity level were only found significant in the commodity goods model. The effects of age, gender, education and household composition differ per product class.

Women appear to buy search goods less frequently online, yet experience goods and commodity goods more frequently. Apparently women go shopping for clothing more often than men do, but also more frequently do the groceries. The diversity amongst product classes induces an insignificant relationship in the main model.

Age is an important indicator of shopping frequency. For commodity goods the effects are comparable to the main model – with age the frequency of buying commodity goods offline rises. The age group that uses the Internet to buy commodity goods is 25 to 49. Offline sales for search goods is not affected by age, however online sales are performed less by elderly people. For the class of experience goods a peak in online and offline shopping frequency appears for age groups between 25 and 49 as well.

Even though the magnitude of effects from education to shopping frequency vary across product classes, the direction stays the same. The relationships are stronger for search goods than for experience goods, however level of education is an explanatory factor for shopping frequency in all product models.

Surprisingly, households with children do groceries less frequently than households without children, as the negative relationships with offline shopping frequency expresses. An explanation could be that one person in particular is responsible for doing the groceries within a household, which results in a lower number of purchases per household member in a family with children than in a two-person household. In order to further investigate this effect, household composition could be approached by means of a variable expressing the number of children per household.

5.1.3. Shopping frequency per product class

The differences between the product class models are important to recognise when considering the effects of e-commerce: for different product classes, the effects will be different. Physical shops in the class of experience goods are likely to generate consumer mobility differently from commodity good shops.

Besides the regression coefficients also the value of the dependent variable shopping frequency varies from one product class to another. This has implications for interpreting the results as well. Table 18

displays the percentage of respondents who indicated their shopping frequency as 5 times or more, per product category.

Table 18 Percentage of respondents shopping 5 times or more in three months per product category

Product category	Offline shopping frequency (% of respondents)	Online shopping frequency (% of respondents)
Books, music, movies and games	1.4	2.0
Consumer electronics	0.1	0.3
Large household equipment	0.1	0.1
Household items	9.5	0.8
Food and groceries	78.4	2.7
Personal care and health items	27.8	1.2
Furniture	0.2	0.1
Shoes, clothing and accessories	7.2	3.5
Sports and hobby goods	1.5	0.9
Toys	1.6	0.8

Especially for the product categories assigned as commodity goods respondents reported a shopping frequency of 5 times or more in three months. No substantiated estimation of the actual number of purchases in that period can be made from the available data, however it is very likely that commodity goods are bought more frequently than five times in three months. As was already explained in paragraph 4.4.2, higher dependent variables will result in higher regression coefficients, although the significance could be affected too.

Also in the category of shoes, clothing and accessories a relatively high percentage of respondents bought products more often than five times in three months –both offline and online. As this product category accounts for half of the product class experience goods, the results of this model should be interpreted with caution as well. For other product categories, the percentage reporting 5 purchases or more are not outstandingly high. The search goods model seems the closest to reality since almost all respondents reported purchase frequencies with an integer value of 1 to 4 times per three months for each of the three product categories.

5.2. Consumer mobility

As the most reliable consumer mobility metric from MPN data was shopping frequency, the model as presented in chapter 4 is based on this variable. In this section the viability of using the model to estimate the effects for other consumer mobility measures is discussed.

Mobility usually is described by means of *trip frequency* to describe the number of trips made and *kilometrage* expressing the number of kilometres travelled. Diary data from the MPN survey includes the number of reported trips per purpose for a period of three days, as well as the kilometres travelled per trip. These metrics were individually used as the dependent variable in the model, replacing shopping trip frequency.

5.2.1. Consumer mobility models

The model as developed in this thesis was found significant for explaining shopping frequency. In order to investigate the applicability for explaining consumer mobility, the model should be slightly adjusted. By replacing the dependent variables offline and online shopping frequency with either the number of shopping trips or distance travelled the usefulness of the main model to estimate consumer mobility was evaluated. Again, a preliminary model without control variables was examined first. Table 19 displays the main relevant results.

Table 19 Structural modelling phase of consumer mobility models

	Shopping trip frequency				Kilometrage	
	Preliminary		Control variables		Preliminary	
	Stand. Reg. Coeff.	p-value	Stand. Reg. Coeff.	p-value	Stand. Reg. Coeff.	p-value
Hedonic shopping value	-0.095	<0.001		0.530		0.853
Presence of employees	0.060	<0.001		0.329		0.596
Compare prices easily	0.038	0.001		0.077		0.663
Buy fast and easy	-0.043	0.008		0.218		0.273
Time-consciousness	-0.106	<0.001	-0.037	0.009		0.149
Offline orientation preference		0.849				0.213
Online orientation preference		0.874				0.702

Although the estimations of the structural model seemed to result in significant relationships in the shopping trip frequency model, most of these were found insignificant after adding control variables. Only the shopping value of finding it important that shopping takes as little time as possible is found as a significant explanatory factor for shopping trip frequency. In the model with kilometrage as dependent variable none of the relations from either shopping value or orientation preferences were found significant.

Although the model as presented in chapter 4 is valuable in explaining shopping frequency, the consumer mobility metrics shopping trip frequency and kilometrage can not be explained from the model. In the next sections an explanation for the lack of significant effects on these consumer mobility metrics as dependent variables is being sought after.

5.2.2. Correlation of dependent variables

A quick assessment of correlation between shopping frequency, the number of shopping trips and distance travelled for the purpose of shopping gives an indication whether the model could be of use in explaining consumer mobility at all. Table 20 gives an overview of the results.

Table 20 Correlation coefficients between consumer mobility metrics

	Offline shopping frequency	Online shopping frequency	Number of shopping trips
Online shopping frequency	0.112 (0.000)		
Number of shopping trips	0.127 (0.000)	-0.070 (0.000)	
Distance travelled	0.041 (0.005)	-0.012 (0.430)	0.315 (0.000)

The positive correlation between offline shopping frequency and online shopping frequency was already explained as an indicator of complementarity in paragraph 4.3.1 – people who frequently shop offline do so online as well.

The correlation coefficient between the number of shopping trips and shopping frequency gives in insight in the mobility behaviour of people mostly buying offline or online. Obviously, people who buy offline more frequently make more shopping trips – even in the three-day diary data. Online shopping frequency is negatively correlated with the number of shopping trips, which means that people who buy online more frequently tend to perform shopping trips less frequently. The same effects were

indicated by the correlation coefficients between kilometrage and shopping frequency, although this was not significant for online shopping.

Although correlation was significant, the coefficients are low according to the line of reasoning that people who buy offline should have made shopping trips too. This could be either because the number of shopping trips are not represented well in the three-day diary, or because people who buy offline make even more shopping trips. To determine the cause of the rather low correlation coefficients the response of the diary data and the e-commerce survey were investigated more closely.

5.2.3. Diary data

As the correlation coefficients between shopping frequency and the number of shopping trips are relatively low, it is still questionable whether the reported number of trips during three days represent shopping frequency well. In this paragraph the number of shopping trips during the diary period are compared to the reported shopping frequency from the e-commerce survey.

The number of trips reported by respondents in the three-day diary were compared to the expected number of trips. The expected number of shopping trips was calculated from the stated offline shopping frequency per three months by diving the total for the period of 90 days by 30. The difference between the reported number of trips and the expected number of trips for all participant are plotted in Figure 16. For 60 percent of the response this difference was negative, meaning that people made more trips in the three reported days than was expected from their stated shopping frequency. The other 40 percent of the response did not exceed the positive value of 1.13.

A miscalculation with an absolute value ranging from 0 to more than 16 and an average of -1.70 is relatively large compared to the average expected shopping trip frequency of 0.39. From these large discrepancies it is clear that the three-day diary is not valid to estimate shopping trip frequency from.

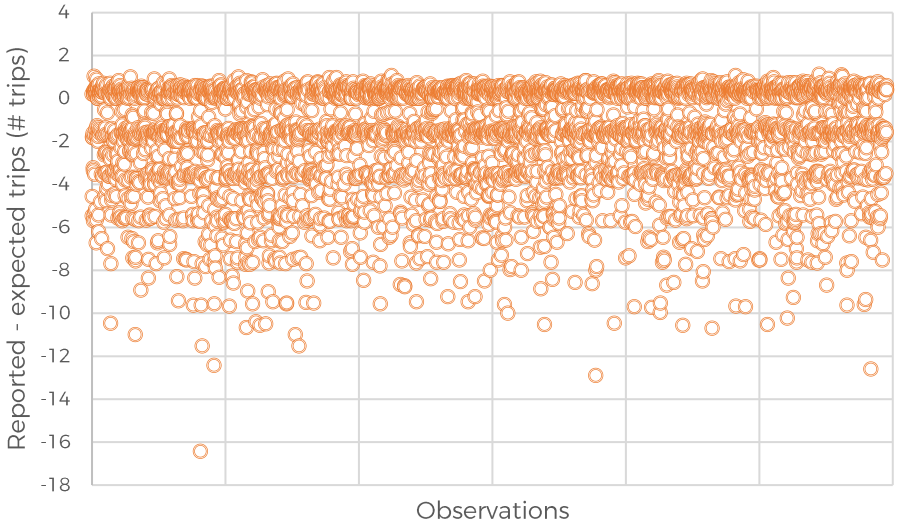

Figure 16 Difference between reported and expected number of shopping trips

The number of shopping trips expected from the MPN survey differ much from the number of shopping trips reported in the three-day diary. Several reasons for the discrepancies are plausible, however an integrated interpretation could not be delivered at this stage.

- The calculation of expected number of shopping trips from the total number of shopping trips does not represent the exact expected trip frequency, as shopping frequency was calculated from offline shopping frequencies per product categories. People could state their shopping frequency up to five times in three months. Shopping frequencies higher than five times in that period were handled as if the value was five. This underestimation of actual shopping frequency works through in the expected shopping trip frequency.
- The calculation of the expected number of shopping trips from offline shopping frequency does not include shopping trips for orientation purposes. The difference might be an indicator that people visit shops more often then they buy something – probably for the purpose of orientation.
- Shopping trips in diary data were reported differently amongst respondents. Whereas some person reports the trip to the city centre as a shopping trip, others report each movement from one shop to another as a shopping trip. As a result, the number of shopping trips in diary data could be overrepresented. As the MPN survey people reported the frequency of the activity of shopping, the negative differences between reported and expected trip frequency are not surprising.
- Another reason could be that people are not well capable of reproducing past behaviour. When reporting shopping frequency it is likely that people do not remember their shopping behaviour to the fullest, especially for a period of three months. In other research in the field of consumer mobility these effects have been found as well (Farag et al., 2007; Hoogendoorn-Lanser et al., 2015). The data used for this analysis suggest and underestimation of shopping frequency, if the differences were to be accounted to this reason.
- Whenever the four previously described defects do not hold, the following theoretical explanation is likely to be valid. The surplus of reported shopping trips with respect to the expected number of trips could be an indication of trips for orientation purposes. People spending more trips on shopping than the number of purchasing trips reported should have spent the extra trips on orientation for either offline or online purchases.

As the differences in the data could be caused by several defects as described above, no conclusions can be drawn from the regression coefficients from the model. However, relations that were found significant are interesting to discuss.

5.3. Conclusion

In this chapter the applicability of the main model for more detailed analyses was tested. The expectation that the model would provide different results for various product classes was approved, whereas the applicability for consumer mobility could not be evaluated positively.

Product type clearly does matter in explaining the relation between e-commerce and consumer mobility. Three product classes were recognised: search goods, experience goods and commodity goods. Experience goods are not related with utilitarian shopping value, whereas relationships from hedonic shopping value are even stronger for experience goods than for the other product classes. Search goods are frequently bought online by all types of customers – demographic variables reveal no strong relations in this model. Commodity goods are nearly always bought offline, although hedonic shopping values do not play a role for this product class.

By evaluating the differences between the number of reported and expected shopping trips, an indication of orientation behaviour could be reached. People who report more shopping trips than offline purchases are likely to have spent shopping trips on orientation for either offline or online purchases. However, the correlation between shopping frequency and other consumer mobility metrics were too low to argue the model as representative for consumer mobility estimation as well.

Improvements to both the shopping frequency survey and the three-day mobility diary could result in more significant effects within this model.

6. Evaluation

In the previous chapters the design, development and estimation of a model that answers the main research question were explained. In this final chapter the results and interpretations are evaluated in four steps. In section 6.1 the research questions are answered by means of previously described findings. Second, the implications of the conclusions for policy makers are explained in 6.2. The study as is described in this thesis is reflected upon in section 6.3. The evaluation is concluded in section 6.4 with recommendations for future research.

6.1. Conclusions

The thesis answered the research questions by the following conclusions. Each sub question will be discussed separately, to be concluded with the answer to the main research question how shopping attitude and orientation behaviour could explain consumer mobility.

Overall, the model as presented in this thesis is argued to have a sufficient goodness of fit for estimating relations between shopping attitude, orientation preferences and shopping frequency.

How are the fundamental concepts shopping attitude and orientation preferences defined?

Shopping attitude can be defined in several ways. Some researchers evaluate the consumers appreciation of shopping as either 'positive' or 'negative', whereas others group respondents based on their shopping attitude in classes such as 'time-conscious shopper', 'adventure seekers' and 'novelty seekers'.

These classifications are based on the concept of shopping values, subdivided into hedonic shopping values and utilitarian shopping values. Hedonic shopping value is in theory defined as the extent to which consumers experience joy from the activity of shopping. Besides enjoyment of the activity and the environment, other elements such as confidence and self-expression contribute to hedonic shopping value. The functional counterpart is referred to as utilitarian shopping value. Efficiency in terms of time, money and effort are important indicators of utilitarian shopping value, although it is hard to capture these different incentives in one concept.

Orientation preferences describe the behaviour of consumers in a shopping phase prior to actually purchasing goods. The orientation phase includes becoming aware of products, comparing product characteristics and evaluating (expert) reviews, amongst others. In e-commerce environments the orientation phase could as well be conducted both offline and online.

What is the theoretical relationship between shopping attitude, orientation preferences and consumer mobility?

Although e-commerce seems an interesting alternative to traditional shopping, consumer mobility did not decrease at the same rate as e-shopping increased in the past decades.

The activity of shopping, rather than the purpose of shopping could be an explanatory factor – people who like to shop are likely to continue shopping in an offline setting. On the other hand, people who dislike shopping are expected to make use of e-commerce as a substitution for traditional shopping.

Orientation preference is found determinant in explaining the choice for purchasing medium. People are likely to maintain to one medium throughout the shopping process, as previous research has proven. However, consumers could have reasons to orientate online and purchase offline or vice versa.

An addition to existing literature is the examination of the relationship between shopping attitude and orientation preferences, which is provided in this thesis. On top of that, all relationships are being evaluated for various product categories, as differences between product categories are expected.

How could shopping attitude and orientation preferences be represented by data?

Shopping attitude is in this study approached in the appearance of shopping values. A set of statements describing enjoyable features of the activity of shopping were captured in the latent construct hedonic shopping value. Several separate statements are included in the model representing utilitarian shopping value.

From a set of statements regarding online orientation before offline and online purchases, as well as offline orientation before online purchases two latent constructs became apparent: the preference for orientating offline and the preference for orientating online. Unfortunately, these statements were only submitted to consumers who bought products online. Consumers who merely buy products offline are not represented in this study.

Consumer mobility was approached in the form of shopping frequency, as this was the most reliable data available from the Netherlands Mobility Panel survey. Relationships in the model were tested for the total sum of purchases for offline and online shopping, as well as for three product classes.

What is the empirical relationship between the fundamental concepts and shopping frequency?

Shopping attitude in the appearance of shopping value is found significant in explaining shopping frequency for offline and online retail. Hedonic shopping value appeared to be significantly related with shopping frequency, especially for offline shopping. People who like to shop report a higher number of purchases in an offline store compared to people who like shopping less. The strongest relationship between a utilitarian shopping value and shopping frequency was from *time-consciousness* to offline shopping frequency. The negative relationship means that people who find it important that shopping takes as little time as possible appear to shop less frequently in an offline retail setting.

The more people expressed their preference for online orientation, the more they bought offline and online – the latter being stronger affected. People preferring offline orientation more revealed a lower online shopping frequency.

The effects are controlled for demographic variables. Three demographic variables were found significant in explaining shopping frequency – gender, age and level of education. Women tend to shop more frequently, regardless of their shopping attitude. This could well be a result of their role in the household as mostly women are responsible for doing the groceries. With age, hedonic shopping value is less important. High educated people show significant relationships with many of the variables in the model. As correlation is checked, these results were not affected by multicollinearity.

What are the differences between product classes?

Product categories are suitable to be bought online to various extents. In this thesis product categories were grouped into three product classes: search goods, experience goods and commodity goods. Search goods are products that can be evaluated by their product characteristics from a distance, and are therefore highly suitable for being bought online. Experience goods require visual inspection, thus are expected induce offline shopping trips. Commodity goods can be considered as basic goods, such as groceries and personal care products.

The model suits the data for specific product classes, however different relationships were found. The indirect effects in the model do not differ much amongst product categories. The commodity goods

model is overall much comparable to the main model, as purchases for commodity goods dominate the total amount of purchases. Hedonic shopping value is only found significant for explaining shopping frequency in the experience goods model, as well as for orientation preferences in all three product class models. Relationships from orientation preferences to shopping attitude are the strongest in the search goods model. These variations prove that product classes should be recognised when interpreting the effects of e-commerce.

How could the model be applied for explaining consumer mobility?

The model as presented in this thesis can not be proven to be applicable for explaining consumer mobility. The number of shopping trips from a three-day diary did not match the expected number of trips calculated from shopping frequency.

How could shopping attitude and orientation preferences explain consumer mobility?

The concepts of shopping attitude and orientation preferences can explain consumer behaviour in terms of shopping frequency on individual level. Given the extent to which a consumer adheres to hedonic shopping value and appreciates orientation options, the consumer's frequency of buying offline or online can be explained by the model presented in this thesis. The pre-purchase phase of the shopping process in the form of orientation preferences is found significant in explaining shopping frequency as well.

Direct and indirect effects from shopping attitude to shopping frequency and direct effects from orientation preferences are found significant in explaining shopping frequency. After controlling for personal characteristics, the relations remained significant. As the effects from shopping value on shopping frequency were strongest, the conclusion can be drawn that shopping value is more important than orientation preferences in explaining consumer mobility in terms of shopping frequency.

The model as described in this thesis is capable of expressing the intention to buy either online or offline from shopping attitude and orientation preferences. Moreover, for various product categories different relations were found significant – for buying experience goods the regression weights and significance of relations differ from the results for search goods or commodity goods. Consumer mobility in terms of shopping trip frequency and kilometrage could not be explained from shopping attitude and orientation preferences in this study. Additional research is required to be able to explain the effects in terms of shopping trip frequency and kilometrage.

6.2. Advice for policy makers

The thesis was written to provide insights in consumer mobility as a result of e-commerce. Since the order of magnitude of the effects were unknown, the Ministry of Infrastructure and Water Management has not been able to assign the responsibility for adequately managing the effects of e-commerce to the appropriate authority. In this section an advice is given regarding the level of responsibility and how to react on the phenomenon of e-commerce from a policy point of view.

The consideration whether or not to make a trip to a shop is not completely derivable from shopping frequency, however the number of purchases made offline is a good starting point for interpreting consumer mobility. As the average shopping trip takes just several kilometres, the results of this thesis are mostly valuable for evaluating mobility on local scale – the responsibility of local authorities, for example city municipalities.

The goal of the Ministry to provide liveability and accessibility should be pursuit by lower level authorities as well. For achieving liveability of a city the desires of citizens should be respected. The research as presented in this thesis is valuable in explaining the desires and behaviour of citizens when

it comes to shopping. The results provided in chapter 4 quantify the relations between shopping attitude, orientation preferences and consumer mobility, the latter being expressed as shopping frequency. The analyses and interpretation of results are focussed on consumer preferences during the shopping process. This micro-perspective study helps policy makers to understand decisions in the shopping process from the consumer's point of view.

Although the number of online sales increases rapidly, on average 48.4 percent of the consumers answered positive to statements describing the hedonic value the activity of offline shopping. On top of that, 24.9 percent of the people who buy products online prefer to orientate offline. Purchasing products might not be the main goal of going shopping in the city centre, orientation and shopping for pleasure are likely to describe the new function of shopping. For achieving liveability this new function of shopping should be respected. Meanwhile, operating shops in mostly small city centres is not workable for many companies – many shops close and premises are empty for long periods.

The advice to policy makers is to stimulate companies to maintain operating physical shops as a large number of citizens values the activity of shopping highly for either the activity itself or to orientate on the actual purchase. Meeting this desire of citizens adds up the liveability of the area, on top of that a vivid city centre – rather than a shopping street with empty premises – is beneficial for liveability.

For consumer mobility in terms of shopping trip frequency or kilometrage no direct conclusions can be drawn from this research. An advice to manage accessibility on local level however could be reasoned from the liveability as well – although shops do not directly benefit from people orientating in city centre, society does. Therefore, policy regarding accessibility of shopping centres should rather stimulate consumers to visit shops than discourage them.

An addition to this advice is that two variables should be kept in mind when considering to stimulate operating stores: product classes and consumer types. Some product classes attract more people to shops than others – books are often bought online these days, whereas people still visit physical stores for clothing. Also, some consumer groups are more likely to visit a shopping area than others. A political strategy might be to adapt spatial planning considerations to the population, their buying behaviour and mobility patterns in order to meet the goal of achieving liveability and accessibility of the area.

6.3. Discussion

The analyses in this study are performed to the best effort of the author, given the limited scope of the thesis project, the availability of data and previous experience in data studies. During the study many insights were gained on several aspects of the project, which are discussed in this section. The methodology, the (non)available data and modelling choices are elaborated upon.

6.3.1. Method

Structural Equation Modelling is often used to confirm hypothesized theory. Although this study was initially meant to be confirmatory, a few factors may indicate otherwise.

As data was gathered upfront, the approach for determining latent constructs was to determine what available data could be used to define the complex concepts. Usually in SEM a survey would be designed in order to generate the data that is required to define these concepts. This diversion from the usual SEM procedure resulted in a rather exploratory analysis during the measurement model phase.

Also in the structural model phase the analyses were not strictly confirmatory. The model is constructed by means of sequential runs of multiple versions of the model, in order to evaluate the impact of adding or removing another variable. As both significance and regression weights, as well as model fit changed by every step, this approach helped a lot in evaluating the model.

An exploratory approach on itself is not criticized, however the exploration should be evaluated with an independent dataset. This could either be done by generating new data from an equivalent respondent's group, or by splitting the dataset before moving over to quantitative analysis. As the aim of the study changed from confirmation to exploration during the process, no holdout sample was kept aside to perform validation of the model in this thesis.

Overall, by applying the method of SEM throughout the project, its possibilities and valuable aspects became clear. A consequence is that the method was not applied to its fullest purpose of confirming theory. SEM is probably more suited in a sequence of studies as a second paper, to verify composed theory from the first paper.

6.3.2. Interpretation of survey questions

The downside of surveys and questionnaires are the questions themselves. If not posed very explicitly, questions are open to the interpretation of respondents. Although the answers of a filled out survey are available, the reasoning behind the answers or any other explanation mostly is not available. In the data used for this analysis this issue is relevant in two ways.

Shopping frequency is asked for ten product categories. Some of the categories are explained with examples, however most of them rely on the imagination of the respondents. For example the category 'Food and groceries': although it might seem obvious what groceries are, food could also be interpreted as take-away meals. The other way around holds as well: soap and garbage bags could be considered as household items, but might be interpreted as groceries too. Also the fact that the category 'Sports and hobby goods' shows a similar buying pattern as 'Clothing, shoes and accessories' could be result of unspecified product categories. The consequence of these plausible misinterpretations might be that product categories are incorrectly assigned to a certain class.

Also, the response should be evaluated in the knowledge that people have answered the questions from memory. This was done on purpose, since the range of three months is likely to include quite some shopping trips. However, respondents tend to underestimate their mobility patterns when reproducing it from memory, compared to actual behaviour revealed from travel diaries. Previous research of Hoogendoorn-Lanser et al. (2015) showed this effect from an earlier wave of the MPN survey. A method to overcome this underestimation issue could be to ask people to report their shopping behaviour and mobility pattern for an upcoming period, rather than reproducing it from the past.

The issue was acknowledged by Kennisinstituut voor Mobiliteit during the development of the survey. By means of in-depth interviews respondents are asked how they interpreted the questions, in order to rephrase and refine the survey. Hence, the dataset used for this thesis is the result of a carefully prepared survey, in which the correct interpretation of survey questions is ensured as much as possible.

6.3.3. Shopping value statements

The concept of shopping value is studied in this thesis. The field is quite broad, as is described in paragraph 2.2.1. Especially utilitarian shopping value captures a set of values that do not per se have a lot in common – a variety of goals such as efficient shopping in terms of price or time, as well as shopping to serve other people are theoretically represented by the concept of utilitarian shopping value.

The empirical representation of shopping value is highly dependent of the statements that were included in the study. In the MPN survey a rather limited amount of statements expected to represent utilitarian shopping value was included. Only low correlation was found during the measurement model phase, which is not surprising as the statements were very diverse. Were other statements included, a construct representing utilitarian shopping value could have been found. In the study of (Kim et al.,

2014) a broad variety of statements was included in order to define utilitarian shopping value, which could serve as an inspiration for expansion of the MPN survey.

Statements that were included in the MPN survey are inspired on other papers: for example Dholakia (1999) studied the effects of shopping value on shopping frequency of families in the USA, for which he used the statement of the type 'How important is it for you that …'. Although a similar study could well be conducted with MPN survey response, these statements do not specifically match the goal of the study as presented here. The statements used in this study were designed for the study of Dholakia (1999), whereas it would be most desirable to generate data from a survey specifically designed for this study. Besides the risk of mismatching, the relevance of the statements should be evaluated as they were constructed almost 20 years ago.

6.3.4. Missing information

Although the MPN dataset is rich, some crucial information for this model lacks. Some important missing information is on offline orientation preferences for offline purchases, as was explained a few times before. The information on orientation only entails the preference of respondents, whereas trip frequency for orientation purposes would be very valuable information as well for interpreting the impact of e-commerce on consumer mobility.

Overall, the only data that was useful for this model and available for all respondents were the statements on shopping value and shopping frequency for online and offline retail. The statements on orientation preferences were only available for people who ever bought online in the past three months, which means that the orientation preferences of the merely offline buying consumer is not represented in this study. The consequence of the structurally missing information is that it is hard to impute the missing values in the dataset. Since the data is not missing on a random basis, but on purpose not asked to a group of respondents with specific criteria, it is not valid to assume that the behaviour of these respondents is equal to the group of respondents for whom the data is available.

Also non-structural missing values could be problematic. A group of respondents did answer statements, but with the option 'does not apply'. These answers do not add to the scale representing a latent variable. If one out of eight statements loading on for example hedonic shopping value misses, there is not so much of a problem as the model is able of imputing data. If more than half of the statements has missing values, the scale for the latent construct however is seriously doubtful. As a remedy, respondents with more than a certain percentage of not answered statements could be excluded from the dataset. This was however not done in this study.

6.3.5. Delivery

The scope of this thesis was limited to orientation and purchase of products in both an online and offline retail environment. Delivery is part of the post-purchase phase, which is not included in this study as the dataset was not sufficient. Relevant information on delivery and return of online purchases is only available for one product class per respondent. Return rate for offline purchases is not available at all, whereas this has mobility effects as well. From questionnaire data, only a rough indication could be given on the impact in the sense of mobility. For assessing the overall impact of e-commerce on consumer mobility, the post-purchase phase should be included as well. People might perform additional trips to collect or return parcels.

The total mobility as a result of e-commerce includes even more transport movements. The delivery movements to transport a product to the consumer's home is an effect on mobility that is completely left aside in this thesis, although it affects the whole transport system. The potential effect of substitution – online purchases replacing offline purchases, thereby eliminating shopping trips – is

compensated to some extent as delivery trips are required instead. Also consumer mobility is affected by home delivery – the vehicles for delivery can block roads, for example.

A study on the total impact of e-commerce on mobility should definitely involve the post-purchase phase including delivery and return.

6.4. Recommendations for future research

In addition to the work that was presented here, future research could enrich the analysis on the impact of e-commerce on consumer mobility. In this section some recommendations for future work are given.

- Much improvement could be gained when the model was based on observed variables that were constructed for the purpose of this model than the other way around – respondents could be asked to express their opinion about predefined statements that are theoretically expected to load on a latent construct.
- The model would be theoretically more correct if the missing data on offline orientation for offline purchases would be gathered as well. Also the orientation behaviour of offline buyers would ameliorate the model.
- The model could be reutilised to test applicability to other related metrics. Shopping trip frequency is an interesting metric, as well as kilometrage. An even better investigation would include trip chaining and transport modes as well. The MPN diary data is a good source for this type of research, even though improvements on data acquisition are required.
- A longitudinal study with the same model is required to reveal trends in the fundamental concepts shopping attitude, orientation preferences, and shopping frequency. New data should be acquired from either the same sample or a population with a somewhat comparable data composition.
- The product classes are in this study mainly based on shopping frequency in the offline and online retail environment. Another classification could result in additional insights on e-commerce in relation to product characteristics. Products could for example be classified based on the frequency of use, product dimension and weight and so on.

On top of that, the model could be applied to gain insight in other topics related to e-commerce and shopping in general. The suggestions may be of commercial interest, yet they add to the scientific value of the model.

- Consumer behaviour during the activity of shopping could be investigated by replacing the dependent variables with ‘time spent in the shop’ or ‘money spent per purchase’, both for offline and online shopping. These insights can be beneficial to recognize orientating customers from clients who will actually purchase something and their potential expenditure.
- The dependent variables could also be replaced by one or more unobservable variables. Psychological concepts such as comfort, self-confidence or satisfaction with the purchase can be related to the shopping process in order to understand consumer needs in order to ameliorate the shopping experience.

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Attachments

Attachment A Overview of literature study results

Table 21 provides an overview of the results of previous research. The results are ordered according to the main relationships in the model evaluated in this thesis. The effects are indicated as either positive or negative by means of a plus or minus sign. Lines in orange correspond with the results found in this thesis.

Table 21 Overview of results from literature

	Offline orientation preference	Online orientation preference	Offline shopping frequency	Online shopping frequency
Hedonic shopping value		+ (Zhen et al., 2018) + (Weltevreden en Rietbergen, 2007) - (Weltevreden en Rietbergen, 2007)	+ (Farag et al., 2007) + (Cao et al., 2012) + (Lee et al., 2017)	+ (Zhai et al., 2017) - (Weltevreden en Rietbergen, 2007) - (Cao et al., 2012) - (Lee et al., 2017)
Presence of employees				
Buy products fast and easy				
Compare prices easily				
Time-consciousness		+ (Cao et al., 2012)		
Offline orientation preference				- (Zhai et al., 2017) - (Cao, 2012)
Online orientation preference	- (Zhen et al., 2018)		+ (Farag et al., 2007) + (Cao et al., 2012)	+ (Zhai et al., 2017) + (Cao, 2012) + (Cao et al., 2012)
Offline shopping frequency				+ (Farag et al., 2007) - (Zhou & Wang, 2014)
Online shopping frequency			+ (Cao et al., 2012) + (Zhou & Wang, 2014)	
Age		+ (Zhen et al., 2018)	- (Farag et al., 2007) + (Cao et al., 2012) + (Zhou & Wang, 2014)	- (Zhou & Wang, 2014)
Gender	+ (Zhen et al., 2018)	- (Zhen et al., (2018) - (Weltevreden en Rietbergen, 2007)	+ (Farag et al., 2007)	+ (Farag et al., 2017) - (Weltevreden en Rietbergen, 2007)
Education	- (Zhen et al., 2018)	+ (Zhen et al., 2018)	- (Zhen et al., 2018)	+ (Cao, 2012) + (Cao et al, 2012) + (Zhou & Wang, 2014)
Urbanity	- (Zhen et al., 2018)		- (Zhen et al., 2018) + (Zhen et al., 2018) + (Cao et al., 2012) - (Zhou &Wang, 2014)	+ (Zhou & Wang, 2014)
Household income		+ (Zhen et al., 2018) + (Cao et al., 2012)	+ (Farag et al., 2007)	+ (Zhai et al., 2017) + (Cao et al., 2012)
Employment			- (Zhou & Wang, 2014)	+ (Zhou & Wang, 2014)
Household size	- (Zhen et al., 2018)		+ (Zhou & Wang, 2014)	- (Zhou & Wang, 2014)

Attachment B Control variables

In this attachment the definition of control variables as dummy variables are explained. The motivation to approach variables as a categorical variable rather than continuously and the choice for category band widths are elaborated upon. The basic strategy was to start with multiple categories, which could be grouped when they turned out to be not significantly different from one another.

Gender

The variable gender is rather straightforward. Men were chosen as the base model, meaning that the value of 1 represents women. Although the discussion on gender identity is vivid, in this research the options are limited to either male or female.

0	Male
1	Female

Age

The age of respondents is known from their year of birth. Respondents could be characterised with age as a continuous or categorical variable. The continuous approach would imply a single extra control variable, whereas the number of additional variables depends on the number of categories to assess. An important consequence of handling age as a continuous variable is the assumption that age is linearly related with the variables that are to be controlled for. In many behavioural studies, a linear relationship is not likely when considering age.

The next consideration is how to define age classes. The main driver for this classification were stages of life: student – young professional – family – midlife – senior – retired. Now the question is what age represents the border between two stages. The exact numbers have been defined in a somewhat iterative process. In the first trial age groups of ten years were examined. In the middle of the spectrum the classes were found too narrow, whereas on the edges of the spectrum a class width of ten years was too big. Two additional constraint in the form of working status and car availability resulted in the following dummy variables:

0	16 and 17 years old
1	18 and 19 years old
2	20 to 24 years old
3	25 to 34 years old
4	35 to 49 years old
5	50 to 64 years old
6	65 to 74 years old
7	75 years old and older

Education

The Dutch education system results in many optional degrees, of which some represent an equivalent education level. Whenever education is approached rather generally, in many studies a rough classification in low – medium – high education suffices. The next enumeration lists the degrees recognised by the Dutch law, subdivided into three classes.

0	Low education – *no education / primary education / LBO-VBO-VMBO KB / MAVO-HAVO-VMBO GT*
1	Medium education – *MBO / propedeuse HBO-WO*
2	High education – *bachelor HBO-WO / master HBO-WO*

Employment

The number of hours someone makes is an indication of the time pressure that person experiences. Respondents mentioned their employment as a categorical variable, more or less equal to the days in the week. At least the comparison between unemployed – part-time – fulltime was desirable to investigate. As the difference between unemployed and fulltime is big, two stages of part-time employment were included in the analysis.

0 Unemployed
1 0 to 12 hours a week
2 13 to 35 hours a week
3 36 hours a week and more

Household income

Considering income, a linear relationship with shopping frequency and other variables in the model could well be possible. However, due to privacy regulations the response was not available in continuous form. Categories were however quite narrow, so a nearly continuous approach is possible. Initially, five income classes were recognised. Whenever huge differences became apparent between those classes, a more detailed classification could be examined. In fact, the classes appeared to have rather similar results, so that only three classes were included in the final model.

0 Lower than modal – *0 – 27.000 euros yearly income*
1 1 to 2 times modal – *27.000 – 67.000 euros yearly income*
2 More than 2 times modal – *more than 67.000 euros yearly income*

Urbanity

The Netherlands are a quite small area with no seriously remote areas. Nevertheless, five urbanity levels based on the number of inhabitants per square kilometre are recognised by Centraal Bureau voor de Statistiek. The levels are recognised as non urban – low urban – medium urban – high urban – very high urban. The inclusion of these levels in the model resulted in similar coefficients for a few levels, hence urbanity is approached as:

0 Non urban – *less than 1500 inhabitants per square kilometre*
1 Urban – *more than 1500 inhabitants per square kilometre*

Household composition

The interpretation of household composition is handled in different ways in previous research. The number of family members, the number of children or the type of family are used as a means to describe household composition. As the true indicator is not clear, in this study several household types were included. Based on the characteristics of these households, a true indicator could be recognised.

0 Couple
1 Single
2 Couple with children
3 Single with children

Attachment C Syntax for data preparation

The dataset of the Netherlands Mobility Panel survey was manipulated in order to select the right respondents and to sum observed variables as dependent variables for the study. The syntax used to perform these manipulations is written below.

Only respondents who had answered the statements on shopping in general and orientation preferences were selected as subjects of study in this research.

```
*Antwoord op stellingen shopping attitude en orientation preferences.
DATASET ACTIVATE DataSet1.
DATASET COPY  SELECTION.
DATASET ACTIVATE  SELECTION.
FILTER OFF.
USE ALL.
SELECT IF (WINKELEN_STELLING1 <= 6 & WINKELEN_STELLING2 <= 6 & WINKELEN_STELLING3 <= 6 &
    WINKELEN_STELLING4 <= 6 & WINKELEN_STELLING5 <= 6 & WINKELEN_STELLING6 <= 6 & WINKELEN_BELANG1 <= 6
    & WINKELEN_BELANG2 <= 6 & WINKELEN_BELANG3 <= 6 & WINKELEN_BELANG4 <= 6 & WINKELEN_BELANG5 <= 6 &
    WINKELEN_BELANG6 <= 6 & WINKELEN_BELANG8 <= 6 & WINKELEN_BELANG9 <= 6 & WINKELEN_BELANG10 <= 6 &
    WINKELEN_BELANG11 <= 6).
EXECUTE.
DATASET ACTIVATE  SELECTION.

*Geen antwoord (vanwege niet online gekocht) = missing.
DATASET ACTIVATE SELECTION.
    RECODE WI_STELLING1 WI_STELLING2 WI_STELLING3 WI_STELLING4
    WI_STELLING5 WI_STELLING6 WI_STELLING7 WI_STELLING8 WI_STELLING9 WI_STELLING10
    WI_w5_STELLING11 WI_STELLING12 (1=1) (2=2) (3=3) (4=4) (5=5) (6=SYSMIS) (7=SYSMIS)
    (99=SYSMIS) INTO Mis_STELLING1 Mis_STELLING2 Mis_STELLING3 Mis_STELLING4
    Mis_STELLING5 Mis_STELLING6 Mis_STELLING7 Mis_STELLING8 Mis_STELLING9 Mis_STELLING10
    Mis_STELLING11 Mis_STELLING12.
VARIABLE LABELS  Mis_STELLING1 'Mis_STELLING1' /Mis_STELLING2
    'Mis_STELLING2' /Mis_STELLING3 'Mis_STELLING3'
    /Mis_STELLING4 'Mis_STELLING4' /Mis_STELLING5 'Mis_STELLING5'
    /MisSTELLING6 'MisSTELLING6' /Mis_STELLING7 'Mis_STELLING7' /Mis_STELLING8
    'Mis_STELLING8' /Mis_STELLING9 'Mis_STELLING9'
    /Mis_STELLING10 'Mis_STELLING10' /Mis_STELLING11 'Mis_STELLING11'
    /MisSTELLING12 'MisSTELLING12'.
EXECUTE.
```

Response to statements that was answered with the option ‘does not apply’ was recoded into missing values.

```
*Neutraal antwoord = missing.
DATASET ACTIVATE SELECTION.
RECODE WINKELEN_BELANG1 WINKELEN_BELANG2 WINKELEN_BELANG3
    WINKELEN_BELANG4 WINKELEN_BELANG5 WINKELEN_BELANG6 WINKELEN_BELANG8
    WINKELEN_BELANG9 WINKELEN_BELANG10 WINKELEN_BELANG11 (1=1) (2=2) (3=3) (4=4) (5=5) (6=SYSMIS) (97=SYSMIS) (98=SYSMIS)
    (99=SYSMIS) INTO Mis_WINKELEN_BELANG1 Mis_WINKELEN_BELANG2 Mis_WINKELEN_BELANG3
    Mis_WINKELEN_BELANG4 Mis_WINKELEN_BELANG5 Mis_WINKELEN_BELANG6 Mis_WINKELEN_BELANG8
    Mis_WINKELEN_BELANG9 Mis_WINKELEN_BELANG10 Mis_WINKELEN_BELANG11.
VARIABLE LABELS  Mis_WINKELEN_BELANG1 'Mis_WINKELEN_BELANG1' /Mis_WINKELEN_BELANG2 'Mis_WINKELEN_BELANG2'
    /Mis_WINKELEN_BELANG3 'Mis_WINKELENBELANG3' /Mis_WINKELEN_BELANG4 'Mis_WINKELEN_BELANG4' /Mis_WINKELEN_BELANG5
'Mis_WINKELEN_BELANG5' /Mis_WINKELEN_BELANG6
    'Mis_WINKELEN_BELANG6' /Mis_WINKELEN_BELANG8 'Mis_WINKELENBELANG8' /Mis_WINKELEN_BELANG9 'Mis_WINKELEN_BELANG9'
/Mis_WINKELEN_BELANG10 'Mis_WINKELEN_BELANG10'
    /Mis_WINKELEN_BELANG11 'Mis_WINKELEN_BELANG11'.
EXECUTE.

DATASET ACTIVATE SELECTION.
    RECODE WINKELEN_STELLING1 WINKELEN_STELLING2 WINKELEN_STELLING3
    WINKELEN_STELLING4 WINKELEN_STELLING5 WINKELEN_STELLING6 (1=1) (2=2) (3=3) (4=4) (5=5) (6=SYSMIS) (97=SYSMIS) (98=SYSMIS)
    (99=SYSMIS) INTO Mis_WINKELEN_STELLING1 Mis_WINKELEN_STELLING2 Mis_WINKELEN_STELLING3
    Mis_WINKELEN_STELLING4 Mis_WINKELEN_STELLING5 Mis_WINKELEN_STELLING6.
VARIABLE LABELS Mis_WINKELEN_STELLING1 'Mis_WINKELEN_STELLING1' /Mis_WINKELEN_STELLING2 'Mis_WINKELEN_STELLING2'
/Mis_WINKELEN_STELLING3
    'Mis_WINKELEN_STELLING3' /Mis_WINKELEN_STELLING4 'Mis_WINKELEN_STELLING4' /Mis_WINKELEN_STELLING5 'Mis_WINKELEN_STELLING5'
/Mis_WINKELEN_STELLING6
    'Mis_WINKELEN_STELLING6'.
EXECUTE.
```

Only respondents who ever bought any product offline or online were selected as study objects in this research.

```
*Iets gekocht.
DATASET ACTIVATE  SELECTION.
FILTER OFF.
USE ALL.
SELECT IF (WI_PRODUCT1 >= 1 OR WI_w5_PRODUCT2 >= 1 OR WI_w5_PRODUCT3 >= 1 OR WI_w5_PRODUCT4 >= 1 OR WI_w5_PRODUCT5 >= 1 OR
    WI_w5_PRODUCT6 >= 1 OR WI_w5_PRODUCT7 >= 1 OR WI_w5_PRODUCT8 >= 1 OR WI_w5_PRODUCT9 >= 1 OR WI_w5_PRODUCT10 >= 1 OR
    WF_PRODUCT1 >= 1 OR WF_PRODUCT2 >= 1 OR WF_PRODUCT3 >= 1 OR WF_PRODUCT4 >= 1 OR WF_PRODUCT5 >= 1 OR
    WF_PRODUCT6 >= 1 OR WF_PRODUCT7 >= 1 OR WF_PRODUCT8 >= 1 OR WF_PRODUCT9 >= 1 OR WF_PRODUCT10 >= 1).
EXECUTE.
DATASET ACTIVATE  SELECTION.
```

In order to analyse shopping frequency for the total of products, as well as for product classes, the frequencies of product categories were summed.

```
*Shopping frequency optellen.
*Total.
DATASET ACTIVATE SELECTION.
COMPUTE TotalON=WI_PRODUCT1 + WI_w5_PRODUCT2 + WI_w5_PRODUCT3 + WI_w5_PRODUCT4 + WI_w5_PRODUCT5 +
    WI_w5_PRODUCT6 + WI_w5_PRODUCT7 + WI_w5_PRODUCT8 + WI_w5_PRODUCT9 + WI_w5_PRODUCT10.
EXECUTE.

DATASET ACTIVATE SELECTION.
COMPUTE TotalOFF=WF_PRODUCT1 + WF_PRODUCT2 + WF_PRODUCT3 + WF_PRODUCT4 + WF_PRODUCT5 +
    WF_PRODUCT6 + WF_PRODUCT7 + WF_PRODUCT8 + WF_PRODUCT9 + WF_PRODUCT10.
EXECUTE.

*Commodity goods.
DATASET ACTIVATE SELECTION.
COMPUTE CommodityON= WI_w5_PRODUCT4 + WI_w5_PRODUCT5 + WI_w5_PRODUCT6 .
EXECUTE.

DATASET ACTIVATE SELECTION.
COMPUTE CommodityOFF=WF_PRODUCT4 + WF_PRODUCT5 + WF_PRODUCT6.
EXECUTE.

*Experience goods.
DATASET ACTIVATE SELECTION.
COMPUTE ExperienceON=WI_w5_PRODUCT8 + WI_w5_PRODUCT9 + WI_w5_PRODUCT10.
EXECUTE.

DATASET ACTIVATE SELECTION.
COMPUTE ExperienceOFF=WF_PRODUCT8 + WF_PRODUCT9 + WF_PRODUCT10.
EXECUTE.

*Search goods.
DATASET ACTIVATE SELECTION.
COMPUTE SearchON=WI_PRODUCT1 + WI_w5_PRODUCT2.
EXECUTE.

DATASET ACTIVATE SELECTION.
COMPUTE SearchOFF=WF_PRODUCT1 + WF_PRODUCT2.
EXECUTE.
```

Attachment D Survey sequence and response

The analyses in this thesis are based on a dataset representing response to the special e-commerce module of the Netherlands Mobility Panel survey. In Figure 17 the sequence of question in the survey is displayed in a flow diagram. The questions that were used for analysis are highlighted in orange.

Table 22 gives an overview of the number of missing values to each question. Values could either miss since they were not asked to certain people – indicated as structural missing values; or since the answer respondents gave was neutral. Neutral answers were recoded into missing values. Missing values were repaired in AMOS by means of full information maximum likelihood method (FIML).

Table 22 Missing values and neutral answers

Question topic	Indicator	Structural	Neutral answer
Shopping motivation	WS1	-	424
	WS2	-	43
	WS3	-	230
	WS4	-	102
	WS5	-	368
	WS6	-	284
Shopping attitude	WB1	-	45
	WB2	-	65
	WB3	-	111
	WB4	-	206
	WB5	-	74
	WB6	-	38
	WB8	-	235
	WB9	-	72
	WB10	-	28
	WB11	-	50
Offline purchases		0	0
Online purchases		0	0
Offline orientation preference	WI1	1972	111
	WI2	1972	94
	WI3	1792	111
	WI4	1972	91
Online orientation preference	WI5	1972	97
	WI6	1972	93
	WI7	1972	102
	WI8	1972	81
	WI9	1972	132
	WI10	1972	140
	WI11	1972	124
	WI12	1972	89

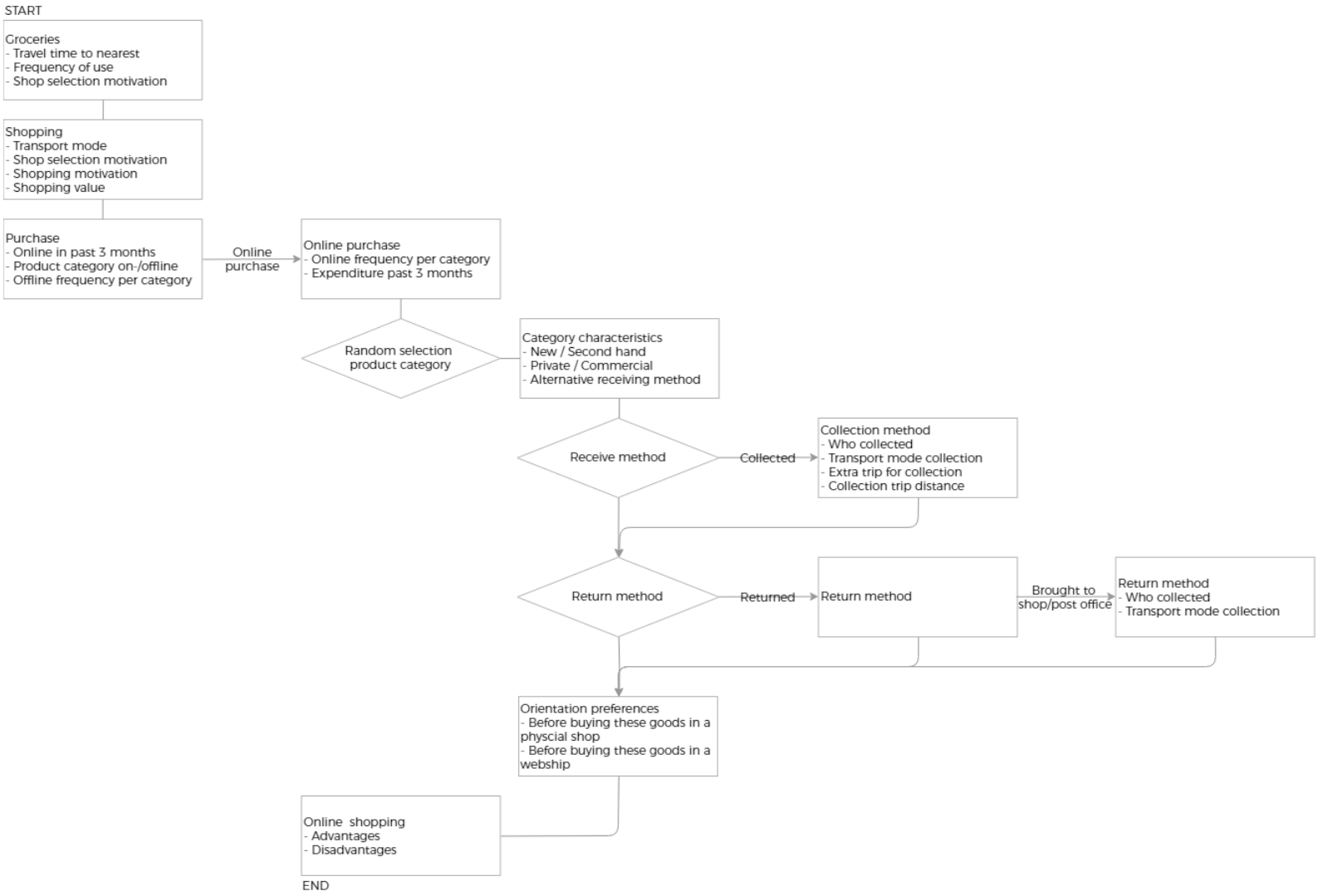

Figure 17 Sequence of questions in MPN survey

Attachment E Exploratory factor analysis

The latent constructs are composed according to an indicative exploratory factor analysis. Although this is quite unusual in structural equation modelling, paragraph 3.1.2 describes why this approach is valid in this research. In this attachment the statements from the Netherlands Mobility Panel survey that were selected for factor analysis are listed. For each statement the following details are described:

- **Indicator**
  Code that is referred to in chapter 4
- **Description**
  Statement evaluated by respondents
- **Response**
  Response options respondents could fill out when evaluating statements
- **Mean** and standard deviation (**S.D.**)
  Average response to statement and deviation from the average
- Factor analysis (**1**, **2**, **3**, **4**)
  Correlation coëfficients of statements to either of four factors. Factor analysis was conducted in SPSS by means of the Principal axis factoring method with a fixed number of factors of 4 and rotation Varimax (Molin, 2017).

The selection of statements as indicators for latent constructs as a result of the factor analysis are described in paragrahp 4.2.2. Table 9 in the main report describes statements that were not explained by any construct, but are included in the structural model. Statements that were not included in either the measurement or structural model are WB2, WI5, WS1, WS4, WS5 and WS6.

WB2 refers to the utilitarian value of accomplishing a purchase when shopping. Respondents value the statement rather neutral, as appears from the mean and standard deviation. Therefore, the statement is not particularly correlated with either of the latent constructs.

WI5 describes the act of getting inspiration via the Internet. The correlation with other statements was lower than the threshold of 0.5 to be included in either of the constructs.

Statements WS1, WS4, WS5 and WS6 already cover behaviour, rather than preferences or attitudinal factors. Besides the fact that the statements did not show much correlation with other factors, the statements might induce bias when included in the model – someone stating that he shops frequently online does not surprisingly show more online purchases and less offline purchases (WS1). This was reason to exclude these statements from the model.

Table 23 Exploratory factor analysis

Indicator	Description	Response	Mean	S.D	1	2	3	4
WB1	How important is it for you that shopping is enjoyable?	Likert scale 1-5 (1 = very unimportant; 5 = very important)	3.78	0.828	0.282	0.585	-0.211	0.134
WB2	How important is it for you that you buy something during shopping?	Likert scale 1-5 (1 = very unimportant; 5 = very important)	2.94	0.942	0.052	0.068	-0.045	0.272
WB3	How important is it for you that shopping gives a break from your daily routine?	Likert scale 1-5 (1 = very unimportant; 5 = very important)	3.04	1.010	0.314	0.611	-0.048	0.032
WB4	How important is it for you to shop with friends?	Likert scale 1-5 (1 = very unimportant; 5 = very important)	2.96	1.068	0,319	0,616	0,106	-0,001
WB5	How important is it for you that shopping takes as little time as possible?	Likert scale 1-5 (1 = very unimportant; 5 = very important)	3.08	1.048	-0.111	-0.468	-0.017	0.459
WB6	How important is it for you that the shopping environment is enjoyable?	Likert scale 1-5 (1 = very unimportant; 5 = very important)	3.82	0.765	0.288	0.499	-0.178	0.161
WB8	How important is it for you that your family likes to join shopping?	Likert scale 1-5 (1 = very unimportant; 5 = very important)	3.11	1.058	0.282	0.580	-0.089	0.014
WB9	How important is it for you to have contact with shop employees?	Likert scale 1-5 (1 = very unimportant; 5 = very important)	2.91	0.936	0.172	0.289	0.104	0.202
WB10	How important is it for you to be able to buy products fast and easy?	Likert scale 1-5 (1 = very unimportant; 5 = very important)	3.72	0.774	0.106	-0.150	0.169	0.602
WB11	How important is it for you to be able to compare price and quality of products easily?	Likert scale 1-5 (1 = very unimportant; 5 = very important)	3.70	0.778	0.318	0.119	-0.076	0.384
WI1	Before I buy this product in a physical shop, I find ideas through the Internet for new products to buy	Likert scale 1-5 (1 = completely disagree; 5 = completely agree)	3.49	1.093	0.587	-0.085	0.158	0.029
WI2	Before I buy this product in a physical shop, I search for product information through the Internet	Likert scale 1-5 (1 = completely disagree; 5 = completely agree)	3.79	1.078	0.766	-0.286	-0.125	-0,062
WI3	Before I buy this product in a physical shop, I view reviews of other users or experts through the Internet	Likert scale 1-5 (1 = completely disagree; 5 = completely agree)	3.54	1.178	0.744	-0.270	-0.074	-0.075
WI4	Before I buy this product in a physical shop, I compare prices through the Internet at various vendors	Likert scale 1-5 (1 = completely disagree; 5 = completely agree)	3.82	1.115	0.702	-0.299	0.047	-0.039
WI5	Before I buy this product in a physical shop, I find ideas through the Internet for new products to buy	Likert scale 1-5 (1 = completely disagree; 5 = completely agree)	3.62	1.081	0,474	-0,107	0,173	0,083

WI6	Before I buy this product through the Internet, I search for product information through the Internet	Likert scale 1-5 (1 = completely disagree; 5 = completely agree)	4.08	1.011	0.691	-0.301	-0.149	-0.052
WI7	Before I buy this product through the Internet, I view reviews of other users or experts through the Internet	Likert scale 1-5 (1 = completely disagree; 5 = completely agree)	3.75	1.133	0.722	-0.254	0.092	-0.094
WI8	Before I buy this product through the Internet, I compare prices through the Internet at various vendors	Likert scale 1-5 (1 = completely disagree; 5 = completely agree)	4.10	1.047	0.705	-0.277	-0.084	-0.082
WI9	Before I buy this product through the Internet, I like to have seen the product in a shop	Likert scale 1-5 (1 = completely disagree; 5 = completely agree)	2.73	1.116	0.464	0.105	0.722	0.048
WI10	Before I buy this product through the Internet, I like to go to a shop for advice	Likert scale 1-5 (1 = completely disagree; 5 = completely agree)	2.53	1.115	0.417	0.164	0.686	0.072
WI11	Before I buy this product through the Internet, I compare products in a physical shop	Likert scale 1-5 (1 = completely disagree; 5 = completely agree)	2.92	1.138	0.476	0.105	0.528	0.046
WI12	Before I buy this product through the Internet, I compare products through the Internet	Likert scale 1-5 (1 = completely disagree; 5 = completely agree)	3.97	1.066	0,757	-0,283	-0.060	-0,055
WS2	Shopping is an outing to me	Likert scale 1-5 (1 = completely disagree; 5 = completely agree)	3.24	1.105	0.264	0.153	0.005	0.139
WS3	Shopping is a way to spend time with friends and family	Likert scale 1-5 (1 = completely disagree; 5 = completely agree)	2.80	1.125	0.270	0.623	-0.105	-0.095
WS4	For promotions/sale I make special visits to certain stores.	Likert scale 1-5 (1 = completely disagree; 5 = completely agree)	3.40	1.006	0.294	0.628	-0.087	-0.016

Attachment F Correlation matrices

In this attachment an overview of correlation between variables in the model. Each layer of the causal chain is examined on correlation, to check whether multicollinearity occurs. Whenever correlation coefficients are too high (>0.500), multicollinearity could occur. This means that the effect from a variable can not be fully explained by that variable, but possibly more by the variable with which it is correlated.

The correlation coefficient from offline orientation preferences and online orientation preferences is 0.329.

Correlation between hedonic shopping value and the statements representing utilitarian shopping value were already examined by means of exploratory factor analysis. Were correlation between these variables high, then the variables would load on the same latent construct. Table 24 displays the correlation coefficients between shopping value variables.

Table 24 Shopping value - correlation coefficients

	Hedonic shopping value	Presence of employees	Buy fast and easy	Compare prices easily
Presence of employees	0.321			
Buy fast and easy	-0.054	0.071		
Compare prices easily	0.246	0.171	0.260	
Time-consciousness	-0.468	-0.036	0.339	0.055

Control variables are especially vulnerable to multicollinearity. However, since the data was evaluated as representative for the Dutch population according to the Gouden Standaard, chances on multicollinearity are small. As Table 25 reveals, some correlation exists between household income, employment rate and level of education, which is not surprising.

The conclusion could be drawn that multicollinearity is not an issue in this study.

Table 25 Control variables - correlation coefficients

	18 to 24	25 to 34	35 to 49	50 to 64	65 to 74	75+	Female	Medium	High	Urban	1-2x average	2x+ average	0 to 12	13 to 35	36+	Single	Single + kids
Age (reference 16 to 17)																	
18 to 24																	
25 to 34	-0.137																
35 to 49	-0.166	-0.266															
50 to 64	-0.171	-0.274	-0.332														
65 to 74	-0.129	-0.207	-0.251	-0.258													
75+	-0.075	-0.120	-0.146	-0.150	-0.113												
Gender (reference male)																	
Female	0.018	0.056	0.013	-0.035	-0.015	-0.044											
Education (reference level low)																	
Medium	0.077	0.022	0.058	0.030	-0.110	-0.060	0										
High	-0.096	0.189	0.125	-0.065	-0.133	-0.044	-0.023	-0.539									
Urbanity (reference non-urban)																	
Urban	0.028	0.060	0.001	-0.046	-0.014	-0.006	0.024	-0.047	0.093								
Income (reference lower than 2 times average)																	
1-2x average	-0.055	0.005	0.004	-0.011	0.030	0.031	-0.077	0.013	-0.038	-0.043							
> 2x average	0.001	-0.023	0.086	0.069	-0.117	-0.080	-0.064	-0.055	0.219	0.019	-0.553						
Employment (reference 0 hours per week)																	
0 to 12	0.064	-0.117	-0.131	-0.019	0.152	0.098	0.059	0.001	-0.073	-0.031	-0.029	-0.081					
12 to 35	-0.001	0.065	0.142	0.028	-0.171	-0.129	0.249	0.077	0.049	-0.017	-0.028	0.064	-0.252				
35 or more	-0.049	0.209	0.178	0.026	-0.279	-0.169	-0.323	-0.008	0.226	0.050	0.077	0.134	-0.278	-0.041			
Household composition (reference couple)																	
Single	-0.039	0.074	-0.074	-0.044	0.071	0.070	0.090	-0.052	0.100	0.162	-0.149	-0.219	0.073	-0.084	0.019		
Single + kids	0.102	-0.026	0.073	-0.018	-0.104	-0.057	0.117	-0.100	-0.067	-0.002	0.041	-0.047	-0.002	0.073	-0.046	0.140	
Couple + kids	0.138	0.050	0.277	-0.057	-0.327	-0.192	-0.052	0.115	0.017	-0.104	0.052	0.251	-0.119	0.179	0.140	-0.428	-0.189

Attachment G Indirect and summed effects

From the regression coefficients found during the structural model phase by means of AMOS software indirect and summed effects are calculated. In this attachment the calculations and sub results that lead to the values in Table 13 are presented.

Equation 2 in 3.1.2 is the general formula for indirect effects. Here, the equations for the summed effects from hedonic shopping value to offline shopping frequency and online shopping frequency, including direct and indirect effects are given as an example for all shopping value variables. The term between the first pair of brackets is the indirect effect on shopping frequency via offline orientation preference, the second term refers to the indirect effect on shopping frequency via online orientation preference and the term between brackets is the direct effect from shopping value to shopping frequency.

$$\begin{aligned} &Hedonic\ shopping\ value \rightarrow Offline\ shopping\ frequency \\ &\quad = \big((Hedonic\ shopping\ value \rightarrow Offline\ orientation\ preference) \\ &\quad * (Offline\ orientation\ preference \rightarrow Offline\ shopping\ frequency)\big) \\ &\quad + (Hedonic\ shopping\ value \rightarrow Online\ orientation\ preference) \\ &\quad * (Online\ orientation\ preference \\ &\quad \rightarrow Offline\ shopping\ frequency)) + (Hedonic\ shopping\ value \\ &\quad \rightarrow Offline\ shopping\ frequency) \end{aligned}$$

Equation 3 Summed effect on offline shopping frequency

$$\begin{aligned} &Hedonic\ shopping\ value \rightarrow Online\ shopping\ frequency \\ &\quad = \big((Hedonic\ shopping\ value \rightarrow Offline\ orientation\ preference) \\ &\quad * (Offline\ orientation\ preference \rightarrow Online\ shopping\ frequency)\big) \\ &\quad + \big((Hedonic\ shopping\ value \rightarrow Online\ orientation\ preference) \\ &\quad * (Online\ orientation\ preference \rightarrow Online\ shopping\ frequency)\big) \\ &\quad + (Hedonic\ shopping\ value \rightarrow Online\ shopping\ frequency) \end{aligned}$$

Equation 5 Summed effect on online shopping frequency

Hedonic shopping value can be replaced by any of the other shopping value variables used throughout the thesis.

The effects are calculated based on standardised regression weights as presented in Table 10 to Table 12. As only significant relations are included in the calculations, the resulting indirect effects are significant as well.

Table 26 Calculations for indirect and summed effects

	Direct				Indirect		Summed	
	Offline shopping frequency	Online shopping frequency	Offline orientation	Online orientation	Offline shopping frequency	Online shopping frequency	Offline shopping frequency	Online shopping frequency
Hedonic shopping value	0.095	0.074	0.149	0.075	(0.149*0) + (0.075*0.056) = 0.0042	(0.149*-0.079)+(0.075*0.094) = -0.0047	0.095 + 0.0042 = 0.0992	0.074 – 0.0047 = 0.0693
Presence of employees	0.048	-0.027	0.170	0	(0.170*0)+(0*0.056) = 0	(0.170*-0.079)+(0*0.094) = -0.0059	0.048 + 0 = 0.048	-0.027 – 0.0059 = -0.0329
Compare prices easily	0.035	0	0.101	0.196	(0.101*0)+(0.196 *0.056) = 0.0110	(0.101*-0.079)+(0.196 *0.094) = 0.0294	0.035 + 0.0110 = 0.0460	0 + 0.0294 = 0.0294
Buy fast and easy	0.034	0.040	-0.070	0.074	(-0.070*0)+(0.074 *0.056) = 0.0055	(-0.070*-0.079)+(0.074 *0.094) = 0.0097	0.034 + 0.0055 = 0.0395	0.040 + 0.0097 = 0.497
Time-consciousness	-0.081	0.053	0	0	(0*0)+(0 *0.056) = 0	(0*-0.079)+(0 *0.094) = 0	-0.081 + 0 = -0.081	0.053 + 0 = 0.053
Offline orientation	0	-0.079	-	-				
Online orientation	0.056	0.094	-	-				

Attachment H Moderator effects

Regression coefficients of the model including the main concepts and control variables differ from the values in the preliminary model where only shopping value, orientation preferences and shopping frequency were represented. In Table 27 the results of both models are listed.

Table 27 Moderator effects from control variables

			Preliminary		Control variables	
From		**To**	**Stand. Reg. Coeff.**	**p-value**	**Stand. Reg. Coeff.**	**p-value**
Hedonic shopping value	→	Offline shopping frequency	0.114	<0.001	0.095	<0.001
Hedonic shopping value	→	Online shopping frequency	0.148	0.005	0.074	<0.001
Presence of employees	→	Offline shopping frequency	0.040	<0.001	0.048	<0.001
Presence of employees	→	Online shopping frequency	-0.072	<0.001	-0.027	0.048
Compare prices easily	→	Offline shopping frequency	0.038	<0.001	0.035	0.012
Buy fast and easy	→	Offline shopping frequency	0.043	<0.001	0.034	0.014
Buy fast and easy	→	Online shopping frequency	0.065	<0.001	0.040	0.003
Time-consciousness	→	Offline shopping frequency	-0.066	<0.001	-0.081	<0.001
Time-consciousness	→	Online shopping frequency	0.123	<0.001	0.053	<0.001
Offline orientation preference	→	Online shopping frequency	-0.101	<0.001	-0.079	<0.001
Online orientation preference	→	Offline shopping frequency	0.045	0.007	0.056	<0.001
Online orientation preference	→	Online shopping frequency	0.095	<0.001	0.094	<0.001
Hedonic shopping value	→	Offline orientation preference	0.141	0.004	0.149	<0.001
Hedonic shopping value	→	Online orientation preference	0.050	<0.001	0.075	<0.001
Presence of employees	→	Offline orientation preference	0.181	0.007	0.170	<0.001
Compare prices easily	→	Offline orientation preference	0.104	0.003	0.101	<0.001
Compare prices easily	→	Online orientation preference	0.202	<0.001	0.196	<0.001
Buy fast and easy	→	Offline orientation preference	-0.081	<0.001	-0.070	<0.001
Buy fast and easy	→	Online orientation preference	0.080	<0.001	0.074	<0.001

After adding control variables in the model a number of changes in regression coefficients are noticed:

- The effects on online shopping frequency are less strong when control variables are considered for all shopping value statements and orientation preferences, except 'being able to buy products fast and easy'.
- Shopping frequency was less convincingly found significantly affected by shopping value in four cases: the importance of the presence of employees for online shopping frequency; the importance of being able to compare prices easily and being able to buy products fast and easy on offline shopping frequency; the latter for both online and offline shopping frequency.
- The relation between online orientation preference and offline shopping frequency was found both stronger and significant on a larger interval.
- The effects on offline orientation preferences with a p-value larger than 0.001 in the preliminary model were found more convincingly significant in the control variable model.
- Regression weights for the effects from shopping value on orientation preferences were weaker in the model including control variables for all shopping value statements, whereas the effects from hedonic shopping value were stronger.

Attachment I Product class models

In chapter 5 the results for product class models are discussed. Only relationships that were outstandingly different from the main model were included in tables. The relationships different from the main model were those affecting offline and online shopping trip frequency. In the tables in this attachment all relationships are listed. Table 28 includes all relations between shopping values, orientation preferences and shopping frequency for all three models. Table 29 to Table 31 show the relationships between control variables in the form of dummy variables for each of the product class models separately.

Table 28 Main relationships in product class models

			Search		Experience		Commodity	
From		**To**	**Regr. Coeff.**	**p-value**	**Regr. Coeff.**	**p-value**	**Regr. Coeff.**	**p-value**
Hedonic shopping value	→	Offline orientation preferences	0.150	<0.001	0.137	<0.001	0.148	<0.001
Hedonic shopping value	→	Online orientation preferences	0.077	<0.001	0.080	<0.001	0.078	<0.001
Hedonic shopping value	→	Offline shopping frequency		0.125	0.167	<0.001		0.061
Hedonic shopping value	→	Online shopping frequency		0.230	0.111	<0.001		0.980
Presence of employees	→	Offline orientation preferences	0.179	<0.001	0.177	<0.001	0.169	<0.001
Presence of employees	→	Offline shopping frequency	0.084	<0.001		0.104	0.039	0.004
Presence of employees	→	Online shopping frequency		0.432	-0.048	0.002		0.773
Compare prices easily	→	Offline orientation preferences	0.104	<0.001	0.104	<0.001	0.102	<0.001
Compare prices easily	→	Online orientation preferences	0.194	<0.001	0.195	<0.001	0.195	<0.001
Compare prices easily	→	Offline shopping frequency		0.373		0.556	0.051	<0.001
Compare prices easily	→	Online shopping frequency	0.041	0.002		0.694		0.745
Buy fast and easy	→	Offline orientation preferences	-0.071	<0.001	-0.080	<0.001	-0.070	<0.001
Buy fast and easy	→	Online orientation preferences	0.077	<0.001	0.076	<0.001	0.073	<0.001
Buy fast and easy	→	Offline shopping frequency		0.163		0.358	0.040	0.005
Buy fast and easy	→	Online shopping frequency		0.161		0.148	0.060	<0.001
Time-consciousness	→	Offline shopping frequency		0.175	-0.035	0.021	-0.108	<0.001
Time-consciousness	→	Online shopping frequency		0.120	0.064	<0.001		0.074

Table 29 Relationships control variables in Search goods model

	Hedonic shopping value	Time-consciousness	Presence of employees	Buy fast and easy	Compare prices easily	Offline orientation preference	Online orientation preference	Offline shopping frequency	Online shopping frequency
Gender (reference male)									
Female	0.286	-0.179	0.074	-0.069			-0.108		-0.093
	(<0.001)	(<0.001)	(<0.001)	(<0.001)	(0.074)	(0.546)	(<0.001)	(0.874)	(<0.001)
Age (reference 16 to 17)									
18 to 24			-0.063						
	(0.570)	(0.888)	(0.030)	(0.409)	(0.711)	(0.315)	(0.858)	(0.192)	(0.759)
25 to 34								-0.089	
	(0.103)	(0.111)	(0.408)	(0.859)	(0.649)	(0.700)	(0.261)	(0.030)	(0.051)
35 to 49	-0.136								
	(0.003)	(0.074)	(0.664)	(0.800)	(0.296)	(0.517)	(0.330)	(0.064)	(0.197)
50 to 64	-0.157			-0.097				-0.092	-0.139
	(<0.001)	(0.565)	(0.223)	(0.031)	(0.557)	(0.762)	(0.209)	(0.040)	(0.001)
65 to 74	-0.207			-0.159					-0.168
	(<0.001)	(0.277)	(0.737)	(<0.001)	(0.335)	(0.143)	(0.416)	(0.187)	(<0.001)
75+	-0.175			-0.102					-0.137
	(<0.001)	(0.290)	(0.655)	(<0.001)	(0.123)	(0.613)	(0.581)	(0.088)	(<0.001)
Education (reference level low)									
Medium	-0.046			0.035				0.086	0.041
	(0.006)	(0.070)	(0.136)	(0.032)	(0.344)	(0.401)	(0.604)	(<0.001)	(0.009)
High	-0.125	0.079	-0.049	0.038		-0.080		0.178	0.144
	(<0.001)	(<0.001)	(0.009)	(0.030)	(0.140)	(<0.001)	(0.604)	(<0.001)	(<0.001)
Employment (reference 0 hours per week)									
0 to 12	-0.032			-0.040					
	(0.036)	(0.857)	(0.467)	(0.007)	(0.143)	(0.946)	(0.644)	(0.822)	(0.678)
12 to 35		0.036			-0.066	0.055			
	(0.653)	(0.045)	(0.203)	(0.326)	(<0.001)	(0.017)	(0.759)	(0.694)	(0.392)
35 or more		0.048			-0.064	0.096			
	(0.626)	(0.016)	(0.112)	(0.538)	(0.002)	(<0.001)	(0.443)	(0.926)	(0.052)
Income (reference lower than 2 times average)									
1-2x average					-0.038				
	(0.100)	(0.077)	(0.540)	(0.920)	(0.050)	(0.181)	(0.468)	(0.052)	(0.900)
> 2x average						-0.077		0.040	0.049
	(0.061)	(0.480)	(0.119)	(0.069)	(0.065)	(0.003)	(0.670)	(0.046)	(0.012)
Urbanity (reference non-urban)									
Urban	-0.067		-0.045						
	(<0.001)	(0.918)	(<0.001)	(0.561)	(0.291)	(0.890)	(0.170)	(0.871)	(0.988)
Household composition (reference couple)									
Single	-0.051					-0.080		0.063	0.080
	(0.003)	(0.180)	(0.188)	(0.061)	0.133	(<0.001)	(0.067)	(<0.001)	(<0.001)
Single + kids	-0.038	0.034			-0.040				
	(0.015)	(0.020)	(0.080)	(0.931)	(0.008)	(0.092)	(0.626)	(0.508)	(0.199)
Couple + kids	0.042			-0.039	-0.042				
	(0.024)	(0.972)	(0.090)	(0.031)	(0.022)	(0.059)	(0.984)	(0.586)	(0.848)

Table 30 Relationships control variables in Experience goods model

	Hedonic shopping value	Time-consciousness	Presence of employees	Buy fast and easy	Compare prices easily	Offline orientation preference	Online orientation preference	Offline shopping frequency	Online shopping frequency
Gender (reference male)									
Female	0.286 (<0.001)	-0.179 (<0.001)	0.074 (<0.001)	-0.070 (<0.001)	(0.075)	(0.723)	-0.115 (<0.001)	0.091 (<0.001)	0.070 (<0.001)
Age (reference 16 to 17)									
18 to 24	(0.568)	(0.888)	-0.063 (0.031)	(0.407)	(0.710)	(0.319)	(0.881)	(0.938)	(0.700)
25 to 34	(0.103)	(0.112)	(0.411)	(0.861)	(0.649)	(0.737)	(0.311)	0.104 (0.009)	0.123 (0.002)
35 to 49	-0.135 (0.003)	(0.074)	(0.664)	(0.798)	(0.294)	(0.542)	(0.376)	0.087 (0.045)	0.103 (0.016)
50 to 64	-0.156 (<0.001)	(0.562)	(0.222)	-0.097 (0.031)	(0.553)	(0.787)	(0.217)	(0.774)	(0.155)
65 to 74	-0.207 (<0.001)	(0.272)	(0.740)	-0.159 (<0.001)	(0.338)	(0.146)	(0.408)	(0.178)	(0.131)
75+	-0.175 (<0.001)	(0.288)	(0.657)	-0.102 (<0.001)	(0.124)	(0.613)	(0.568)	(0.244)	(0.089)
Education (reference level low)									
Medium	-0.046 (0.007)	(0.070)	(0.133)	0.035 (0.032)	(0.344)	(0.297)	(0.548)	0.041 (0.009)	(0.084)
High	-0.125 (<0.001)	0.079 (<0.001)	-0.049 (0.006)	0.039 (0.028)	(0.137)	-0.088 (<0.001)	(0.738)	0.098 (<0.001)	0.053 (0.002)
Employment (reference 0 hours per week)									
0 to 12	-0.032 (0.037)	(0.867)	(0.466)	-0.040 (0.007)	(0.143)	(0.970)	(0.610)	(0.333)	(0.897)
12 to 35	(0.659)	0.035 (0.046)	(0.202)	(0.326)	-0.066 (<0.001)	0.054 (0.019)	(0.761)	(0.160)	(0.304)
35 or more	(0.626)	0.048 (0.016)	(0.111)	(0.539)	-0.064 (0.002)	0.095 (<0.001)	(0.434)	(0.097)	(0.671)
Income (reference lower than 2 times average)									
1-2x average	(0.100)	(0.080)	(0.540)	(0.910)	-0.038 (0.049)	(0.164)	(0.458)	(0.331)	(0.207)
> 2x average	(0.061)	(0.507)	(0.119)	(0.076)	(0.067)	-0.079 (0.002)	(0.707)	(0.054)	0. 075 (<0.001)
Urbanity (reference non-urban)									
Urban	-0.067 (<0.001)	(0.932)	-0.045 (<0.001)	(0.557)	(0.291)	(0.840)	(0.165)	(0.183)	(0.144)
Household composition (reference couple)									
Single	-0.051 (0.003)	(0.165)	(0.188)	(0.061)	(0.134)	-0.086 (<0.001)	(0.086)	(0.056)	(0.755)
Single + kids	-0.038 (0.014)	0.034 (0.020)	(0.079)	(0.928)	-0.040 (0.008)	(0.071)	(0.625)	(0.390)	0.047 (<0.001)
Couple + kids	0.041 (0.026)	(0.951)	(0.090)	-0.038 (0.034)	-0.042 (0.023)	(0.048)	(0.894)	0.060 (<0.001)	0.106 (<0.001)

Table 31 Relationships control variables in Commodity goods model

	Hedonic shopping value	Time-consciousness	Presence of employees	Buy fast and easy	Compare prices easily	Offline orientation preference	Online orientation preference	Offline shopping frequency	Online shopping frequency
Gender (reference male)									
Female	0.286 (<0.001)	-0.179 (<0.001)	0.074 (<0.001)	-0.069 (<0.001)	(0.074)	(0.607)	-0.111 (<0.001)	0.094 (<0.001)	0.036 (0.010)
Age (reference 16 to 17)									
18 to 24	(0.568)	(0.887)	-0.063 (0.031)	(0.406)	(0.711)	(0.320)	(0.901)	0.101 (<0.001)	(0.507)
25 to 34	(0.103)	(0.112)	(0.412)	(0.866)	(0.640)	(0.730)	(0.309)	0.264 (<0.001)	0.138 (<0.001)
35 to 49	-0.136 (0.003)	(0.074)	(0.659)	(0.795)	(0.295)	(0.542)	(0.372)	0.297 (<0.001)	0.149 (<0.001)
50 to 64	-0.157 (<0.001)	(0.567)	(0.222)	-0.097 (0.030)	(0.557)	(0.771)	(0.202)	0.269 (<0.001)	(0.203)
65 to 74	-0.207 (<0.001)	(0.278)	(0.737)	-0.159 (<0.001)	(0.337)	(0.183)	(0.314)	0.209 (<0.001)	(0.492)
75+	-0.175 (<0.001)	(0.290)	(0.658)	-0.102 (<0.001)	(0.124)	(0.710)	(0.756)	0.149 (<0.001)	(0.349)
Education (reference level low)									
Medium	-0.046 (0.006)	(0.068)	(0.130)	0.035 (0.031)	(0.345)	(0.371)	(0.609)	0.055 (<0.001)	0.045 (0.005)
High	-0.125 <(0.001)	0.079 (<0.001)	-0.049 (0.006)	0.039 (0.028)	(0.136)	-0.082 (<0.001)	(0.619)	0.134 (<0.001)	0.053 (0.003)
Employment (reference 0 hours per week)									
0 to 12	-0.032 (0.036)	(0.861)	(0.472)	-0.040 (0.007)	(0.144)	(0.937)	(0.589)	(0.486)	(0.923)
12 to 35	(0.658)	0.035 (0.046)	(0.204)	(0.329)	-0.066 (<0.001)	0.056 (0.016)	(0.753)	0.037 (0.037)	(0.689)
35 or more	(0.621)	0.048 (0.016)	(0.113)	(0.545)	-0.064 (0.002)	0.097 (<0.001)	(0.450)	(0.163)	(0.301)
Income (reference lower than 2 times average)									
1-2x average	(0.100)	(0.077)	(0.542)	(0.897)	-0.038 (0.049)	(0.161)	(0.463)	(0.463)	(0.152)
> 2x average	(0.060)	(0.492)	(0.124)	(0.081)	(0.067)	-0.078 (0.002)	(0.763)	(0.978)	0. 076 (<0.001)
Urbanity (reference non-urban)									
Urban	-0.067 (<0.001)	(0.922)	-0.045 (<0.001)	(0.557)	(0.289)	(0.912)	(0.168)	(0.389)	0.048 (<0.001)
Household composition (reference couple)									
Single	-0.052 (0.003)	(0.171)	(0.189)	(0.062)	(0.133)	-0.082 (<0.001)	(0.057)	(0.637)	(0.780)
Single + kids	-0.038 (0.014)	0.034 (0.019)	(0.080)	(0.938)	-0.040 (0.008)	(0.086)	(0.592)	-0.037 (0.011)	(0.084)
Couple + kids	0.042 (0.025)	(0.973)	(0.090)	-0.038 (0.033)	-0.042 (0.022)	(0.062)	(0.895)	-0.073 (<0.001)	(0.105)

Attachment J Consumer mobility models

In this attachment the structural modelling phase of the estimation process for the consumer mobility models is displayed in tables.

Table 32 and Table 33 both include a column describing the results of estimating a preliminary model without control variables. When estimating the model with the number of shopping trips, the preliminary model revealed significant relationships between shopping value and the dependent variables of shopping trips. After controlling for demographic variables, most of these relations turned insignificant. Only the effect of the shopping value 'time-consciousness' on the number of shopping trips remained significant.

Table 32 Consumer mobility model - shopping trip

			Preliminary		Control variables	
From		**To**	**Stand. Reg. Coeff.**	**p-value**	**Stand. Reg. Coeff.**	**p-value**
Hedonic shopping value	→	Shopping trips	-0.095	<0.001		0.530
Presence of employees	→	Shopping trips	0.060	<0.001		0.329
Compare prices easily	→	Shopping trips	0.038	0.001		0.077
Buy fast and easy	→	Shopping trips	-0.043	0.008		0.218
Time-consciousness	→	Shopping trips	-0.106	<0.001	-0.037	0.009
Offline orientation preference	→	Shopping trips		0.849		
Online orientation preference	→	Shopping trips		0.874		
Hedonic shopping value	→	Offline orientation preference	0.143	<0.001	0.149	<0.001
Hedonic shopping value	→	Online orientation preference	0.050	0.005	0.077	<0.001
Presence of employees	→	Offline orientation preference	0.178	0.007	0.169	<0.001
Presence of employees	→	Online orientation preference		0.291		
Compare prices easily	→	Offline orientation preference	0.104	0.003	0.102	<0.001
Compare prices easily	→	Online orientation preference	0.201	<0.001	0.195	<0.001
Buy fast and easy	→	Offline orientation preference	-0.078	<0.001	-0.070	<0.001
Buy fast and easy	→	Online orientation preference	0.079	<0.001	0.073	<0.001
Time-consciousness	→	Offline orientation preference		0.105		
Time-consciousness	→	Online orientation preference		0.113		

Kilometrage as the dependent variable revealed no significant relations between the main concepts shopping value and orientation preferences. Consequently, no demographic variables are controlled for.

Table 33 Consumer mobility model - kilometrage

			Preliminary	
From		**To**	**Stand. Reg. Coeff.**	**p-value**
Hedonic shopping value	→	Kilometrage		0.853
Presence of employees	→	Kilometrage		0.596
Compare prices easily	→	Kilometrage		0.663
Buy fast and easy	→	Kilometrage		0.273
Time-consciousness	→	Kilometrage		0.149
Offline orientation preference	→	Kilometrage		0.213
Online orientation preference	→	Kilometrage		0.702
Hedonic shopping value	→	Offline orientation preference	0.141	<0.001
Hedonic shopping value	→	Online orientation preference	0.050	<0.001

Presence of employees	→	Offline orientation preference	0.181	<0.001
Presence of employees	→	Online orientation preference		0.289
Compare prices easily	→	Offline orientation preference	0.104	<0.001
Compare prices easily	→	Online orientation preference	0.202	<0.001
Buy fast and easy	→	Offline orientation preference	-0.081	<0.001
Buy fast and easy	→	Online orientation preference	0.080	<0.001
Time-consciousness	→	Offline orientation preference		0.109
Time-conscousness	→	Online orientation preference		0.114