BJÖRN VROOMEN

# The Effects of the Internet, Recommendation Quality and Decision Strategies on Consumer Choice

# The Effects of the Internet, Recommendation Quality and Decision Strategies on Consumer Choice

# The Effects of the Internet, Recommendation Quality and Decision Strategies on Consumer Choice

De invloed van het internet, de kwaliteit van een aanbeveling
en beslissingsstrategieën op keuzes van consumenten

PROEFSCHRIFT

ter verkrijging van de graad van doctor
aan de Erasmus Universiteit Rotterdam
op gezag van de rector magnificus

Prof.dr. S.W.J. Lamberts

en volgens besluit van het College voor Promoties.

De openbare verdediging zal plaatsvinden op

donderdag 9 november 2006 om 16:00 uur

door

Björn Leon Kristian Vroomen
geboren te Heerlen

Promotiecommissie

| | |
|---|---|
| Promotor: | Prof.dr. Ph.H.B.F. Franses |
| Overige leden: | Prof.dr.ir. B.G.C. Dellaert |
| | Prof.dr. S.M.J. van Osselaer |
| | Prof.dr. P.C. Verhoef |
| Copromotor: | Dr. A.C.D. Donkers |

Erasmus Research Institute of Management (ERIM)
RSM Erasmus University / Erasmus School of Economics
Erasmus University Rotterdam

Internet: http://www.erim.eur.nl
ERIM Electronic Series Portal: http://hdl.handle.net/1765/1

ERIM Ph.D. Series Research in Management, 90

ISBN-10: 90-5892-122-0
ISBN-13: 978-90-5892-122-2

Design: B&T Ontwerp en advies www.b-en-t.nl / Print: Haveka www.haveka.nl



This thesis was prepared with LaTeX $2_\varepsilon$

# Acknowledgements

Decision-making lies at the core of this Ph.D.-thesis. Six years ago I had to make an important decision. Philip Hans Franses and Cor Bioch initiated this project and I was given the opportunity to write a thesis. Which decision strategy I used I cannot recall, but I decided to take on this challenge.

Writing this thesis was not a one-man show. I benefited from being a member of a top research group. The enthusiasm and enduring support from my promotor Philip Hans have been important factors in writing this thesis. I owe him many thanks for that. With my co-promotor Bas Donkers I had many interesting discussions on various subjects that kept me on track. His excellent guidance and endless support have been invaluable. Furthermore, I am very grateful to Peter Verhoef for his ideas and support. Both of which led to the collaboration with marketing practitioners on two studies in this thesis. This was a welcome introduction to the 'real world' of marketing.

The members of the small committee, Benedict Delleart, Stijn van Osselear and Peter Verhoef evaluated this thesis. I am grateful for their valuable suggestions and comments.

Despite all the desk research, I still had the time to travel around the world to attend conferences. The financial support for these trips from ERIM and the Econometric Institute is gratefully acknowledged. Furthermore, ERIM and especially Tineke van der Vhee and Manfred Zielinski created an excellent research environment. I am very grateful for their support. In addition, I am thankful for the hospitality of the Tinbergen Institute and the Econometric Institute during my time at the Erasmus University and for the support I received from the CPB during the last two years.

Chapters 2 and 3 benefited from cooperation with marketing practitioners. I would like to thank Mieke van Os and Serge van Lier from Independer, and Eduard de Wilde and André Doffer from MarketResponse and VODW for valuable comments, suggestions and for providing me with data. In addition, I want to thank Patrick de Neef for his research assistance and all those who filled out one of my questionnaires.

It is also important to mention the R&D department. Richard Paap and Dennis Fok are great friends and I benefited greatly from their expertise. They just know everything.

As a Ph.D.-candidate I became part of a special community. It was a pleasure sharing a room with Dennis, Remco Prins, Govert Bijwaard and Lennart Hoogerheide. Furthermore, there were many interesting discussions and, more importantly, a lot of laughs during breaks in the TI-coffee room, lunches, diners and 'Friends sessions'. I would also like to thank Daina, Dennis, Erjen, Ivo, Jedid-Jah, Joost, Jos, Kevin, Klaas, Merel, Patrick, Pim, Rene, Remco, Richard P, Richard K, Rutger, Ward, Wilco, and all the others for a great time on the $16^{th}$-floor.

Writing this thesis could not have succeeded without the support from my family and friends. Especially I want to thank Nynke for her never ending and invaluable support during the writing of this thesis.

Björn Vroomen
Rotterdam, August 2006

# Contents

# List of Figures

# List of Tables

# Chapter 1

# Introduction

## 1.1 Motivation and structure of the thesis

The Internet conquered the world at a very rapid pace. We cannot imagine how the world would be today without it. The Internet is an efficient channel for communication, marketing and for distribution (Alba *et al.*, 1997; Hoffman and Novak, 1996; Peterson *et al.*, 1997). Firms increasingly add Internet channels to their channel portfolio (Geyskens *et al.*, 2002). However, despite the apparently ideal characteristics the effect it may have on commerce is still rather unclear (Brynjolfsson and Smith, 2000; Geyskens *et al.*, 2002).

Consumers have not yet fully adopted the Internet as a new channel. For example, the research-shopper is an often seen phenomenon. That is, half of the online shoppers use the Internet purely for gathering information and subsequently purchase products in a classic brick-and-mortar store (Kelley, 2002). This phenomenon demonstrates the use of multiple channels by consumers to obtain a product (Rash and Linter, 2001; Kelley, 2002; Stone *et al.*, 2002).

For example, what determines that the Internet is used for information search and the brick-and-mortar store for purchase? That is, what determines which channel is used for which type of task? This is a question not uncommon in the literature and several studies have therefore considered antecedents of channel usage to explain choices for either search or purchase activities (Bell and Lattin, 1998; Baker *et al.*, 2002; Ratchford *et al.*, 2003; Inman *et al.*, 2004, among others). However, these studies usually focus on a single channel or consider only one of the two considered tasks. In Chapter 2 we identify and investigate the effect of specific channel characteristics on search and purchase attractiveness. Moreover, we study how attractiveness levels may differ between four channels, including the Internet.

The type of product is likely to be of importance when considering the Internet as a channel for purchase. Products such as books, cd's or airplane tickets are common on the Internet and commercially well suited for the Internet. However, the Internet appears not to be well accepted by consumers and retailers for complex services and is also possibly less suited for this type of service (Peterson *et al.*, 1997). The number of complex services offered on the Internet is still very low. Furthermore, the number of retailers offering these services is even smaller.

A mortgage loan is an example of such a complex service on the Internet. It is a service that consists of many items per attribute, that is tailor-made, infrequently purchased, difficult to comprehend, and that requires, in general, assistance during the decision-making process. These characteristics make it less suited for the Internet. Still, they are offered on the Internet.

An online mortgage-loan service is ideal to quickly gather information, however the number of online purchases is low. Consumer characteristics and behavior on the web site (clickstream data) may provide information on the intentions of an online applicant, that is, the probability of purchase. An online broker can use this information in order to be able to focus on the potentially more successful applicants. In Chapter 3 we investigate the identification of potentially successful online mortgage-loan applicants.

Offering products and fulfilling requests on the Internet is just one part of e-commerce. Another part is the e-service provided, that is, "providing consumers with a superior experience with respect to the interactive flow of information" (Rust and Lemon, 2001). Enabling the consumer to control this information flow, via such e-services, substantially influences his or her information processing abilities (Ariely, 2000).

A recent development in services on the Internet is the so-called decision aid tool or recommendation agent (West *et al.*, 1999; Häubl and Trifts, 2000, among others). These tools assist consumers in controlling the massive amount of information on the Internet. For this purpose, preferences of consumers are used to filter information or, even more, recommend products (Ansari *et al.*, 2000; Ansari and Mela, 2003).

The quality of these recommendation agents differs and the recommendations made are not perfect. This quality level is an important aspect of the e-service provided as it can affect consumer satisfaction (Rust and Lemon, 2001; Ansari and Mela, 2003). In addition, using recommendation agents can influence decision-making of consumers (Chu and Spires, 1999; Häubl and Trifts, 2000; Todd and Benbasat, 1999, among others). Subsequently, the quality level of the agent may influence consumer decision-making as well.

We study in Chapter 4 the effect of the quality of a recommendation agent on several aspects of consumer decision-making.

Changes in decision-making, as a result of using a recommendation agent or as a result of differences in recommendation quality, may indicate changes in decision-strategy usage. The decision strategy is an important aspect of decision-making as it determines the intensity and method of information processing. The choice for a decision strategy is the outcome of a trade-off between the anticipated effort and accuracy levels related to a choice task (effort-accuracy framework Payne *et al.*, 1993). Recommendation agents can affect these anticipated levels and therefore decision strategy usage.

Insights in decision strategy usage can help explain the effect recommendation agents may have on consumer decision-making. Although the effort-accuracy framework is frequently used to study decision strategy usage (see Bettman *et al.*, 1990; Todd and Benbasat, 1994, 1999; Chu and Spires, 2001, among others), it does not provide a quick and efficient method to identify decision strategies. In Chapter 5 we provide a first setup for such a method.

## 1.2 More detailed outline of the thesis

In Chapter 2 we investigate the antecedents of channel attractiveness for search and purchase tasks. We identify specific channel characteristics which serve as these antecedents of channel attractiveness. A novelty of our study is that we study channel attractiveness for two tasks and for multiple channels.

Our framework of analysis consists of three building blocks. First of all, we explicitly make a distinction between search and purchase tasks of a channel (Alba *et al.*, 1997; Blattberg *et al.*, 2004). Channel attractiveness may differ for search and purchase tasks as consumers may favor certain characteristics more for search and others more for purchase. Secondly, we assume that channel attractiveness is purely based on characteristics of that specific channel. We therefore model attractiveness formation for search and purchase independently. Finally, we classify channels on cost and benefit characteristics (similar to Baker *et al.*, 2002). The resulting cost/benefit trade-off will determine the level of channel attractiveness of a channel for either search or purchase tasks.

Based on the literature we distinguish twelve channel characteristics as antecedents of attractiveness and identify for each characteristic several attributes. The majority of the distinguished channel characteristics is applicable to both search and purchase tasks. However, some of the characteristics only apply to search or to purchase. Based on

data obtained from an extensive survey, we estimate a fixed-effect model for both search and purchase attractiveness. Findings of our study provide new insights into channel attractiveness.

We study in Chapter 3 the acquisition of mortgage loans via the Internet, as an example of a complex service. The Internet is often only used to advertise and not to sell complex services. In addition, acquiring a complex service on the Internet is different from, for example, buying a book. That is, the exact specification of the complex service is in general not known until the point of purchase. This chapter is based on Vroomen *et al.* (2005).

Four sets of determinants of online purchases of complex services are identified, based on findings in the literature. The first determinant is consumer-search behavior on the web site (Moe, 2003). In addition, we decompose this determinant into two subcomponents, which are, online and competitive search behavior. Online search behavior characterizes the behavior demonstrated during the visit of a web site. In addition, competitive search behavior characterizes the comparison of services or retailers during search activities. The second determinant is trust in the online retailer. Trust is an important issue for adoption of the Internet as a transaction channel (Peterson *et al.*, 1997; McKinny *et al.*, 2002). The third determinant is the level of expertise of the complex service (Alba and Hutchinson, 1987). The final and fourth determinant concerns socio-demographics (see for example, Ratchford *et al.*, 2003).

We have access to a unique data set from an online Dutch financial service provider. This set contains data on behavior of consumers on the web site (that is, clickstream data), data from the application form, and data on purchase. These three data sets are combined in order to investigate the online applications for a mortgage loan.

Our set of four determinants shows to be a useful framework to investigate purchases of complex services on the Internet. An important application of our study is the ability to select customers. Using some form of selection criteria, a firm can select those customers that are most likely to engage in a purchase. This may lead to a substantial decrease in costs and consequently to a higher level of efficiency. We demonstrate the application of two selection criteria, the probability of purchase and the expected revenue.

Chapter 4 deals with the effect of recommendation agent quality on consumer decision-making. Recommendation agents are a special form of decision aid tools and provide customized support based on preferences of consumers (Alba *et al.*, 1997; West *et al.*, 1999; Häubl and Trifts, 2000). Literature indicates that such agents can influence decision-

making of consumers (Häubl and Trifts, 2000; Pedersen, 2000; Bechwati and Xia, 2003, among others).

Despite the fact that the quality of recommendations is not optimal, little is known about the effect of recommendation quality on consumer decision-making. An important aspect in our study is that in order to affect decision behavior the quality of the agent needs to be assessed. For example, the quality of a ranking can easily be observed as in this case all alternatives remain presented. However, a consumer can in general not asses the quality of a selection as he or she will have no reference to the full set of alternatives.

We consider two recommendation agents, one that ranks alternatives and one that selects alternatives. The quality level of both types of agent is adjusted to yield low-quality recommendations. The high and low-quality recommendations are subsequently compared to a non-aided task. We show that the quality of a recommendation agent can affect revealed effort, revealed accuracy and system satisfaction levels. Furthermore, we show that the identified effects are dependent on the type of agent. That is, the effect of recommendation quality differs between a ranking of alternatives and a selection of alternatives.

In Chapter 5 we propose a new method for the identification of decision strategies. That is, to be able to answer the question whether recommendation agents affect decision strategy usage, a method for strategy identification is required that is suitable for the Internet. The decision strategy is an important element in decision-making as it determines the method and intensity of information processing and consequently the accuracy of the decision.

Currently, two existing methods are used to identify decision strategies, the verbal-protocol method and self-stated usage (see, for example, Payne, 1976; Todd and Benbasat, 1991, 1999; Chu and Spires, 2001, 2003). Both methods have clear disadvantages, especially for an environment like the Internet. The verbal-protocol method relies on the quality and completeness of recorded statements. Self-stated usage is dependent on the expertise, skills, and motivation of the participant.

We focus on the development of a method that consists of a short and simple questionnaire. A questionnaire is easy to comprehend and can be applied in various experimental settings. In addition, we also incorporate multiple-strategy usage into this questionnaire. That is, several strategies may be used sequentially to make a decision (see for example Bettman *et al.*, 1990; Payne *et al.*, 1993; Todd and Benbasat, 1991).

To identify a strategy we propose to focus on an indicator of each strategy instead of focusing on the whole decision strategy. This framework reduces the length of a questionnaire considerably. Each indicator is based on a unique characteristic of the corresponding

strategy. Several experiments are conducted to set up, improve and validate a list of items to measure each indicator. An additional experiment is conducted to obtain insights on differences between the verbal-protocol method, self-stated usage and our questionnaire. We show that a large variation in strategy identification exists between all three methods. However, our scale matches better with the two existing methods than that these match with each other. In addition, we show that our framework provides a sound basis for further development of a questionnaire to identify decision strategies.

Finally, in Chapter 6 we conclude this thesis with a brief overview of the findings. In this chapter we will also discus some of the implications of our research and outline some topics for further research.

# Chapter 2

# Antecedents of channel search and purchase attractiveness in a multi-channel context

## 2.1 Introduction

"Today's customers 'channel surf' with abandon", (Nunes and Cespedes, 2003).

Half of the online shoppers use the Internet purely for gathering information, but purchase products in a brick-and-mortar store (Kelley, 2002). This phenomenon, which is known as the 'research shopper' (Blattberg *et al.*, 2004) clearly demonstrates the use of multiple channels for search and purchase tasks by consumers (Rash and Linter, 2001; Kelley, 2002; Stone *et al.*, 2002). In reaction to consumers' usage of multiple channels, firms are constantly adding new channels as well (Geyskens *et al.*, 2002).

Studies on consumer's multi-channel usage are becoming more common in the marketing literature. For example, researchers in the field of customer relationship management have investigated the effect of multi-channel usage for acquisition and retention, as well as for strategy development to obtain an optimal channel-usage mix (Vekatesan and Kumar, 2004; Reinartz *et al.*, 2005). In addition, Ansari *et al.* (2005) have modeled the migration between the catalog and the Internet. Others have compared the price levels and price dispersion between different channels (Brynjolfsson and Smith, 2000; Ancarani and Shankar, 2004).

To our knowledge there is no study that investigates search and purchase antecedents for multiple channels. Studies usually focus on a single channel or consider only one task.

Table 2.1: Literature overview

| | Channel usage | |
|---|---|---|
| Task | *Single* | *Multiple* |
| | Biswas (2004) | Ratchford, Lee, and Talukdar (2003) |
| *Search* | Johnson, Moe, Fader, Bellman, and Lohse (2004) | Ratchford, Talukdar, and Lee (2001) |
| | Vermeir and Van Kenhove (2005) | Strebel, Erdem, and Swait (2004) |
| | | Wendel and Delleart (2005) |
| | Baker, Parasuraman, Grewal, and Voss (2002) | Gupta, Su, and Walter (2004) |
| | Darian (1987) | Alba, Lynch, Weitz, Janiszewski, Lutx, Sawyer, and Wood (1997) |
| *Purchase* | Childers, Carr, Peck, and Carson (2001) | Bhatnagar and Ratchford (2004) |
| | Bell and Lattin (1998) | Fox, Montgomery, and Lodish (2004) |
| | | Inman, Shankar, and Ferraro (2004) |
| *Search & purchase* | Montoya-Weiss, Voss, and Grewal (2003) | *This chapter* |

In Table 2.1 we provide a short overview of several studies on channel usage for search and purchase tasks.

The objective of this chapter is therefore to identify and investigate the effect of specific channel characteristics on search and purchase attractiveness and how these may differ between channels. These differences may occur as consumers can favor certain characteristics of a channel more for search and others more for purchase. Findings of our study provide new insights into channel attractiveness, which can be used to improve the understanding of channel choice and channel design.

In order to be able to classify our channel characteristics on several attributes we deploy a cost-benefit approach, similar to Srinivasan and Ratchford (1991), Alba *et al.* (1997), and Baker *et al.* (2002). Subsequently, we make the assumption that the resulting costs and benefits of a channel will affect the search and purchase attractiveness of that channel.

The outline of the chapter is as follows. A short discussion of the literature is provided in Section 2.2. In Section 2.3 we discuss measurement issues and in Section 2.4 we discuss the collection of our data. Measurement reliability and validity is discussed in Section 2.5. Our analysis and findings are presented in Section 2.6. Finally, we conclude with a short discussion and managerial implications in Section 2.7.

## 2.2 Theory

Our conceptual framework is depicted in Figure 2.1 and the model demonstrates three assumptions we make on channel attractiveness formation. First, we explicitly make a distinction between two tasks of a channel, these are search and purchase (see also Alba *et al.*, 1997; Blattberg *et al.*, 2004).

Second, we model attractiveness formation for both tasks independently. That is, we do not assume that search attractiveness of a channel may influence purchase attractiveness of that channel, or vice versa. Attractiveness of a channel is purely based on characteristics of that specific channel. Note that in a channel choice context this may not always be a valid assumption. Interactions between the choice of a channel for search and purchase may occur, most likely via the (independent) attractiveness levels.

Third, channels are classified on costs and benefits (similar to Baker *et al.*, 2002), which may influence channel-attractiveness perceptions of consumers. The resulting cost/benefit trade-off will determine the level of channel attractiveness of a channel for either search or

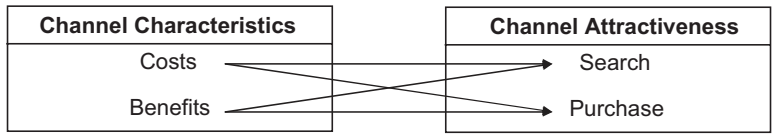


Figure 2.1: Conceptual framework

purchase tasks. Furthermore, an additional assumption is made that there are differences in the effects of channel characteristics on search and purchase attractiveness.

The concept of using channel characteristics to explain store (channel) choice or consumer patronage is relatively common in the literature, see for example the extensive list of studies mentioned in Table 2.2. However, most studies focus on channel benefits and the distinction between channel-cost characteristics and channel-benefit characteristics is not often made. Examples of the few studies that do make this distinction include Messinger and Narasimhan (1997), who define store choice as a trade-off between benefits and costs perceptions of consumers. Baker *et al.* (2002) indicate that store patronage is a function of perceptions of shopping-experience costs, next to the channel benefits merchandize value and interpersonal-service quality. In addition, Bell *et al.* (1998) make a distinction between fixed and variable costs and indicate that the probability of a visit to a store increases with lower shopping costs.

The literature provides numerous studies which consider channel benefits. For example, Kunkel and Berry (1968) made a distinction between the price level, quality of merchandize, assortment offered, services provided, the atmosphere, and convenience as channel benefits. Dickson and Albaum (1977) distinguished additional characteristics as layout and facilities. In addition, Zimmer and Golden (1988) performed a content analysis on consumers' retail image and extended earlier lists with characteristics, such as friends that shop at the same store and after-sale service. In a more recent study on the impact of task definition on store choice, Van Kenhove *et al.* (1999) distinguish location, convenience, service, price, stock, assortment depth, atmosphere, availability of the newest products, and quality as influential channel-benefit characteristics. Furthermore, enjoyment may be considered as a channel benefit (Childers *et al.*, 2001), as well as negotiation (Bazerman, 2001). For certain products it may be very important to be able to negotiate, for example, the acquisition of a car (see Morton *et al.*, 2003).

Similar to channel benefits we can distinguish several channel-cost characteristics from the literature. Messinger and Narasimhan (1997) distinguish shopping time and logistics

Table 2.2: Channel characteristics

| Characteristic | Benefit or Cost | Search or Purchase | Attributes | Reference |
|---|---|---|---|---|
| Assortment | B | S/P | depth assortment; breadth assortment; amount; availability of new products; variety brands; availability popular products; quality level; on stock | Kunkel and Berry (1968); Kiang *et al.* (2000); Samli *et al.* (1998); Yoo *et al.* (1998); Van Kenhove *et al.* (1999) |
| Price | B | S/P | high-low price level; value for money | Dickson and Albaum (1977); Steenkamp and Wedel (1991) |
| Promotion | B | S/P | advertisement; display; discounts; loyalty program; customized offers (direct marketing) | Kunkel and Berry (1968); Dickson and Albaum (1977) |
| Information | B | S | availability; accessability; examination alternatives; comparison alternatives; quality; convenience | Montoya-Weiss *et al.* (2003); Kiang *et al.* (2000); Ratchford *et al.* (2001) |
| Cliental | B | S/P | social appeal; friends; store-image and self-image congruency | Zimmer and Golden (1988); Alba *et al.* (1997) |
| Service | B | S/P | return policy; repair policy; delivery service; installation service; refund policy; customization; reservation/layaway; expertise; attitude; number of personal; decision aid tool; search engine | Dickson and Albaum (1977); Homburg *et al.* (2002); Kiang *et al.* (2000); Kunkel and Berry (1968); Samli *et al.* (1998); Yoo *et al.* (1998) |

Table 2.2 continued: Channel characteristics

| Characteristic | Benefit or Cost | Search or Purchase | Attributes | Reference |
|---|---|---|---|---|
| Convenience | B | S/P | opening hours; general; location; learning to use | Kunkel and Berry (1968); Zimmer and Golden (1988); Messinger and Narasimhan (1997) |
| Enjoyment | B | S/P | fun | Beatty and Ferrell (1998); Alba *et al.* (1997); Childers *et al.* (2001) |
| Atmosphere | B | S/P | layout; presentation | Kunkel and Berry (1968); Montoya-Weiss *et al.* (2003); Park *et al.* (1989); Yoo *et al.* (1998) |
| Negotiation | B | P | price negotiation; options | Bazerman (2001) |
| Consumer shopping costs | C | S/P | time-costs; mental costs; physical costs | Srinivasan and Ratchford (1991); Messinger and Narasimhan (1997); Bell *et al.* (1998); Baker *et al.* (2002) |
| Risk | C | S/P | financial; product performance; social; physical; psychological; time/convenience loss; privacy | Srinivasan and Ratchford (1991); McKnight *et al.* (2002); Forsythe and Shi (2003); Park and Jun (2003) |

as channel costs relative to the benefits assortment, price and convenience. Baker *et al.* (2002) distinguish time and effort required for obtaining products and the psychical costs of shopping. In addition, Bhatnagar and Ratchford (2004) distinguish time and membership fee as costs for store choice, and price and assortment as channel benefits. Another aspect of channel costs is the level of risk associated with a certain channel for either search or purchase tasks. Srinivasan and Ratchford (1991) incorporate perceived risk levels in their model for explanation of search behavior for automobiles, next to costs of time and psychical costs. They included as risk factors financial, performance, psychical and convenience risk. Forsythe and Shi (2003) use a similar classification of risk but take social factors into account as well. Risk can be translated into trust, which is especially of importance for the Internet. Low trust in the Internet will refrain consumers from adopting e-commerce as a new channel (McKnight *et al.*, 2002).

Although the literature discussed above focuses mainly on brick-and-mortar stores we identified an extensive list of attributes describing store characteristics on benefits and costs. These characteristics and corresponding attributes can easily be extended towards other channels (Internet, catalog and telephone). We distinguish twelve channel characteristics from the literature, which are listed in Table 2.2 and which are each defined on several attributes. In addition, the classification as channel cost or benefit characteristics is provided in this table as well.

Our research objective implies an investigation of differences that may occur between channel characteristics for search and purchase tasks. These may occur due the different requirements of channels for either search or purchase tasks. Furthermore, it is this difference in effects of characteristics on channel attractiveness for search or purchase that may explain why consumers consider a certain channel more attractive than other channels for either task.

Although the majority of the distinguished channel characteristics are applicable to both search and purchase tasks, two of the characteristics will however only apply to search or to purchase. Based on the studies mentioned above we classify a-priori negotiation as a pure purchase characteristic as this is in general not required during search activities. In addition, we classify information as a pure search characteristic as this is the main objective of search activities. The other characteristics are classified as applicable to search and purchase.

## 2.3 Measurements

We obtained a very extensive list of items (attributes) describing channel characteristics (see Table 2.2). Note that respondents should answer each item concerning channel attractiveness for each of the four channels (store, Internet, catalog and telephone). This implies that the number of survey questions multiplies by four. Additional questions are included in the survey as well and therefore a reduction of channel items was a necessity to minimize the response burden.

We therefore pretested our list of survey-items in three steps. First, interviews with academic experts were conducted. Based on their remarks we rephrased items and marked several items for deletion. Second, in an iterative process of extensive discussions with an expert from a Dutch research company we were able to further reduce the list of items and improve items on phrasing. Third, the reduced survey was presented to several persons within the research company with expertise in the field of conducting consumer surveys. After incorporation of their remarks we obtained our final list of survey-items. In total the survey contained 44 items to measure channel characteristics, which are presented in Appendix 2.A. The attractiveness of a channel for either search or purchase will each be measured with two items. The first item indicates perceived suitability of the channel and the second item indicates perceived appropriateness of the channel for either tasks.

We accommodate for differences in product type by slightly adjusting the questionnaire for each product. Phrasing was adjusted to match the product included in the survey. Furthermore, we make a distinction between in-shop service (service obtained before purchase) and after-sale service. Some after-sale service related items are not included for certain products. In addition, for books also two non-service items are not included[1].

This adjustment of our survey for the seven product categories allows us to distinguish the following thirteen channel characteristics to analyze search and purchase attractiveness; assortment, price, promotion, information, cliental, in-shop service, after-sale service, convenience, enjoyment, risk, time, costs, and negotiation. Responses for items on channel characteristics, and search and purchase attractiveness are recorded on a 5 point Likert-scale anchored by 1 (strongly disagree) and 5 (strongly agree).

[1]These are the items 17 and 44 in Appendix 2.A

Table 2.3: Classification of considered products and services on frequency, complexity and tangibility

| Product | Frequency | Complexity | Tangibility |
|---|---|---|---|
| Mortgage loan | low | high | no |
| Health insurance | low | medium | no |
| Computer | medium | high | yes |
| Electronic appliances | medium | medium | yes |
| Holiday | medium | low | no |
| Books, dvd, cd | high | low | yes |
| Clothing | high | low | yes |

## 2.4 Sample and data collection

We collected data for our analysis using a survey which was set out among a panel of *MarketResponse*, a Dutch marketing research company. To improve generalizability of results we collected data on seven product categories, which are books, clothing, computers, electronic appliances, health insurances, holidays and mortgage loans. The classification presented in Table 2.3 demonstrates that these seven products cover a wide spectrum on frequency, complexity and tangibility (see also Peterson *et al.*, 1997).

In total 3000 panel members were selected aged between 20 till 65, with the additional requirement of an Internet connection at home to insure familiarity with the Internet. A short telephone survey revealed that 2400 panel members purchased one or more of the seven products during the three months before this telephone interview was conducted. For each product 130 panel members were selected to participate in our survey. These panel members ($7 \times 130 = 910$ in total) obtained our survey by surface-mail. This selection per product ensures familiarity with the product and with search and purchase activities for that product. Of the final 910 selected panel members 460 returned the survey yielding a response rate of 52 per cent. However, screening on response revealed that 62 questionnaires were incomplete. These questionnaires were deleted from our sample yielding a final sample of 398 respondents for our analysis (44 per cent net response rate).

Respondents are equally distributed over the seven products (around 15%), except for clothing (11%). The majority is female (65%) and respondents are on average 44 years of age, 35% holds a college degree, and 54% had attended a graduate school. In

total, 48% of the households consisted of one or two persons without children and 60% of the respondents (households) earns an monthly net income above € 2250. Concerning Internet usage, 56% are online on a daily basis and nearly half of the respondents (48%) is more than 20 minutes online during each occasion.[2]

## 2.5 Reliability and validity measures

To asses the reliability and validity of our measures we start with an analysis of item-to-total correlations. Results indicate that two items do not fit well to their corresponding constructs (channel characteristics), which are convenience and costs. The item for convenience is deleted and the item for costs is included in the analysis as a separate single-item construct. This item indicates the possible importance of privacy concerns (item 36 in Appendix 2.A). In addition, we can distinguish a new construct 'time' consisting of two items, which were part of the consumer costs construct. This new construct should reveal the importance of time-costs for search and purchase attractiveness.

Table 2.4 reports the Cronbach alpha for the channel characteristics and for search and purchase attractiveness. The second column of this table shows the alpha values when we ignore differences in channel and products that is, when we pool the data. The third till sixth column show the alpha values for each channel.[3] The Cronbach's alpha values show that the reliability of the different constructs is sufficient (Nunnally, 1978).

To further asses reliability and validity of our measures we perform a confirmatory factor analysis (CFA, see Anderson and Gerbing (1988)). We have set the loading and variance of the one-item construct for privacy and negotiation to 0.95 times the standard deviation of the corresponding item and 0.1 times the variance of the item, respectively (Anderson and Gerbing, 1988). Results of this CFA are shown in Table 2.5. The fit of the model is satisfactory given the Non-Normed Fit Index (NNFI=0.89), the Comparative Fit Index (CFI=0.91), and the Root Mean Square Error of Approximation (RMSEA=0.079) (see Bagozzi and Yi (1988) and Baumgartner and Homburg (1996)). Furthermore, the loadings on the factors are strong for all the items ($t$-values range from 18.8 to 55.6), indicating convergent validity. Results indicate further that composite reliability of all constructs except for time exceed the threshold of 0.7. The values for extracted portion of variance all exceed the 0.5 threshold. Furthermore, none of the 95% confidence inter-

[2]More detailed information on the sample of respondents and the survey can be found in the report "De multichannelende consument", 2005, VODW-marketing (in Dutch).

[3]Cronbach alpha values for each product are provided in Table 2.11 in Appendix 2.B

Table 2.4: Cronbach alpha values

| | Total | Store | Internet | Catalog | Telephone |
|---|---|---|---|---|---|
| Assortment | 0.94 | 0.88 | 0.91 | 0.85 | 0.91 |
| Price | 0.80 | 0.65 | 0.77 | 0.71 | 0.84 |
| Promotion | 0.90 | 0.90 | 0.87 | 0.86 | 0.87 |
| Information | 0.91 | 0.81 | 0.86 | 0.81 | 0.85 |
| Clients | 0.79 | 0.81 | 0.71 | 0.67 | 0.82 |
| In-shop service | 0.87 | 0.84 | 0.70 | 0.71 | 0.81 |
| Convenience | 0.87 | 0.77 | 0.93 | 0.76 | 0.85 |
| Enjoyment | 0.80 | 0.64 | 0.76 | 0.73 | 0.75 |
| Risk | 0.77 | 0.71 | 0.73 | 0.64 | 0.73 |
| Costs | 0.81 | 0.78 | 0.78 | 0.78 | 0.82 |
| Privacy[1] | – | – | – | – | – |
| Time | 0.61 | 0.62 | 0.53 | 0.61 | 0.68 |
| Negotiation[1] | – | – | – | – | – |
| After-sale service[2] | – | – | – | – | – |
| | | | | | |
| Search attractiveness | 0.87 | 0.76 | 0.77 | 0.74 | 0.71 |
| Purchase attractiveness | 0.90 | 0.81 | 0.86 | 0.81 | 0.78 |

[1] Privacy and negotiation consist of 1 item.
[2] Not determined per channel as a result of the variation in items induced by the adjustment to differences in product.

vals around all pair wise latent-trait correlations encompass 1.0, indicating discriminant validity (Anderson and Gerbing, 1988).

The results on reliability and validity discussed above provide evidence for internal and external validity of the constructs used. Our variables are now constructed by the average value of the responses to a particular construct. Correlations between channel characteristics are reported in Table 2.6. In general, correlations are below 0.6 and we do not expect complications in our analysis due to these values (for example, multi-collinearity).

## 2.6 Analysis and results

### Model

We are mainly interested in the effect of the distinguished channel characteristics on search and purchase attractiveness for the four channels store, Internet, catalog and telephone.

Table 2.5: Results of confirmatory factor analysis

| | Item | Standardized loading | Composite reliability | Proportion of variance extracted |
|---|---|---|---|---|
| Assortment | | | 0.95 | 0.78 |
| | 1 | 0.89 | | |
| | 2 | 0.91 | | |
| | 3 | 0.91 | | |
| | 4 | 0.85 | | |
| | 5 | 0.85 | | |
| Price | | | 0.67 | 0.51 |
| | 6 | 0.77 | | |
| | 7 | 0.86 | | |
| Promotion | | | 0.72 | 0.56 |
| | 8 | 0.92 | | |
| | 9 | 0.94 | | |
| Information | | | 0.90 | 0.68 |
| | 10 | 0.83 | | |
| | 11 | 0.83 | | |
| | 12 | 0.89 | | |
| | 13 | 0.88 | | |
| Cliental | | | 0.69 | 0.53 |
| | 14 | 0.8 | | |
| | 15 | 0.84 | | |
| In-shop Service | | | 0.84 | 0.64 |
| | 16 | 0.85 | | |
| | 25 | 0.83 | | |
| | 26 | 0.87 | | |
| Convenience | | | 0.85 | 0.65 |
| | 27 | 0.91 | | |
| | 28 | 0.83 | | |
| | 29 | 0.8 | | |

Table 2.5 continued: Results of confirmatory factor analysis

| | Item | Standardized loading | Composite reliability | Proportion of variance extracted |
|---|---|---|---|---|
| Enjoyment | | | 0.72 | 0.57 |
| | 31 | 0.87 | | |
| | 32 | 0.82 | | |
| Risk | | | 0.81 | 0.59 |
| | 33 | 0.76 | | |
| | 34 | 0.72 | | |
| | 35 | 0.75 | | |
| Privacy | | | – | – |
| | 36 | 0.95 | | |
| Time | | | 0.56 | 0.39 |
| | 37 | 0.7 | | |
| | 38 | 0.64 | | |
| Costs | | | 0.86 | 0.61 |
| | 39 | 0.67 | | |
| | 40 | 0.71 | | |
| | 41 | 0.8 | | |
| | 42 | 0.77 | | |
| Negotiation | | | – | – |
| | 43 | 0.95 | | |
| Search | | | 0.90 | 0.82 |
| | s1 | 0.92 | | |
| | s2 | 0.9 | | |
| Purchase | | | 0.93 | 0.87 |
| | p1 | 0.94 | | |
| | p2 | 0.93 | | |

Table 2.6: Correlations between channel characteristics

| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Assortment | | | | | | | | | | | | | |
| 2 | Price | 0.72 | | | | | | | | | | | | |
| 3 | Promotion | 0.66 | 0.71 | | | | | | | | | | | |
| 4 | Information | 0.82 | 0.71 | 0.64 | | | | | | | | | | |
| 5 | Cliental | 0.53 | 0.46 | 0.48 | 0.57 | | | | | | | | | |
| 6 | In-shop Service | 0.54 | 0.46 | 0.37 | 0.55 | 0.42 | | | | | | | | |
| 7 | Convenience | 0.43 | 0.40 | 0.39 | 0.47 | 0.28 | 0.07 | | | | | | | |
| 8 | Enjoyment | 0.64 | 0.51 | 0.52 | 0.64 | 0.45 | 0.44 | 0.43 | | | | | | |
| 9 | Risk | -0.23 | -0.13 | -0.10 | -0.23 | -0.16 | -0.41 | 0.13 | -0.14 | | | | | |
| 10 | Costs | -0.35 | -0.29 | -0.25 | -0.35 | -0.25 | -0.30 | -0.17 | -0.40 | 0.38 | | | | |
| 11 | Negotiation | 0.13 | 0.16 | 0.14 | 0.14 | 0.16 | 0.43 | -0.10 | 0.10 | -0.17 | 0.03 | | | |
| 12 | Time | -0.06 | -0.07 | -0.04 | -0.07 | -0.08 | -0.02 | -0.12 | -0.13 | 0.20 | 0.58 | 0.06 | | |
| 13 | Privacy | 0.41 | 0.32 | 0.28 | 0.40 | 0.27 | 0.54 | 0.05 | 0.37 | -0.33 | -0.22 | 0.27 | 0.01 | |
| 14 | After-sale service | 0.60 | 0.53 | 0.44 | 0.61 | 0.45 | 0.86 | 0.24 | 0.52 | -0.33 | -0.35 | 0.33 | -0.06 | 0.51 |

We therefore model each channel separately. Recall that we divided the respondents over seven product categories. This improves generalization of results however it may also introduce certain heterogeneity in response. That is, for a certain channel the average attractiveness level for the seven product categories may differ. For example, the Internet might a-priori be perceived as less attractive for mortgage loans than for books. To take these differences in average attractiveness levels into account we introduce a fixed-effect component in our model for each product within each channel. This yields the following general model specification.

$$Y_{cp} = \alpha_{cp} + X_{cp}\beta_c + \varepsilon_{cp}, \qquad \varepsilon_{cp} \sim N(0, \Sigma). \tag{2.1}$$

Channels are indicated with $c$ and each product with $p$. Given (2.1) $\beta_c$ demonstrates the effect of the channel characteristics of channel $c$ on the attractiveness of that channel. The parameters $\alpha_{cp}$ indicate the use of fixed-effects for the seven products.

Given our model specification we obtain a system of four equations with identical exogenous variables, which are most likely correlated. Using ordinary least squares (OLS) would normally, therefore, yield inefficient estimates. However, when an identical set of exogenous variables is used in each equation, OLS per equation does provide consistent and efficient model parameters Greene (1993).

## Search attractiveness

In Table 2.7 we report the average values for search and purchase attractiveness for each of the 28 product-channel combinations. Concerning search activities it appears that the store and the Internet are perceived as the two most attractive channels. For the product categories computers, health insurances and vacations it even holds that the Internet is perceived as more attractive than the brick-and-mortar store. However, differences in attractiveness levels are small. The catalog is perceived as a relatively attractive channel as well. The telephone is clearly perceived as not attractive. Respondents disagree relatively strong with the statement that the telephone is an attractive channel for search activities. This could be due to the absence of visual cues for the telephone. Information is vocally presented, making it more difficult to asses the appearance of the product, and the relevance or the importance of the provided information.

When we look at the estimation results for search, presented in Table 2.8, we see that assortment, information, convenience and enjoyment positively influence the attractiveness of all four channels. Price levels and promotions are not a determinant for search attractiveness. Only the Internet is influenced by both characteristics. The perception of

Table 2.7: Average search and purchase attractiveness

| | Store | Internet | Catalog | Telephone |
|---|---|---|---|---|
| | | Search attractiveness [a] | | |
| Books | 4.4 | 4.1 | 3.6 | 1.6 |
| Clothing | 4.2 | 3.1 | 3.5 | 2.0 |
| Computer | 4.4 | 4.5 | 3.6 | 1.8 |
| Electronic appliances | 4.3 | 4.2 | 3.8 | 1.8 |
| Health insurance | 3.6 | 4.2 | 3.3 | 2.1 |
| Mortgages | 4.5 | 4.3 | 3.2 | 1.8 |
| Vacation | 4.4 | 4.5 | 4.3 | 2.0 |
| | | Purchase attractiveness [a] | | |
| Books | 4.7 | 3.4 | 3.2 | 1.6 |
| Clothing | 4.5 | 2.5 | 3.2 | 1.8 |
| Computer | 4.5 | 3.6 | 2.7 | 1.7 |
| Electronic appliances | 4.7 | 3.2 | 3.1 | 1.8 |
| Health insurance | 4.0 | 3.5 | 2.7 | 2.4 |
| Mortgages | 4.7 | 2.5 | 2.2 | 1.6 |
| Vacation | 4.4 | 3.9 | 3.4 | 2.5 |

[a] anchored by 1 (strongly disagree) and 5 (strongly agree)

low prices on the Internet makes it however not more, but less attractive as a channel for search tasks. This may be related to the positive effect of information for the Internet. The low Internet prices may be compensated with less information on products. When retailers are perceived to provide more or better information the Internet becomes more attractive for search. In contrast to this finding on price we find some support for that promotions make the Internet more attractive for search.

Service is a characteristic only of importance to the store. If one perceives that one may obtain a better service during ones search process, the store becomes more attractive. This may be related to the face-to-face communication in a store, which is a unique characteristic for the brick-and-mortar store. One can easily ask a salesperson for (additional) information. Risk is a factor that affects the search attractiveness for all channels except the Internet. However, there is only weak support for the effect of risk on store attractiveness. That the attractiveness of the Internet is not influenced by risk factors may

Table 2.8: Parameter estimates for search attractiveness

| | Store | Internet | Catalog | Telephone |
|---|---|---|---|---|
| Assortment | 0.15** | 0.22*** | 0.20** | 0.17*** |
| Price | 0.00 | -0.13** | -0.01 | -0.03 |
| Promotion | 0.01 | 0.08* | 0.06 | -0.09 |
| Information | 0.25*** | 0.15** | 0.35*** | 0.37*** |
| Cliental | -0.03 | 0.05 | 0.13** | 0.01 |
| Service | 0.20** | -0.03 | -0.14 | 0.04 |
| Convenience | 0.11*** | 0.35*** | 0.11** | 0.19*** |
| Enjoyment | 0.18*** | 0.22*** | 0.16*** | 0.20*** |
| Risk | -0.08** | -0.03 | -0.13** | -0.10** |
| Costs | 0.02 | -0.08* | -0.11 | -0.04 |
| Negotiation | -0.02 | -0.02 | 0.04 | 0.05 |
| Time | 0.02 | 0.08* | 0.07 | 0.00 |
| Privacy [a] | 0.03 | 0.00 | 0.01 | 0.07* |
| After-sale service | 0.00 | 0.04 | 0.07 | -0.13 |

[a] Reversed item, a higher score indicates more confidence in privacy
significance level: * = 10%, ** = 5%, *** = 1%

relate to the vas amount of information that is available. Different sources of information can be used, reducing the level of risk of getting incorrect information considerably. Furthermore, the information can easily be accessed which relates to the positive effect of time for the Internet. Finally, costs perceptions might reduce the attractiveness of the Internet. As the Internet is relatively young, these costs may relate to the investment of getting familiar to using the Internet for search tasks. The other three channels are well known and therefore easy (less costly) to use.

## Purchase attractiveness

The average purchase-attractiveness values in Table 2.7 reveal that the store is clearly (still) the most attractive channel for all products. However, the Internet is perceived as relatively attractive as well, except for clothing and mortgage loans. We see for the catalog that respondents are more or less indifferent on attractiveness for purchase. Moreover, similar to the results for search attractiveness the telephone is perceived as an unattractive channel.

Table 2.9: Parameter estimates for purchase attractiveness

| | Store | Internet | Catalog | Telephone |
|---|---|---|---|---|
| Assortment | 0.09 | 0.16* | 0.26*** | 0.21*** |
| Price | 0.01 | -0.01 | 0.11 | 0.12 |
| Promotion | 0.03 | 0.03 | 0.03 | -0.11 |
| Information | 0.14** | -0.02 | -0.03 | 0.14* |
| Cliental | -0.02 | 0.13** | 0.14** | -0.01 |
| Service | 0.25*** | 0.06 | 0.04 | 0.04 |
| Convenience | -0.01 | 0.06 | 0.05 | 0.09* |
| Enjoyment | 0.12*** | 0.24*** | 0.18*** | 0.22*** |
| Risk | -0.04 | -0.17*** | -0.29*** | -0.15*** |
| Costs | 0.01 | -0.07 | -0.07 | 0.03 |
| Negotiation | -0.02 | -0.01 | 0.07 | 0.08** |
| Time | 0.03 | -0.01 | -0.03 | -0.06 |
| Privacy [1] | 0.05 | 0.17*** | 0.04 | 0.07* |
| After-sale service | 0.05 | 0.35*** | 0.24** | 0.03 |

[1] Reversed item, a higher score indicates more confidence in privacy
significance level: * = 10%, ** = 5%, *** = 1%

Table 2.9 shows the estimation results of the fixed-effects model for purchase attractiveness. These results reveal that in contrast to the results for search attractiveness, assortment no longer significantly affects the store attractiveness and for the Internet only weak support is found. The other two channels, however, still become more attractive for purchase when the perceptions on assortment improve. Shopping enjoyment positively affects the purchase attractiveness of all channels for purchase tasks. Information is of minor importance compared to the findings on search attractiveness, which is expected. Still information of the store may improve the level of purchase attractiveness. This might indicate the ability to obtain additional information from the salesperson during purchase.

Surprisingly, price and promotion do not influence the attractiveness of the four channels for purchase. It may hold that price or promotion affect the choice of a retailer within a channel more than the choice between channels. The significant negative effects of risk for Internet, catalog, and telephone indicate that there are still some concerns about the use of these channels. Privacy is an issue for the Internet conforming earlier findings in the literature. It also affects moderately the telephone as well. Cliental (hence,

friends) positively relates to purchase attractiveness of the Internet and catalog. Finally, after-sale service has a significant effect on purchase attractiveness for the Internet and catalog. Both channels have to be perceived to have a good after-sale service to become more attractive for purchase.

## 2.7 Discussion

The objective of this chapter was to distinguish several channel characteristics as antecedents of search and purchase attractiveness to provide new insights on channel attractiveness for search and purchase tasks. We classified channel characteristics on cost and benefit attributes. The trade-off between these costs and benefits should reveal the attractiveness of a channel.

We obtained data from an extensive survey. Average values for search and purchase attractiveness revealed that both the brick-and-mortar store and the Internet are perceived as attractive channels for search and that the store remains the most attractive channel for purchase. The catalog and telephone are perceived as relative unattractive.

A fixed-effects model was estimated for both search and purchase attractiveness. Outcomes of this model are summarized in Table 2.10. Several channel characteristics reveal to have a significant effect on channel attractiveness for either search or purchase or both. However, other channel characteristics do not demonstrate a clear effect. A comparison of Tables 2.2 and 2.10 reveals that only a few characteristics can be classified as search and/or purchase. Indeed assortment and risk are perceived as attractive attributes of a channel for search and purchase tasks. Information and convenience are pure search attributes and after-sale service a pure purchase attribute.

Our findings provide several interesting findings. Attractiveness of channels, either for search or purchase, can be controlled by several channel characteristics. Assortment and enjoyment are two characteristics shared by the four channels. These can therefore easily be applied to improve attractiveness for either search or purchase of a channel in general. Moreover, they may even be applied to differentiate between consumers, although further research is required.

The brick-and-mortar store is still perceived as very attractive for search and for purchase. This favorable position may be due to the personal interaction and ability to observe the product in a store. This aspect of the store is further emphasized by the importance of the in-shop service level that is the service one may obtain before purchase.

Table 2.10: Significant effects of channel characteristics on attractiveness of Store (St), Internet (I), Catalog (C) and Telephone (T) for search of purchase

| Channel characteristic | Assumption | Search attractiveness | Purchase attractiveness | Classification [a] |
|---|---|---|---|---|
| Assortment | S&P | St, I, C, T | I, C, T | S&P |
| Price | S&P | I | – | – |
| Promotion | S&P | I | – | – |
| Information | S | St, I, C, T | St, T | S |
| Cliental | S&P | C | I, C | – |
| In-shop service | S | St | St | – |
| Convenience | S&P | St, I, C, T | T | S |
| Enjoyment | S&P | St, I, C, T | St, I, C, T | S&P |
| Risk | S&P | St, C, T | I, C, T | S&P |
| Costs | S&P | I | – | – |
| Negotiation | P | – | T | – |
| Time | S&P | I | – | – |
| Privacy | S&P | T | I, T | – |
| After-sale service | P | – | I, C | P |

[a] Classification based on the number of significant effects and the level of significance as presented in Tables 2.8 and 2.9. S=search characteristic, P=purchase characteristic.

If we focus on the Internet, we see that the Internet is catching up with the brick-and-mortar store, especially concerning search activities. Still several issues remain that may refrain consumers from using this channel for purchase activities. These issues include the classical concerns on privacy and risk. Related to these concerns is the issue of after-sale service. The latter issue can easily be resolved; the former two are more difficult and relate to trust in the retailer. When these issues are indeed resolved the Internet may become a serious alternative for the brick-and-mortar store for the purchase of products and services.

The catalog is not perceived as very attractive for either search or purchase. Similar to the Internet, concerns on risk and after-sale service may refrain consumers from using this channel for purchase.

The telephone as a search or purchase channel is not perceived as attractive at all. A result which may not be that surprising, as it is the least used channel of the four

included in this study. Privacy and risk temper attractiveness for purchase. However, the importance of information, convenience and negotiation demonstrates the benefits of the telephone as a complementary channel for either search or purchase tasks. That is, the telephone is an ideal channel in addition to other ones. Especially in addition to the Internet and the catalog, which are both characterized by non-personal contact.

This study provided a first exploration of antecedents of search and purchase attractiveness in a multi-channel context. Our study is however characterized by some limitations. First, although we had a large number of respondents, the number of respondents per cell is still low (that is, per product-channel combination). This could have had an effect on outcomes of our analysis. In addition, we used a panel of a Dutch marketing research company. Differences between inhabitants of the Netherlands and for example of the USA may occur. Furthermore, the selected set of seven products may still be to restrictive to capture the effects of the channel characteristics on search and purchase attractiveness. Finally, this study does not provide information on the choice of a channel for either search or purchase tasks. These issues remain for further research.

## 2.A Items for channel attractiveness included in our survey

*Items are translated from Dutch*

- Assortment
  1. A large assortment of <<product x>> can be found
  2. The newest types of <<product x>> are offered
  3. The popular brands and types of <<product x>> are offered
  4. Good quality <<product x>>'s are offered
  5. I can find the <<product x>> that best suits me
- Price
  6. Prices for <<product x>> are low
  7. You get good value for your money for <<product x>>
- Promotion
  8. You can frequently find offers for <<product x>>
  9. Attractive offers for <<product x>>can be found
- Information
  10. A lot of information on <<product x>> can be found
  11. The quality of information on <<product x>> is good
  12. I can quickly compare characteristics/options of <<product x>>
  13. It is easy to compare prices on <<product x>>
- Cliental
  14. Friends of mine search themselves for information on <<product x>>
  15. Friends of mine obtain <<product x>> themselves
- General service
  16. Excellent service for <<product x>> is offered

17. When there are problems with <<product x>>, I can get good assistance
18. You can get good personal advice on <<product x>>
19. When I want to obtain <<product x>> I can get excellent assistance

- Product specific service

20. <<Product x>> can be delivered from stock
21. I can easily return <<product x>>
22. It is easy to get <<product x>> repaired, when I obtain it from
23. Delivery of <<product x>> is easy to arrange
24. It is easy to let <<product x>> be installed at home, when I obtain it from
25. It is no problem to get a refund for <<product x>>, when I obtain it from
26. It is easy to order <<product x>>

- Convenience

27. I can gather information on <<product x>> whenever I want
28. I can obtain <<product x>> whenever I want
29. I can quickly obtain information on <<product x>>
30. I can quickly obtain <<product x>>

- Enjoyment

31. It is convenient to shop for <<product x>>
32. It is fun to shop for <<product x>>

- Risk

33. It is likely that I will not get the <<product x>> that I ordered
34. It is difficult to judge the quality of <<product x>>
35. It is likely that there will be problems with my payment for <<product x>>

- Privacy

36. It is likely that my privacy is guaranteed when I obtain <<product x>>

- Time

37. It takes a lot of time to search for information on <<product x>>
38. It takes a lot of time to obtain <<product x>>

- Costs

39. It takes a lot of effort to search for information on <<product x>>
40. It takes a lot of effort to obtain <<product x>>
41. It is complicated to search for information on <<product x>>
42. It is complicated to obtain <<product x>>

- Negotiation

43. I can negotiate on the price of <<product x>>
44. I can negotiate on extra options of <<product x>>

## 2.B Cronbach-alpha values; product specific

Table 2.11: Cronbach's $\alpha$ product specific

| | Mortgage Loans | Health Insurance | Computer | Electronic appliances | Holiday's | Books | Clothing |
|---|---|---|---|---|---|---|---|
| Assortment | 0.90 | 0.94 | 0.94 | 0.95 | 0.94 | 0.96 | 0.94 |
| Price | 0.78 | 0.68 | 0.87 | 0.83 | 0.72 | 0.88 | 0.79 |
| Promotion | 0.91 | 0.81 | 0.92 | 0.88 | 0.90 | 0.96 | 0.89 |
| Information | 0.89 | 0.90 | 0.92 | 0.81 | 0.89 | 0.93 | 0.89 |
| Clients | 0.67 | 0.74 | 0.73 | 0.77 | 0.83 | 0.89 | 0.86 |
| In-shop service | 0.94 | 0.89 | 0.88 | 0.93 | 0.90 | 0.83 | 0.90 |
| After-sale service | 0.84 | 0.86 | 0.86 | 0.88 | 0.68 | 0.86 | 0.83 |
| Convenience | 0.97 | 0.91 | 0.88 | 0.91 | 0.81 | 0.87 | 0.89 |
| Enjoyment | 0.58 | 0.66 | 0.85 | 0.89 | 0.89 | 0.90 | 0.83 |
| Risk | 0.76 | 0.69 | 0.73 | 0.79 | 0.72 | 0.75 | 0.88 |
| Costs | 0.83 | 0.80 | 0.83 | 0.80 | 0.77 | 0.81 | 0.69 |
| Negotiation | 0.90 | 0.84 | 0.88 | 0.88 | 0.70 | - | 0.90 |
| Time | 0.55 | 0.66 | 0.60 | 0.56 | 0.45 | 0.70 | 0.71 |
| | | | | | | | |
| Search attractiveness | 0.79 | 0.78 | 0.86 | 0.82 | 0.78 | 0.88 | 0.88 |
| Purchase attractiveness | 0.78 | 0.81 | 0.82 | 0.88 | 0.79 | 0.88 | 0.91 |

# Chapter 3

# Purchasing complex services on the Internet; An analysis of mortgage-loan acquisitions

## 3.1 Introduction

Today, the Internet seems to turn into a profitable and valuable business. During the first quarter of 2003, online US retail sales covered a total of $ 11.9 billion, an increase with 200 percent compared to the first quarter of 2000 (U.S. Census Bureau, 2003). Consumers favor the Internet for its 24 hour shopping ability, easy accessible information and tools to assist in the decision-making process, without having to leave their home. These advantages of the Internet are well exploited by firms, such as *amazon.com*, offering products like compact discs and books. Products that are now often purchased on the Internet.

In contrast, the number of more complex services offered on the Internet is still low and the number of retailers offering these services is even smaller. It seems that the Internet is not as well accepted for this kind of services and possibly also less suited (Peterson *et al.*, 1997). With complex services we mean services that consist of many items per attribute, that are often tailor-made, infrequently purchased, more difficult to comprehend, and that require in general assistance during the decision-making process.

A good example of a complex service on the Internet concerns the acquisition of a mortgage loan on the Internet. In the case of mortgage loans it is still customary to go to a local off-line intermediary to acquire such a service. Often, the Internet is only used to advertise the service, that is, to provide information on where the mortgage broker

is located and how she or he can be contacted. Compared to the Internet, the local intermediary provides a less anonymous environment combined with personal interaction. These features may be desirable, especially for a service like a mortgage loan, as personal information is shared and assistance of an expert is often needed. Furthermore, it is possible to negotiate on specifications of the service, including its price.

In contrast to a product like a book - that can be bought on the Internet with a single click on an icon 'buy now' - the exact specifications of a complex service are not known until the point of purchase. Consequently, also the process of acquiring a complex service on the Internet differs from buying a book. For a book, (1) consumers visit the online store and search for information, (2) subsequently they purchase the book. In addition to these two steps, a complex service requires an additional third step. Complex services have an extra intermediate step of 'indication of interest'. The web site is (1) visited and searched for information, subsequently (2) a request for the service is made, which (3) may lead to a purchase. This difference in the buying process and the complexity of the decision-making process when buying a complex service online, requires a further investigation on purchasing complex services on the Internet.

Only a few empirical studies have considered the visit to a web site and the subsequent purchase of a product or a service on that web site. Moe (2003) investigates consumer intentions of an online store visit. She uses navigational clickstream data to differentiate between online shoppers via demonstrated differences in search behavior. In addition, based on disaggregate clickstream data, Bucklin and Sismeiro (2003) develop a modeling approach to understand the duration of a page view, and the consumers' decision to continue or to stop browsing a web site. The findings of these two studies on online consumer behavior are of importance for web site design and customization of the web site. Finally, Moe and Fader (2003) developed and estimated a model explaining the purchase of simple products, such as books, on the Internet. No studies have, however, modeled the purchase of complex services on the Internet. In this study we therefore focus on online purchases of complex services, and we study the determinants of purchase of such a service.

To this end, we acquired a unique data set from an online Dutch financial service provider, which offers services like mortgage loans and insurances on the Internet on behalf of financial institutions. This data is unique in that sense that, besides clickstream data, we also obtained data on user-specific information like demographics. Although clickstream data provide large amounts of information, a limitation is that user-specific information is generally not available (Moe, 2003). Furthermore, we also obtained infor-

mation on whether the request for the service resulted in a purchase. We will focus on the case of online mortgage loans as an example of a complex service on the Internet.

Our contribution to the literature is two-fold. First, we study the purchases of complex services using the Internet. Second, we combine three data sources, namely, clickstream data, online user provided data and purchase data to analyze online purchases of complex services. Direct managerial applications of our model include the ability to identify customer characteristics of successful applicants. This is useful as not all online requests will be converted into a purchase, and accordingly will yield only costs and no profits. We show how our model can be used to select the more successful mortgage-loan applications 'at the gate'.

The structure of the paper is as follows. In Section 3.2 we discuss the relevant theoretical background for the decision to purchase complex services online, which shapes the discussion of our modeling. In Section 3.3 we describe the data we obtained for our analysis. We discuss model specifications and findings in Section 3.4. In Section 3.5 we illustrate how our findings can be used for customer selection. Finally, we conclude in Section 3.6.

## 3.2 Theoretical considerations

Due to characteristics of complex services, specific issues will have to be taken into account to explain such purchases using the Internet. Complex services are characterized by many items per attribute, are often tailor-made, purchased infrequently, difficult to comprehend, and often require assistance during the decision-making process. Clearly, these services differ from other online products like compact discs and books.

Based on previous studies we define four sets of determinants of online purchases of complex services. First, demonstrated search behavior may reveal the purpose of the online store visit, and subsequently the intention of purchase (Moe, 2003). Second, trust in the online retailer is an issue of concern for customers to adopt the Internet as a transaction channel and therefore of importance for purchase (Peterson *et al.*, 1997; McKinny *et al.*, 2002). Third, product knowledge may influence the probability of purchase (Alba and Hutchinson, 1987, among others). Fourth, socio-demographics may provide insights in online purchase behavior (see, for example, Ratchford *et al.*, 2003).

The diversity created due to differences in products/services offered on the Internet, makes it difficult to classify a buyer on the Internet based on socio-demographic information. Therefore, it is not possible to determine which variables should a-priori be

included into an analysis of purchases of complex services. In addition, these variables are mainly data driven, that is, dependent on availability in the data set. We elaborate on the socio-demographic variables in Section 3.3, where we discuss the measures of purchase determinants of mortgages loans using the Internet, as an example of complex services. We elaborate on each of other three sets of determinants below.

### 3.2.1 Search behavior

We distinguish two types of search behavior that may be of importance for online purchases of complex services. First, 'online search behavior' characterizes the behavior demonstrated during the visit of a web site, for example, the number of pages visited and the time spent on the web site. Second, 'competitive search behavior' characterizes comparison of services or retailers during search activities. Information on the latter type of search behavior originates from the extra information that can be obtained during the decision-making process of complex services.

#### Online search behavior

The availability of clickstream data enables researchers to study the behavior of a customer on a web site. Especially, specific search strategies can be revealed. Moe (2003) defines four search strategies that customers can demonstrate on the web site of an online store, which are, direct-buying, search/deliberation, hedonic browsing and knowledge building. These strategies are based on the two dimensions 'search' (goal-directed versus exploratory) and 'purchase horizon' (immediate versus future), as defined by Moe (2003). Direct-buying indicates a strategy that will result into an immediate purchase. Search/deliberation is aimed at forming a consideration set of available options. Both strategies have the intention of purchase but differ on the timing of that purchase. Hedonic browsing is a strategy that is mainly stimulus-driven, possibly resulting in impulse purchases. Knowledge building is a strategy with the objective to gain expertise. The latter two strategies are both exploratory, that is, they focus on information gathering but differ in intention of purchase.

Due to the specific characteristics of complex services two strategies will no longer exist. First of all, a direct-buying strategy is not plausible. The exact specifications of the service are not known until the point of purchase, eliminating the option of a direct purchase. Especially, the customer can negotiate on specifications of the service. Second, complex services are not the type of services one purchases by impulse, eliminating

the hedonic-browsing option. Only the two shopping strategies search/deliberation and knowledge building could be demonstrated on a web site of complex services.

Although there are differences in the number of strategies that can be investigated, we believe that the same characteristics for these search strategies hold as defined by Moe (2003). Differences in repeat service viewings and variety in category search and service search allow us to distinguish between these two search strategies. That is, consumers with an intention of purchase (search/deliberation strategy) will reveal very focussed and goal-directed search behavior. In contrast, consumers demonstrating a knowledge building strategy will reveal a very broad search pattern.

#### Competitive search behavior

For services like mortgage loans, consumers often use an extended decision process, in which several offers of competing firms are compared. The Internet, with its low search costs, is an ideal medium to compare offers from several companies (Bakos, 1997). In fact, tools on the Internet have specifically been developed to perform such activities (see also Chapter 4.

We call this type of search behavior competitive search behavior. This is especially of importance for services that have a large financial and long-term impact on consumers. As mentioned before, the decision-making process of a complex service contains an extra step, that is, the request for an offer of the service. During this request, information on offers from competitors can easily be obtained, for example, as part of the application form for the service.

Consumers that already have been in contact with a competitor might be less likely to purchase the service using the Internet. However, consideration of competitors may also indicate that the consumer is closer to making a purchase. We believe that the first effect is most likely to occur. Therefore, we expect that consumers that have been in contact with competitors will be less likely to purchase a mortgage loan.

### 3.2.2 Trust/Privacy

Before engaging in online transactions, consumers have to adopt the Internet as a new transaction channel. It appears that especially trust in the online store is of importance for adoption of the Internet for transactions. Trust is defined as "the extent to which a consumer believes that its exchange partner is honest and/or benevolent" (Geyskens *et al.*, 1998). Low trust will refrain consumers from adopting e-commerce (McKnight

*et al.*, 2002). More in detail, low trust initiates network privacy concerns, which in turn reduce the willingness to provide (personal) information over the Internet (Peterson *et al.*, 1997).

The issue of trust may be very important during the decision-making process of acquiring a complex service. In contrast to, for example, purchasing a book on the Internet, much is at stake when a consumer engages in the purchase of a complex service like a mortgage loan. Therefore, trust in the company offering the service is of importance, both off-line and online. Especially, the issue of privacy is of importance, as much personal information is exchanged during the decision-making process (Stewart and Segars, 2002). In case of an online shop, this information will be transmitted over the Internet, which may increase concerns about trust and privacy. As a result, people may refrain from providing information until a certain level of trust is obtained. That is, until the required level of trust is obtained, consumers will not engage in a purchase. Therefore, erroneous answers or missing data may signal concerns about trust.

### 3.2.3 Product knowledge

Product knowledge consists of two components, that are, familiarity and expertise (see, Alba and Hutchinson, 1987). Familiarity arises from experience related to the product and expertise indicates the capability to perform tasks related to the product successfully. Both components have been considered as an important variable in shaping consumer behavior both off-line and online.

Product expertise can be acquired via information search, and product familiarity can be acquired via the acquisition of a similar service in the past. We have defined complex services as services with many items per attribute, which will likely differ in complexity. Before the decision of purchase is made, a certain level of expertise on the service will be required. This level of expertise on service specifications can be used as an indicator for the progress in the decision-making process. The higher the level of knowledge acquired, the closer the customer will be to the point of purchase of the service.

In addition, the effect of purchases made in the past may be two-fold. First, there is the effect of experience with the service. And second, there is the effect of experience with the purchasing process. For complex services, the effect of experience with the service is difficult to define. Consumers will not acquire an identical service twice, as these services are often custom-made. However, due to the specific characteristics of the service, experience with the decision process of acquiring such a service may be of value

to the customer. This familiarity allows the customer to focus on service specifications and accordingly it may simplify the decision-making process.

## 3.3 Data

The data we acquired for our study are obtained from a Dutch online financial service provider. This company is an intermediary (broker) on the Internet for large financial institutions and offers on behalf of these institutions a wide range of financial services, including insurances, savings accounts and mortgage loans, among other products. The company operates only via the Internet and is the market leader in the Netherlands in facilitating the purchase of financial services on the Internet.

### 3.3.1 Online mortgage-loan applications

In March 2001 the company started with the service of offering mortgage loans on the Internet. The part of the web site concerning mortgage loans, facilitates information search and several utilities that aid in estimating costs and consequences of variants of attributes of mortgage loans. For example, one can calculate the maximum amount that can be borrowed and the corresponding monthly costs.

Before we provide details on the data we acquired, we first elaborate on the process of applying for a mortgage loan using the Internet at this company. This process is typical for online firms selling complex services. Examples of web sites where complex products or services are sold include *www.countrywide.com* and *www.amomortgage.com* for mortgage loans, *www.carsdirect.com* for cars and *www.insweb.com* for insurances.

#### Purchasing a mortgage loan using the Internet

In Figure 3.1 we graphically show the process of an online mortgage-loan application at the Dutch financial service provider. We already mentioned in the introduction the difference in the online decision process between complex services and products like books, that is, customers first provide an indication of interest before engaging in a purchase.

To acquire a complex service, like a mortgage loan, customers visit the web site and state their interest for a loan by filling out an application form. On the web site consumers make a choice between applying for an offer or applying for a meeting with an expert, which may be followed by an offer. Information required for both requests is usually

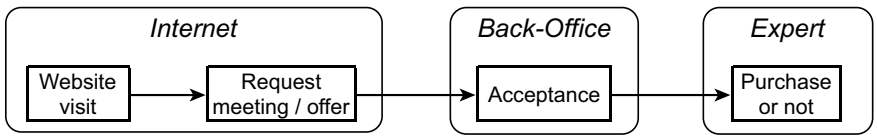


Figure 3.1: Process of an online mortgage-loan application

similar, although a request for an offer requires more information from the applicant on mortgage-loan specifications.

After submission of the application, the applicant is sent a confirmation email. The application is then forwarded to the back-office. The back-office decides, based on certain criteria, whether the application will be processed, and if so, it forwards the application to an expert for further processing. This expert will contact the applicant and will provide the applicant with an offer or will arrange a meeting, depending on the type of request. Subsequently, the expert and applicant try to settle an agreement on mortgage-loan specifications, which eventually may lead to a purchase.

This process of purchasing a mortgage loan using the Internet generates three sources of data. First, the behavior of the consumer on the web site is monitored (clickstream data). Second, information provided on the application form is stored. And third, information whether the application is processed, and whether it eventually led to a purchase is stored as well. We use the information that is available directly after acceptance of the application by the back-office, to analyze the occurrence and properties of eventual purchases. Note, all applications accepted by the back-office are processed and applicants are made an offer (directly or during a meeting with an expert). Hence, rejecting or accepting an offer is a decision made by the applicant, not by the mortgage provider.

### Mortgage-loan application data

The data we obtained consist of all mortgage-loan applications during the period April 2001 until December 2002. After some basic screening, 6487 mortgage-loan applications remained for analysis that were all accepted by the back office for further processing. Due to confidentiality we cannot provide the exact number of purchases. In addition, we have access to clickstream data of all mortgage-loan applicants in our sample. Of the 6487 applications we acquired, 6016 are requests for an offer and the remaining 471 are requests for a meeting with an expert.

### 3.3.2 Measurements of purchase determinants

In Table 3.1 we provide an overview of the determinants of purchases of complex services on the Internet and our measures of these determinants. Note that these measures arise from the customer database and serve as indicators of the theoretical constructs discussed in Section 3.2. We elaborate on each measure below.

#### Online search behavior

All customers are monitored during their visit of the web site. In the previous section we mentioned that two search strategies can be displayed at a web site of a complex service; a search/deliberation strategy and a knowledge building strategy. We use two measures as indicators of the search/delibration strategy. The first measure is a dummy variable indicating (1) whether the customer directly visited the mortgage-loan web site or (0) followed a web link[1]. Direct visitors may have a higher brand awareness. Consequently and perhaps as a result of an accompanying higher trust in the organization and the online acquisition process, direct visitors may have a larger purchase probability of mortgage loans (Bolton *et al.*, 2004; Davis *et al.*, 2000; Kelley, 2002)

Our second measure for online search behavior is the fraction of time spent on the mortgage-loan section, which is defined as the ratio between the time spent on the mortgage-loan section and the total time spent on the web site. This ratio will be 1 if the customer only focused on the mortgage-loan section. Customers displaying goal-directed search behavior will have a value of 1 or close to 1. If customers display goal directed behavior, they are probably more likely to finally purchase the service.

#### Competitive search behavior

The application form for a mortgage loan, that needs to be filled out, provides us with information on different topics, including competitors. To measure competitive search behavior we obtained information whether the applicant already had been in contact with a competitor and therefore already obtained an offer or had a meeting with an expert. If indeed this is the case, it is likely that the online service is used for a second opinion, which negatively influences the likelihood of a purchase.

[1] A direct visit to a web site is a visit for which the consumer directly typed the web site's address (URL) into the address bar of the web browser.

Table 3.1: Explanatory variables for purchases of mortgage loans using the Internet

| Measurement of purchase determinants | Variable | Expected effect |
|---|---|---|
| *Online search behavior* | | |
| Directly to web site (1) or not (0) | DIRECT | + |
| Fraction of time spent on mortgage-loan section | TIME | + |
| *Competitive search behavior* | | |
| Applicant had been in contact with competitor (1) or not (0) | COMP | − |
| *Trust/privacy* | | |
| Income is not correctly provided (1) or correctly (0) | DINC | − |
| *Product knowledge* | | |
| Application is *not* for first mortgage loan (1) or it is (0) | PURPOSE | + |
| The number of submortgages | NUMSUB | + |
| Request for a meeting with an expert (1) or an offer (0) | REQUEST | + |

**Trust/privacy**

Applicants may refrain from providing personal information or they may even provide erroneous information, due to the issue of privacy. This last notion provides an opportunity to construct an indirect measure of trust. In general, consumers in the Netherlands are very reluctant to provide information on their income level. We check if the applicants reported a reasonable income level, that is, above the € 20,000 and below € 150.000. We use a dummy variable to indicate that information on income did not satisfy this criteria (1) or it did (0). Concerns about privacy, demonstrated by erroneous data and measured by this dummy variable will negatively influence purchase of a mortgage loan.

### Product knowledge

The request for a mortgage loan may be for financing the purchase of a house for the first time, for the second time or to change specifications of the existing mortgage loan, among other reasons. These purposes of an mortgage loan-application provide us with information on service familiarity, that is, previous purchases of mortgage loans. In case the application is for a mortgage loan acquired for the first time, our product familiarity dummy will indicate this with the value of 0, that is, there is no experience based on previous purchases. In all other cases a mortgage loan has previously been acquired. For this variable we expect a positive relation with purchase.

A customer may demonstrate his or her expertise on a product by choosing more advanced mortgage-loan specifications. For example, one may decide to split up a loan into certain 'submortgages', differing on, for example, how and when each sub-mortgage will be paid off. This is a feature that requires good understanding of the principles of mortgage loans. Therefore, the variable indicating the number of submortgages, as an indicator of expertise, will positively influence the likelihood of purchase.

In addition, expertise may also be demonstrated via the type of request made. Customers have two possibilities when applying for a mortgage loan. Customer may request an offer or a meeting with an expert. A request of an offer is probably used only for comparison purposes or to orientate on the service. However, it may also indicate that the company is being considered for purchase. A meeting with an expert can be considered as that the company upgraded to the choice set (Roberts and Lattin, 1997). That is, the set from which the eventual provider of the service is chosen. Consequently, consumers requesting a meeting with an expert will probably more likely purchase a mortgage loan.

### Socio-demographics

In addition to the measures mentioned above, we include socio-demographic variables. It is difficult to define the characteristics of an typical Internet buyer, but see Ratchford *et al.* (2003) and Degeratu *et al.* (2000) for some relevant insights. We consider both age and income - next to the dummy income used as an indicator of trust - of the applicant.

The purchase decision on a mortgage loan, is a decision where much is at stake. Research on consumer decision-making has shown that a spouse can have a significant impact on the decision-making process (Davis and Regeaux, 1974; Su *et al.*, 2003). We therefore include a dummy variable that indicates if the applicant has a spouse (1) or not (0).

## 3.4 Empirical results

The aim of the previous two sections was to introduce four sets of determinants of purchase and specify the components of these determinants in context of the data we acquired. We incorporate the measurements as defined in the previous section into a model to explain purchase. As purchase is a binary variable (yes=1), we use the familiar logit model (see Franses and Paap, 2001, among others).

As noted, the back-office decides on certain criteria whether the application will be processed. In our model we only include those customers that were actually processed. This could cause a selection bias (see Heckman, 1976), which should be corrected for. However, the selection process in the period we consider was minimal. The only type of applications that were rejected consisted of clearly non-sensible ones. These applications will never be treated and are therefore not in the population of interest and also not in our database.

In our model estimation, we also ignore customers who visited the Web site but did not request an offer or a meeting with an expert. This is in accordance with the fact that the company can only decide whether to process an application for site visitors who applied. Hence, visitors who did not fill out the application form will never be selected for processing, and we do not need to consider them in our model aimed at customer selection.

Estimation results of our model are shown in Table 3.2. The two measures 'fraction of time on mortgage-loan section' [TIME], and 'direct to mortgage-loan web site' [DIRECT] were introduced to give an indication of the search/deliberation strategy, and subsequently purchase. Both measures have indeed the expected positive effect, see Table 3.2, which is in line with the findings of Moe (2003). This indicates that online search behavior can also provide valuable insights into purchase behavior of complex services using the Internet.

In addition to these findings we now will discuss findings more specific for complex services, especially mortgage-loan applications. In the set of search behavior we defined competitive search behavior, next to online search behavior. Indeed, but at a 10 per cent significance level, the measure for competitive search behavior [COMP] negatively influences purchase. This gives an indication that it is relevant to consider information on activities of competitors as a determinant of purchase.

We used information on the reported level of income, to investigate if privacy considerations negatively influence purchase [DINC]. Indeed, as can be seen in Table 3.2 the expected effect is present, but only at a 10 per cent significance level. Applicants providing erroneous information on income are less likely to purchase.

Table 3.2: Summary estimation results of the logit model

| Variable | Expected | Estimate[1] | St. error |
|---|---|---|---|
| *Online search behavior* | | | |
| DIRECT | + | 0.358*** | 0.107 |
| TIME | + | 1.321** | 0.554 |
| *Competitive search behavior* | | | |
| COMP | − | -0.106* | 0.063 |
| *Trust/privacy* | | | |
| DINC | − | -0.608* | 0.369 |
| *Product knowledge* | | | |
| PURPOSE | + | 0.306** | 0.121 |
| NUMSUB | + | 0.537*** | 0.096 |
| REQUEST | + | 1.309*** | 0.143 |
| *Socio-demographics* | | | |
| SPOUSE | | -0.258** | 0.127 |
| INCOME | | -0.002 | 0.002 |
| AGE | | 0.031*** | 0.006 |
| McFadden $R^2$ | 0.050 | | |

[1] level of significance: * = 10%, ** = 5%, *** = 1%

We determined product familiarity using the purpose of the application [PURPOSE]. From Table 3.2 we can conclude that, in line with findings in the literature on other types of products, service familiarity obtained via previous purchases positively influences the purchase of complex services using the Internet.

In addition, we also distinguished service expertise obtained via information search. The first measure we used is the variable that indicates the number of submortgages [NUMSUB]. In line with our expectations we find that applicants requesting a mortgage loan divided in multiple parts have a higher incentive to purchase a mortgage loan using the service on the Internet.

The second measure used as indicator of product expertise, is the 'type of request' [REQUEST]. Clearly, this measure has a positive effect on purchase, indicating that customers applying for a meeting with an expert have a higher incentive of purchase. Consequently, customers applying for an offer are less likely to purchase. As most applications involve request for an offer this result may indicate that the online service is mainly used for comparison reasons.

We included the demographic variables age, income, and spouse into our model as well. The reported level of income has an insignificant effect. As discussed above, the issue of correctly providing this information is of greater importance. The finding on age is that older applicants are more likely to be involved in the purchase of a mortgage loan. The finding on spouse is that having a spouse negatively influences purchase probabilities. There is much at stake when acquiring a mortgage loan and the spouse might demand to be involved in the decision-making process and accordingly influence the decision-making. Furthermore having a spouse involves two persons that have to obtain enough trust in the Internet as a transaction channel. Therefore, the Internet may be rejected for acquiring mortgage loans.

## 3.5 Managerial application of the model

One important application of our study and model is customer selection. Using some form of selection, the company can handle those customers that have the highest purchase probability. This may lead to a substantial decrease in costs and a higher level of efficiency. To this end, the outcome of the logit model can be interpreted as the probability of purchase, conditional on explanatory variables. These outcomes can directly be used for the selection of applicants, for example, by declining all applications below a certain threshold level (Bult and Wansbeek, 1995). To illustrate the effect of such a selection rule, we apply it to the sample of applications available to us. Furthermore, we also demonstrate the effect of another popular selection rule, that is, selecting based on expected revenue.

In Figure 3.2 we demonstrate the effect of the probabilistic selection rule on profit and the number of selected successful cases. On the x-axis we give the fraction of cases selected. The left y-axis shows the fraction of successes that are in the sample given the fraction of selected cases. Furthermore, we define profit as one per cent of the mortgage loan amount minus € 150 fixed costs. Although these hypothetical values are a simplification of the revenue and cost structure, it is sufficient to demonstrate the effect of the selection rule. The right y-axis shows the profit obtained given the percentage of selected cases and the

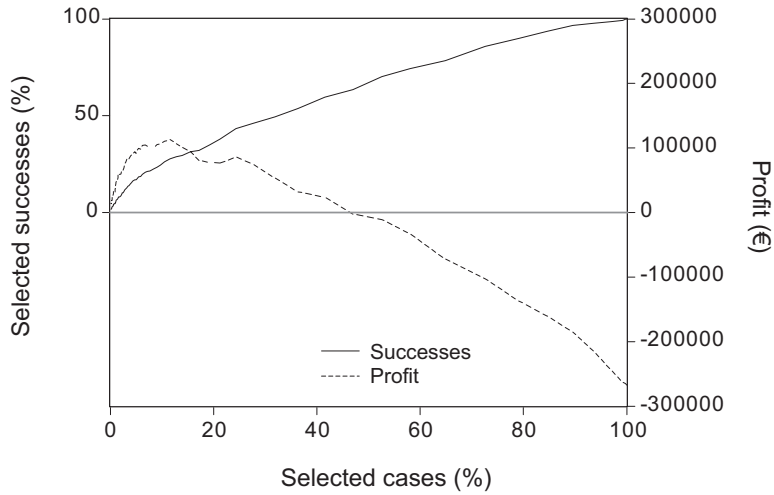


Figure 3.2: Probability based selection of mortgage-loan applications

corresponding percentage of selected successes. For example, one may set the threshold on the probability of success such that 20 per cent of the applications will be processed. Correspondingly, we see that the selection rule is able to select 35 per cent of all the successes in our sample. Furthermore, this 35 per cent of successes, as part of the 20 per cent processed cases, yields a (hypothetical) profit of € 77,615.

From Figure 3.2 it is directly clear that it is not optimal to process all applications. This will result in a loss of € -267,368. Two points are of main interest to us. First, at about 12 per cent of the selected cases, a maximum profit of € 113,190 is obtained. This profit is obtained with 28 per cent of the successful applications. Second, the break-even point, of importance to start-up companies, is obtained at a point of 45 per cent selected cases with a corresponding 61 per cent of the successes selected.

Figure 3.3 shows the effect of an expected revenue-based selection rule. That is, we define for each application the expected profit based on probability of purchase and profit as defined above. Applications will be selected at the level of expected revenue. Figure 3.3 is similar to Figure 3.2, however closer examination shows some differences. The expected revenue based selection rule yields a maximum profit of € 134,900, with 9 per cent selected cases and 19 per cent selected successes. Furthermore, the break-even point is obtained with 58 per cent of selected cases and 63 per cent selected successes.

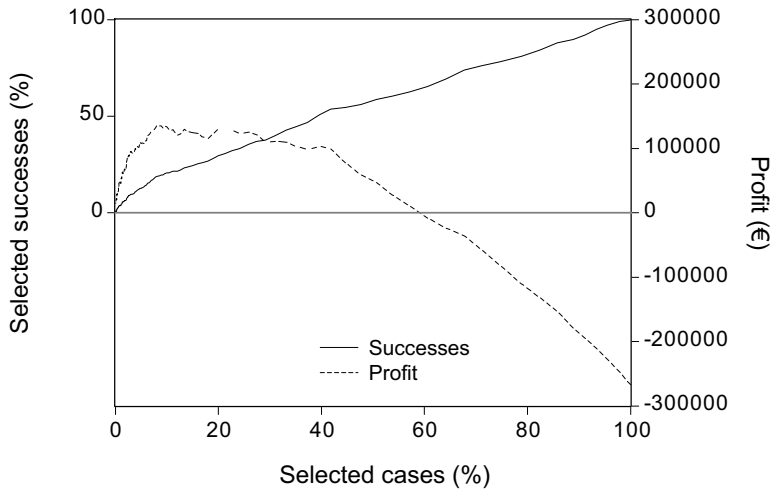


Figure 3.3: Expected revenue based selection of mortgage-loan applications

We summarize the results of the two selection rules in Table 3.3. As expected, the probability rule selects more successful applications, whereas the expected revenue rule selects more profitable cases. As a result, a selection rule needs to be chosen that best fits managerial objectives.

## 3.6 Conclusion

We investigated the purchase of online complex services using the Internet. These services clearly differ from common online products like compact discs and books. Especially, the expected level of effort required from both consumer and retailer, in an environment trying to minimize this effort, makes this topic an interesting research topic. We focused on the acquisition of mortgage loans using the Internet.

We specified four determinants of purchase, namely, search behavior, trust, product knowledge and socio-demographics. In addition we decomposed search behavior into two parts, that are, online search behavior and competitive search behavior. We acquired data from a Dutch online service provider offering mortgage loans. The data indicated that our sets of determinants provide a useful framework to investigate purchases of complex

Table 3.3: Summary of effects of the probability based and the expected revenue based selection rule

| | *Current practice* | | |
|---|---|---|---|
| | Processed | Successes selected[1] | Profit |
| All cases | 100% | 100% | € -267368 |
| | *Profit maximization* | | |
| | Processed | Successes selected | Profit |
| Probability based selection | 12% | 28% | € 113190 |
| Expected revenue based selection | 9% | 19% | € 134900 |
| | *Break-even* | | |
| | Processed | Successes selected | Profit |
| Probability based selection | 45% | 61% | € 0 |
| Expected revenue based selection | 58% | 63% | € 0 |

[1] The fraction of applications that lead to a purchase, and that are selected given the fraction of applications selected to be processed.

services using the Internet. Especially, information on product search, competitive search and product knowledge provided useful information.

An interesting phenomenon is our finding on privacy. We used indicators of erroneous data as a measure for potential worries about privacy, which is derived from trust. Indeed our dummy variable, as an indicator of privacy concerns, has a significant effect, however only at a 10 per cent significance level. Further research should indicate if indeed missing or erroneous data are indeed useful for measuring trust.

Finally, we discussed managerial implications of our findings. Based on the outcomes of the model, one can construct selection rules. We demonstrated the effect of selection using two popular selection rules, that are, selection based on probability of success and selection based on expected revenue.

A limitation of our study is that the information in the database was limited to fully incorporate the theoretical framework into an econometric model. Research with an extended number of variables for each determinant should yield additional insights into complex products offered on the Internet. An additional limitation is that we have no

information on previous web site visits of applicants. According to the study of Moe and Fader (2003), these previous visits may be very informative to explain purchases. In our setting however, the number of such visits may be limited. We also have no information on the phase between submission of the mortgage and eventual purchase. To gain a better understanding of purchase this information may be very valuable.

An issue for further research includes a study on the benefits of offering mortgage loans online. A direct comparison with off-line intermediaries should indicate if the Internet can indeed reduce effort and costs for both consumer and intermediary. More specific, studies should indicate if the decision-making process for acquiring mortgage loans is more efficient when the Internet is used.

# Chapter 4

# See no quality, know no quality: the effect of recommendation quality on consumer decision-making

## 4.1 Introduction

We need assistance on the Internet and recommendation agents can provide it (Alba *et al.*, 1997; West *et al.*, 1999). The Internet offers an enormous amount of information and products. Recommendation agents are a special form of decision aid tools that can control this flow of information. Such agents customize the information flow or even recommend retailers or products based on consumers' preferences (Alba *et al.*, 1997; West *et al.*, 1999; Häubl and Trifts, 2000). Examples of recommendation agents are *www.activebuyersguide.com* and *Smart Sort* at *shopping.yahoo.com*. In addition, the 'other customers who have bought this product also bought ...'-feature at *www.amazon.com* is also a well known recommendation agent.

The support of decision aid tools (recommendation agents) can affect the way consumers make a decision (Todd and Benbasat, 1994; Chu and Spires, 2000; Häubl and Trifts, 2000; Diehl, 2005, among others). In particular, the provided assistance may cause a switch in decision strategy as effort and accuracy levels of various strategies may change (Payne *et al.*, 1993). For example, the strategy of choosing the alternative on top of an unordered list is similar to random choice in terms of effort and accuracy, as the ranking provides no information on the product. Little effort is required, but the accuracy of the decision is expected to be low as well. This strategy is far more appealing when a ranking

of alternatives is presented based on consumers' preferences. Effort levels are the same, however the expected accuracy is much higher as a result of the presented ranking.

Our understanding of effects on consumer decision-making of recommendation agents increases, however many issues remain unsolved. For example, we know that recommendation agents are likely to reduce the effort consumers invest to make a decision (Häubl and Trifts, 2000; Pedersen, 2000). Moreover, they may lead to a decrease in prices paid as a result of an increase in price sensitivity (Diehl *et al.*, 2003). In contrast, the effect on decision accuracy is rather unclear. Findings of Häubl and Trifts (2000) indicate that accuracy may improve when a ranking is provided. However, Aksoy *et al.* (2006) indicate that this effect can depend on the similarity of recommendation agent and consumer on attribute importance and decision strategy. In addition, Diehl (2005) demonstrates that a reduction of search costs in an ordered environment can lead to a decrease in accuracy.

Another issue that is still rather unclear is the effect of differences in recommendation quality on consumer decision-making. Recommendation quality indicates in what manner the provided recommendation matches with the preferences of a consumer. This is of importance as the quality of the recommendation agent is an important aspect of the service provided by a web site (Rust and Lemon, 2001; Ansari and Mela, 2003). Moreover, the recommendation quality can affect the satisfaction with this e-service, which is an important determinant of costumer retention (Rust and Zahorik, 1993; Anderson and Srinivasan, 2003; Shankar *et al.*, 2003; Evanschitzky *et al.*, 2004).

Little is known on the effects of recommendation quality on consumer decision-making and this paper fills in at least a part of this gap. Recommendation quality has received to our knowledge little attention in the literature. In addition, it is mainly considered in combination with ordered lists. For example, Aksoy *et al.* (2006) included recommendation quality of an ordered list indirectly, which they translated as the similarity between recommendation agent and consumer. Diehl and Zauberman (2005) included quality as a driver of overall evaluations of ordered lists.

We study the effect of recommendation quality on consumer decision-making for two types of recommendation agents, (1) ranking alternatives and (2) selecting alternatives. Furthermore, we demonstrate that this effect is dependent on the type of recommendation. The quality of both agents will be manipulated and the effect on effort, accuracy and satisfaction investigated.

The outline of this chapter is as follows. Section 4.2 discusses the setting of our study on the effect of differences in recommendation quality. Section 4.3 presents the hypotheses that we postulate in this study. This is followed by a discussion on experimental design

and data collection in Section 4.4. Analysis and results are presented in Section 4.5. We conclude with a discussion in Section 4.6.

## 4.2 Setting

**Recommendation agent**

Several types of recommendations can be distinguished dependent on (i) the type of information provided, (ii) the way of communication and (iii) requirements on input from the consumer. For example, a book review in a newspaper can be considered as a recommendation for a broad audience. In addition, this recommendation is communicated via a non-electronic channel and requires no input from a consumer. This is clearly different from a recommendation agent on the Internet that recommends stores with the lowest prices, based on consumers' preferences. This recommendation is customized to the input of the consumer.

What kind of recommendations do we consider? First of all, we only consider recommendations made on the Internet by electronic systems. With the rise of the Internet, personalized support to consumers is increasingly offered via electronic recommendation agents. (Alba *et al.*, 1997; West *et al.*, 1999; Häubl and Trifts, 2000).

Secondly, we consider only those recommendation agents that recommend a product and not a store. Given the online context of the study, recommendation agents can be classified into two categories. First of all agents can recommend a retailer to buy the product from, for example, they recommend the cheapest (online) stores. The second category of agents recommends which product to buy, based on certain criteria. For example, given the preferences on certain 'music attributes' of a consumer, recently released CDs can be recommended.

In addition, we consider only recommendation agents that operate within a web site. Whether an agent operates within or across a web site yields another type of classification of online recommendation agents. For example, the above mentioned agent that recommends the cheapest stores operates across web sites. The other type of agents, that recommend a product, are mainly found within a web site.

Finally, we only consider recommendations that require information from the user. That is, the consumer first provides information on his or her preferences and subsequently a recommendation is made by the agent. This type of recommendation is also known as content filtering next to using purely preferences of similar consumers, (collaborative filtering, Ansari *et al.*, 2000).

As the agents we consider in this study provide recommendations based on stated preferences, we therefore consider a measure of quality that takes this translation of consumers' preferences into account. That is, quality indicates the ability of the agent to match these preferences. More formally, economic theory provides us with the concept of utility levels. Each product yields a certain utility level and the better the agent can predict these latent utility levels, the higher the quality of the recommendations will be. And, the closer the recommendation is to a random recommendation the lower the quality will be.

We also consider the selection of alternatives in addition to ranking alternatives, to study effects on consumer decision-making of recommendations. Selecting information is the next step in providing recommendations. A selection can effectively reduce effort required to make a decision. Ranking of alternatives is however the most common agent on the Internet today and in the literature (Häubl and Trifts, 2000; Diehl *et al.*, 2003; Ansari and Mela, 2003; Diehl, 2005, among others).

**Effect on consumer decision-making**

Our conceptual framework is depicted in Figure 4.1. Of interest to us is how the quality of a ranking or a selecting agent may affect consumer decision-making.

An explanation for an effect on consumer behavior can be obtained from the effort-accuracy framework (Payne *et al.*, 1993). The reduction in the 'cost of thinking' induced by recommendation agents can alter anticipations of effort and accuracy of decision strategies. Consequently, this may induce a switch of decision strategy (see for example Payne *et al.*, 1993; Todd and Benbasat, 1994). That is, the recommendation agent alters the decision environment and consumers adapt accordingly (Payne, 1982; Payne *et al.*, 1993; Häubl and Trifts, 2000; Pedersen, 2000; Bechwati and Xia, 2003). We refer to Section 5.2 for a more elaborate discussion on the effort-accuracy framework and decision strategy characteristics.

A ranking of alternatives influences the effort and accuracy levels of several decision strategies. For example, a strategy like the majority of confirming dimension (MCD) may become more appropriate as a result of a possible reference-point effect towards the alternatives on top of the list (Payne *et al.*, 1993). However, the most prevailing strategy is satisficing, based on changes in effort and accuracy levels associated with decision strategies. That is, to start on top of the list and select the first alternative that satisfies certain criteria. In case the agent can perfectly match the preferences of a consumer and


Figure 4.1: Conceptual framework

consequently yield a perfect ranking, the most adequate alternative is the first item on the list. This yields therefore a maximal accuracy level with a minimal effort level.

A selection of alternatives yields a reduction in the number of alternatives, that is, it reduce task complexity. Subsequently, consumers may switch their decision strategy. Findings of Payne (1976), for example, indicate that consumers switch from heuristics to more normative strategies. In addition, lesser decisions with multiple strategies may occur when a selection is presented (Payne *et al.*, 1993). The agent replaces, for example, the quick first selection that is normally conducted by the consumer, which is followed by a decision from the reduced list of alternatives.

The effect of recommending alternatives on consumer behavior is likely to differ between the ranking agent and the selection agent. Ranking alternatives can only effect a consumer via the provided recommendation. In contrast, a selection can firstly affect decision behavior by the elimination of alternatives. Secondly, it can cause an additional effect as this selection is based on consumer preferences. In addition, both types of recommendation agents may direct consumers to different decision processes.

The effect of recommendation quality on consumer decision-making is likely to be different for the ranking agent and the selection agent. The ability to asses the quality of a recommendation differs between both agents and only when the quality of the recommendation is assessed it may affect consumer decision-making. For example, a consumer searching for a digital camera can assess the quality of the ranking of, lets say, 10 digital cameras. This will require some extra effort to compare all cameras. However, when only 5 out of the 10 cameras are presented he or she cannot assess the quality of this selection. The consumer does not have information on the missing 5 cameras.

More formally, The quality of a ranking can easily be observed as all alternatives remain presented. Consumers can therefore adapt to a certain quality level of the ranking. For example, they may extend their search on the full set of alternatives. However, a consumer can in general not asses the quality of a selection. The full set of alternatives is not shown and therefore the consumer will have no reference to it. Only a consumer well informed on the product may notice the quality level of the selection. Therefore, adaptation to the quality of a selection will differ from that of the ranking agent.

Eventual outcomes of changes in recommendation quality may yield differences in satisfaction with the service provided (Bechwati and Xia, 2003). In line with McKnight *et al.* (2002) we distinguish and investigate the effect on several attribute satisfaction levels next to an overall satisfaction level. The attribute satisfaction levels are important determinants of the overall satisfaction level.

## 4.3 Hypotheses

We consider two sets of hypotheses for both types of recommendation, that is, for recommending a ranking and a selection of alternatives. First, we postulate hypotheses on the effect of a recommendation based on stated preferences compared to a non-aided task. The latter involves a choice from an unordered list of the full set of alternatives.

The second set of hypotheses concerns the differences in recommendation quality. The recommendations made for the first set of hypotheses are considered to be our high-quality recommendations. These recommendations serve therefore as a benchmark for our low-quality recommendations. Consequently, the second set of hypotheses resembles the difference in effect of a high-quality recommendation and of a low-quality recommendation, compared to a non-aided case.

Concerning our hypotheses we explicitly assume that the consumers in general do not have information on all available alternatives. Recall, the use of these agents originates from the fact that the Internet contains too much information.

#### Effort

In this study we focus on the cognitive and mental aspects of effort. Effort indicates the cognitive resources that are required to perform mental operations in order to apply a certain decision strategy. For example, information needs to be read, stored in memory and compared to other information (see also Payne *et al.*, 1993).

Both recommendation agents - ranking and selecting - reduce effort requirements of several strategies (see Section 4.2). The effort and accuracy levels may even change in such a manner that the reduction in effort is combined with an increase in accuracy. As consumers in general strive to reduce effort (Shugan, 1980), they can shift effort requirements to the recommendation agent (Bechwati and Xia, 2003). Consequently, consumers' effort reduces (Häubl and Trifts, 2000; Pedersen, 2000).

**Hypothesis H1a** Recommending a ranking of alternatives reduces consumers' effort levels, compared to a non-aided decision.

**Hypothesis H1b** Recommending a selection of alternatives reduces consumers' effort levels, compared to a non-aided decision.

A low-quality ranking eliminates, in a worst case scenario, all effort reductions of the agent. In this scenario the decision environment is equal to the non-aided case. Effort levels are therefore likely to be higher compared to the high-quality ranking.

**Hypothesis H1c** A recommended low-quality ranking increases the level of effort, compared to a recommended high-quality ranking.

A low-quality selection is difficult to asses in contrast with a low-quality ranking. The consumer has in general no reference to the full set of alternatives. Moreover, the consumer can not search the additional alternatives as these are not presented. It is therefore not likely that consumers adapt to a low-quality selection with an increase in effort.

**Hypothesis H1d** A recommended low-quality selection does not affect the level of effort, compared to a recommended high-quality selection.

### Accuracy

In general, accuracy related to a decision can be defined in several ways including utility levels, consideration set formation and consumers' perceptions. We distinguish two accuracy levels, a revealed and an experienced (perceived) level.

We define revealed accuracy ($RA$) in terms of the utility value ($UV$) of the choice made compared to the utility value of the optimal choice (Payne *et al.*, 1993). More formal,

$$RA = \frac{UV_{choice} - UV_{random}}{UV_{optimal} - UV_{random}}. \tag{4.1}$$

The utility value of a random choice is defined as the average value of all alternatives. An improvement in revealed accuracy indicates that the distance between the utility level of the alternative chosen and of the best possible alternative becomes smaller.

Caution is required with the use of experienced accuracy levels. Consumers can be limited in their perception of accuracy outcomes of their decisions. Furthermore, own performance can be overestimated by consumers as well (Fennema and Kleinmuntz, 1995).

This distinction into two accuracy levels is in contrast with effort. Experienced accuracy derived from a selection of alternatives is a realization of a consumer's revealed accuracy and the agent's revealed accuracy. Effects on experienced accuracy may therefore differ from effects on revealed accuracy. Experienced effort levels are however a realization of revealed consumer effort and therefore similar effects are expected.

The effect of a recommendation agent on revealed accuracy is however rather unclear and can differ between types of recommendation agents. For example, a literature review of Benbasat and Nault (1990) on several types of decision aid tools indicates that there is no strong empirical support for a change in accuracy levels. Moreover, studies indicate that consumers focus more on effort reduction than on accuracy improvement (Kleinmuntz and Schkade, 1993; Payne *et al.*, 1993, among others).

Still, according to findings of Häubl and Trifts (2000) a ranking may improve revealed accuracy levels compared to a non-aided case. However, the study of Aksoy *et al.* (2006) indicates that this effect can depend on the similarity between the recommendation agent and the consumer. Revealed accuracy levels may decrease when a dissimilarity occurs on attribute importance and decision strategy. In addition, Diehl (2005) demonstrated that lowering search costs in an ordered environment can decrease revealed accuracy.

These findings complicate the postulation of hypotheses on the effect of ranking alternatives on revealed accuracy levels. In addition, we therefore cannot hypothesize on an effect of a low-quality ranking. We leave these two questions open and let the data speak.

Concerning the revealed accuracy levels related to a recommended selection the effect on the consumer is unclear as well. However, the selection based on consumer preferences will have a higher average utility level compared to the full set of alternatives. With the assumption that consumers do not always make optimal choices in the non-aided case, the concept of selection can therefore increase the revealed accuracy level. That is, this increase in revealed accuracy involves the revealed accuracy level of the recommendation agent. Revealed accuracy of the consumer may be affected as well, but, as indicated, this is rather unclear and also difficult to distinguish from the effect of the agent.

**Hypothesis H2a** Recommending a selection of alternatives increases revealed accuracy levels, compared to a non-aided decision.

However, as this increase in revealed accuracy is derived from the recommendation agent, it is therefore highly dependent on the quality of this agent. A reduction in quality will automatically lead to a less-adequate selection and therefore to a reduction in average utility levels. Consequently, revealed accuracy levels will decline as well.

**Hypothesis H2b** A recommended low-quality selection decreases revealed accuracy levels, compared to a recommended high-quality selection.

We already indicated that consumers tend to focus on an effort reduction instead of an accuracy improvement. With this focus on effort in mind it is not likely that a consumer will experience a higher accuracy, which is supported by findings of Aksoy *et al.* (2006). Eventual increases in revealed accuracy may be considered as positive side effects of ranking alternatives and are likely not to be noticed.

**Hypothesis H3a** Recommending a ranking of alternatives does not affect experienced accuracy levels, compared to a non-aided decision.

A selection yields a clear reduction in the number of alternatives. Findings of Fennema and Kleinmuntz (1995) indicate that consumers anticipate on and experience to make more accurate decisions when a smaller set of alternatives is presented.

**Hypothesis H3b** Recommending a selection of alternatives increases experienced accuracy levels, compared to a non-aided decision.

In line with the effect of a high-quality ranking, accuracy perceptions will not likely be affected by a low-quality ranking. Due to the focus on effort reduction, the benefits of a low-quality or a high-quality agent in terms of accuracy will most likely not be noticed.

**Hypothesis H3c** A recommended low-quality ranking does not affect the experienced accuracy levels, compared to a recommended high-quality ranking.

Consumers in general can not asses the quality of a selection, as indicated above. Despite a low-quality selection, accuracy experiences are expected to remain the same as for the high-quality selection.

**Hypothesis H3d** A recommended low-quality selection does not affect experienced accuracy levels, compared to a recommended high-quality selection.

**Attribute satisfaction**

The level of effort of a decision is negatively related to satisfaction (Bechwati and Xia, 2003). We hypothesized that both recommendation agents - ranking and selection - reduce the effort required to make a decision. Consequently, satisfaction levels with both types of recommendation agents should increase.

**Hypothesis H4a** Recommending a ranking of alternatives increases system satisfaction, compared to a non-aided decision.

**Hypothesis H4b** Recommending a selection of alternatives increases system satisfaction, compared to a non-aided decision.

However, this effect may be counteracted when a low-quality ranking is presented. As indicated in Section 4.2, consumers can asses the quality of a recommended ranking in contrast with a recommended selection. Findings of Gotlieb *et al.* (1994) indicate that the perception of product quality and satisfaction are positively related. The quality of the ranking is observable and the ordered list of the low-quality recommendation agent will most likely not be in line with expectations.

**Hypothesis H4c** A recommended low-quality ranking of alternatives reduces system satisfaction, compared to a recommended high-quality ranking.

When the consumer is aware of the full set of alternatives a low-quality selection may be noticed. However, we have assumed that this is not likely. The consumer therefore can not assess the quality of the recommendation and therefore the low-quality selection will not be noticed.

**Hypothesis H4d** A recommended low-quality selection of alternatives does not affect system satisfaction, compared to a recommended high-quality selection.

We consider the case where a product is chosen but not yet acquired. Consumers have therefore no experience in using the product and product satisfaction will resemble expected product satisfaction.

It is rather unclear if and how this type of product satisfaction may change. It is likely that product expectations are formed or altered during the decision-making process (Bettman *et al.*, 1998). Therefore the recommendation agent may be of importance when it can affect this process. Still, we see this part of the study as explorative and refrain from postulating hypotheses on product satisfaction.

Decision satisfaction is the perception of a consumer's own decision performance. This performance level is dependent on the processing capabilities of the consumer. It is not expected that a recommendation agent affects intrinsic consumer processing capabilities. For example, being able to make a quicker decision is a realization of a feature of the recommendation agent and not of better processing abilities of the consumer. However, the perception of this quicker decision may alter. The effect on decision satisfaction is therefor a-priori rather unclear and we see this part of the study as explorative, similar to product satisfaction. We therefore, refrain from postulating hypotheses on decision satisfaction.

#### Overall satisfaction

Findings of Oliver (1993) indicate that overall satisfaction is distinct from attribute satisfaction. However, the three attribute satisfaction levels - system, product and decision - are important determinants of overall satisfaction. These attribute satisfaction levels affect overall satisfaction directly (Oliver, 1993; Spreng *et al.*, 1996). In addition, Spreng *et al.* (1996) demonstrate that there exists a positive relationship between attribute satisfaction and overall satisfaction (Spreng *et al.*, 1996).

Experiences and therefore satisfaction levels may differ between attributes of the decision process (Oliver, 1993). Moreover, the importance of these attribute levels may differ and consequently the effect on overall satisfaction as well. We leave these differences in effect sizes as an open question. However, considering the direction of these effects we re-examine earlier findings, which indicate that all three attribute levels positively affect overall satisfaction.

**Hypothesis 5a/b/c** System (a), product (b) and decision (c) satisfaction positively affect overall satisfaction.

## 4.4 Data collection

#### Experiment

To test our hypotheses we conduct a controlled experiment. Participants take part in a pre-defined choice task, which mimics the purchase of a product on the Internet. The web site incorporates the two considered recommendation agents, that is, ranking and selecting alternatives based on consumer preferences.

Table 4.1: Characteristics of cases

| Case | Alternatives | Attributes | Presentation |
|---|---|---|---|
| Non-aided | 12 | 6 | random |
| Ranking | 12 | 6 | declining order |
| Low-quality ranking [a] | 12 | 6 | declining order |
| Selection | 5 | 6 | random |
| Low-quality selection [a] | 5 | 6 | random |

[a] Utility scores of each product are manipulated yielding a lower quality recommendation

Recommendations are derived from an utility model (multinominal-logit model) that is determined on the information collected with studies 1 to 3 of Chapter 5. Preference ratings serve as input for this model to determine an overall utility score for each alternative. This score is subsequently used to rank or to select alternatives.

The quality of both recommendation agents is manipulated by adding a random 'error'-term to the overall utility scores. The magnitude of this term is of such an order that the quality of the recommendations is substantially reduced. However, the recommendations are still an improvement over a random ordered list and a random selection. That is, concerning a selection of alternatives, the average utility levels derived of the recommended selections are above the level of the full set of alternatives. In contrast to Aksoy *et al.* (2006) participants are not informed on the quality of the recommendation.

This experimental setup results in five between-subject cases (low/high quality ranking, low/high quality selection and a non-aided case). Participants are randomly assigned to the one of these five cases. We give a summary of this setup in Table 4.1.

Participants take part in a choice task that involves a decision on twelve or five mp3-discmans. Each discman is described by six attributes, excluding the brand name (see also Appendix 4.A). The presentation format is equal for all cases and consists of an information matrix where each row corresponds to one alternative and where the columns correspond to the attribute values.

When participants enter the web site they are instructed on the task, the product and its attributes. Subsequently, participants assigned to an aided task provide their preference ratings on each of the six attributes. Participants of the non-aided task provide these

ratings after their choice. We monitor the time that participants require to process a web pages and to make a choice. Upon making a choice all participants provide their opinions on statements regarding effort, accuracy, satisfaction and involvement on a 7-point Likert-scale, which is bounded by 'totally disagree' and 'totally agree'. See Appendix 4.B for the list of included statements.

### Measures

Revealed effort is conceptualized as the time required to make a decision (Bettman and Zins, 1979). A measure for perceived effort is obtained via statements of the participants.

Based on the utility values for each mp3-discman the relative accuracy measure is determined according to equation 4.1. Although the utility levels may deviate somewhat from the real consumers' utility levels we do not expect that this affects the results of our study, but see Diehl (2005) for an alternative approach. Perceived accuracy is also obtained from participants' statements.

In addition, we make a distinction between the relative accuracy measure with respect to all alternatives and the selection presented. This distinction can provide insights on the two components of revealed accuracy, agent accuracy and consumer accuracy. In the case that the difference between both measures is substantial, consumers may have engaged in different decision processes.

Satisfaction, the third main variable of interest, is conceptualized as a pleasurable fulfillment of an outcome. That is, a consumer's perception of the pleasures and displeasures of that outcome (Oliver, 1999). Measures on overall satisfaction and attribute satisfaction levels - system, product and decision - are obtained via participants' statements.

### Participants

Data collection was conducted in combination with study 4 of Chapter 5. Via an advertisement on the university's online message board, undergraduate students were requested to participate. Students could directly participate by clicking a link in the advertisement which directed them to the experiment web page. This setup enables students to participate at their desired place and time, mimicking the real life setting of online product purchases as much as possible. All participants who completed the survey took part in a lottery and could win a digital camera of 250 euros or one of two 50 euros coupons.

## 4.5 Results

In total 167 undergraduate students completed the experiment. In Table 4.9 in Appendix 4.C we report the Cronbach alpha values for our measures obtained via participants' statements. These values show that the reliability of the different measures is satisfactory (Nunnally, 1978).

Average values for our measures are reported in Table 4.2. A first look at the measures for effort reveals that levels differ for the 4 recommendation cases compared to the non-aided case, which serves as a benchmark. This may indicate an effect of using a recommendation agent. However, the experienced effort levels do not demonstrate such differences. If there is an effect on revealed effort it is therefore not likely to be noticed. Considering the average revealed accuracy levels we see a clear difference between high-quality and low-quality recommendations for the ranking agent and for the selection agent. Similar to effort, this difference in revealed levels is not demonstrated by differences in experienced accuracy levels. Satisfaction levels in Table 4.2 are close to the level 4, which is the neutral score of our scale. A high-quality or a low-quality recommendation does not seem to effect satisfaction levels. However, for the high-quality and low-quality ranking agent the difference in system satisfaction is quite large.

The general linear model (GLM) is the most common analysis technique for our type of study, with the well known (M)AN(C)OVA models as a special case. We include categorial variables to indicate the experimental conditions and continuous variables to control for differences in involvement. This yields the following model specification

$$y = \alpha + \beta_1 R + \beta_2 R \times LQ + \gamma_1 S + \gamma_2 S \times LQ + \delta_1 PI + \delta_2 DI + \varepsilon. \tag{4.2}$$

With $R$ and $S$ indicators for the ranking and selection cases, $LQ$ an indicator for the low-quality case. $PI$ stands for product involvement and $DI$ for decision involvement. Finally, $y$ stands for our variables of interest, which are, effort, accuracy and satisfaction.

We make the assumption that our endogenous variables follow a normal distribution. Consequently, the GLM-model reduces to a multivariate regression model. More specific, it is a seemingly unrelated regression model (SUR) with identical exogenous variables used in each equation. Consequently, model parameters can be estimated consistently and efficiently using ordinary least squares per equation Greene (1993).

#### Manipulation checks

We included statements in our questionnaire to check for differences in the amount of information, the quality of a recommended ranking and the quality of a recommended

Table 4.2: Average values measures

| | | Ranking | | Selection | |
|---|---|---|---|---|---|
| | Benchmark [a] | HQ [b] | LQ | HQ [b] | LQ |
| | *Effort* | | | | |
| Revealed [c] | 83 | 66 | 105 | 54 | 51 |
| Experienced | 2.07 | 1.91 | 2.12 | 1.63 | 1.99 |
| | *Accuracy* | | | | |
| Revealed all [d] | 0.52 | 0.67 | 0.45 | 0.87 | 0.68 |
| Revealed selection [e] | | | | 0.84 | 0.61 |
| Experienced | 4.31 | 4.44 | 4.51 | 4.67 | 4.65 |
| | *Satisfaction* | | | | |
| System | 3.85 | 4.68 | 3.77 | 4.19 | 4.18 |
| Product | 4.35 | 4.48 | 4.09 | 4.42 | 4.62 |
| Decision | 4.07 | 4.16 | 3.86 | 4.08 | 4.23 |
| Overall | 3.91 | 4.14 | 3.66 | 3.99 | 4.04 |
| | *Involvement* | | | | |
| Product | 3.71 | 3.77 | 3.35 | 3.93 | 3.83 |
| Decision | 4.58 | 4.82 | 4.58 | 4.86 | 4.73 |

[a] Non-aided case, consisting of random presentation of all alternatives
[b] HQ: high-quality ranking or selection, LQ: low-quality ranking or selection
[c] Time required to make a decision
[d] Relative accuracy with respect to all alternatives
[e] Relative accuracy with respect to presented selection of alternatives

selection (see also Appendix 4.B). For each of these three manipulations an indicator is constructed and mean levels are compared to verify that our manipulations were successful.

The perception of the amount of information presented (Cronbach alpha 0.63) did not alter when a ranking was presented for both the high ($p = 0.28$) and low-quality case ($p = 0.26$), as intended. In addition, the differences in mean levels of the information provided for the non-aided case and the high-quality and low-quality selection cases are

in the intended directions and significant ($p = 0.00$ and $p = 0.04$, respectively). That is, participants of the selection cases perceived to have obtained lesser information.

The perception of the quality of the recommendations is an important aspect of our study. We constructed a measure for the adequacy of the provided ranking to control for our manipulation (Cronbach alpha 0.7). Quality levels of the high and low cases differed on average significantly and in the intended direction ($p = 0.00$).

A similar measure was constructed for the adequacy of the recommended selection (Cronbach alpha 0.66). As discussed in Sections 4.2 and 4.3 the quality of the selection is expected not to be noticed. Findings indicate that the perceptions of the quality do not differ significantly between the high-quality and the low-quality selection ($p = 0.27$).

We control for differences in involvement and we therefore obtained statements regarding product and decision involvement. In addition, we use product involvement as a proxy for product knowledge. Cronbach alpha values of these two measures are reported in Table 4.9 in Appendix 4.C and average values in Table 4.2. Mean values of product involvement are just below 4 which is the neutral score on our scale. Our assumption that participants do not have high knowledge on the product is therefore plausible. Mean levels of the different cases are for both involvement variables not significantly different (all p-values exceed 0.20).

**Effort**

The effect of a recommendation agent on effort is determined for the revealed and perceived level. The results of a regression for both effort levels according to equation 4.2 are presented in Table 4.3. The second column of this table shows the hypotheses corresponding to the effect estimates of revealed and experienced effort.

Either ranking or selecting alternatives is hypothesized to reduce the level of revealed and experienced effort (hypothesis H1a). Estimation results in Table 4.3 indicate that providing a ranking of alternatives does not significantly reduce revealed effort compared to the non-aided case ($p = 0.20$). This also holds for experienced effort ($p = 0.60$). Hypothesis H1a is therefore not supported.

Recommending a selection of alternatives reduces the level of revealed effort significantly as compared to a non-aided task ($p = 0.03$). However, this reduction is not perceived by the participants. The last two columns of Table 4.3 show for hypothesis H1b a insignificant reduction of experienced effort ($p = 0.13$). Hypothesis H1b is therefore only partly supported by revealed effort.

Table 4.3: Estimation results from the analysis for the effect of a recommendation and of recommendation quality on revealed and experiences effort levels

| | | Revealed effort | | Experienced effort | |
|---|---|---|---|---|---|
| | Hypothesis | estimate | p-value | estimate | p-value |
| Ranking | H1a | -17.69 | 0.20 | -0.17 | 0.60 |
| Selection | H1b | -29.30 | 0.03 | -0.47 | 0.13 |
| Low-quality ranking | H1c | 38.43 | 0.01 | 0.28 | 0.40 |
| Low-quality selection | H1d | -2.52 | 0.86 | 0.38 | 0.24 |
| Product involvement | – | -3.81 | 0.35 | 0.16 | 0.09 |
| Decision involvement | – | 4.76 | 0.37 | 0.00 | 0.97 |
| Number of observations | | 167 | | 167 | |

A low-quality ranking is expected to increase effort levels compared to the high-quality ranking. Indeed, Table 4.3 shows a significant increase of revealed effort for the low-quality ranking case ($p = 0.01$). This implies that consumers observe the low-quality and adapt to it by increasing effort. However, hypothesis H1c is only partly supported as this increase in revealed effort is not perceived as such by participants given the insignificant effect for experienced effort levels ($p = 0.40$).

In addition, we hypothesized that a low-quality selection is not of importance to revealed effort as consumers will most likely not notice this low quality (hypothesis H1d). Table 4.3 indicates an insignificant effect ($p = 0.86$) for a low-quality selection on revealed effort. In addition, participants do not notice a low-quality selection as can be derived from the insignificant effect for experienced effort ($p = 0.24$). Both findings support therefore hypothesis H1d.

These findings on effort reveal that our prior assumption that experienced effort is a realization of revealed consumer effort is not correct. Experienced effort was expected to be a direct translation from revealed effort and therefore effects should be similar. The experienced effort cases show however that they deviate from the effects on revealed effort. Even more, the experienced effort levels do not differ between the 5 cases (Wald-test $p = 0.43$).

**Accuracy**

We obtained two measures for revealed accuracy according to equation 4.1, dependent on the presented set of alternatives. The first measure determines revealed accuracy compared to the full set of alternatives. That is, this measure provides insights on the benefits, in terms of accuracy, which consumers may obtain from using a recommendation agent. The second measure is related to the presented selection of alternatives. This measure may provide insights on the effect of a change in consumer behavior next to the effect of the agent on revealed accuracy. Note that the two revealed accuracy measures only differ for the two selection cases.

The results of a regression analysis of both accuracy levels according to equation 4.2 are presented in Table 4.4. Again, we include a column indicating the hypotheses to which the effect estimates correspond. Recall that we refrained from postulating hypotheses on the effect of ranking alternatives and on the effect of a high-quality and a low-quality ranking on revealed and experienced accuracy.

Estimation results presented in the row 'ranking' of Table 4.4 reveal that ranking alternatives does not significantly improve revealed accuracy levels ($p = 0.26$ and $p = 0.30$). Note, the effect on revealed accuracy levels is equal for both measures as no selection of alternatives is made. In addition, findings on a low-quality ranking demonstrate that revealed accuracy levels are reduced compared to a high-quality ranking ($p = 0.06$ and $p = 0.08$). Still, this reduction in revealed accuracy is not perceived as such by participants ($p = 0.39$).

Considering the selection of alternatives we hypothesized that revealed accuracy levels increase. Both measures for revealed accuracy support our hypothesis H2a ($p = 0.00$ and $p = 0.01$) as can be seen in the row 'selection' of Table 4.4. A low-quality selection is hypothesized to counteract the effect of a high-quality selection. We find some support for hypothesis H2b, that is, the negative effect estimates on revealed accuracy are not highly significant ($p = 0.10$ and $p = 0.07$).

In addition to these findings, we indicated that both measures on revealed accuracy may provide some insights on the differences in consumers' revealed accuracy next to agents' revealed accuracy. The difference between both measures is rather small and may therefore indicate that the accuracy improvement is mainly induced by the selection of alternatives, that is, the agent instead of the consumer.

Experienced accuracy is hypothesized to increase for a recommended selection but not for a recommended ranking of alternatives. Hypothesis H3a is supported in that sense that no different levels of accuracy are perceived when a ranking is provided ($p = 0.86$). The

Table 4.4: Estimation results from the analysis for the effect of a recommendation and of recommendation quality on revealed and experiences accuracy levels

| | | Revealed accuracy all | | Revealed accuracy selection | | | Experienced accuracy | |
|---|---|---|---|---|---|---|---|---|
| | Hypothesis | estimate | p-value | estimate | p-value | Hypothesis | estimate | p-value |
| Ranking | – | 0.13 | 0.26 | 0.13 | 0.30 | H3a | 0.04 | 0.86 |
| Selection | H2a | 0.34 | 0.00 | 0.30 | 0.01 | H3b | 0.24 | 0.32 |
| Low-quality ranking | – | -0.22 | 0.06 | -0.22 | 0.08 | H3c | 0.22 | 0.39 |
| Low-quality selection | H2b | -0.19 | 0.10 | -0.22 | 0.07 | H3d | 0.03 | 0.89 |
| Product involvement | – | -0.05 | 0.11 | -0.05 | 0.14 | – | 0.18 | 0.01 |
| Decision involvement | – | 0.08 | 0.06 | 0.08 | 0.07 | – | 0.29 | 0.00 |
| Number of observations | | 167 | | 167 | | – | 167 | |

improvement in revealed accuracy induced by a recommended selection is not perceived as such ($p = 0.32$). Hypothesis H3b is therefore not supported.

Concerning the low-quality cases it is expected that experienced accuracy levels are not affected. Hypothesis H3c stating that a low-quality ranking does not affect experienced accuracy is supported (p=0.43). The similar hypothesis H3d on the effect of a low-quality selection is supported as well (p=0.36). The latter result supports the idea that consumers do not notice the quality of the selection or do not incorporate the selection step into their evaluation of accuracy.

**Attribute satisfaction**

System satisfaction is the most interesting attribute-satisfaction level for this study. It translates the experiences with the web site and recommendation agent in a satisfaction level. Estimation results for this and other satisfaction measures are reported in Table 4.5.

System satisfaction should increase when a ranking agent or a selection agent is used. The effect estimate for ranking alternatives in Table 4.5 shows a clear positive effect on system satisfaction ($p = 0.00$). Hypothesis H4a is therefore supported. Perhaps surprisingly, a selection of alternatives did not significantly increase system satisfaction ($p = 0.23$). This contradicts our hypothesis H4b.

The effect on system satisfaction of a low-quality recommendation is hypothesized to differ between both agents. A low-quality ranking should counteract the increase in system satisfaction, which it does ($p = 0.00$). Hypothesis H4c is therefore supported. However, the quality of a selection is likely not to be be noticed and therefore a low-quality selection yields a similar effect as the high-quality selection. Estimation results support our hypothesis H4d with a highly insignificant effect estimate ($p = 0.98$).

Concerning product satisfaction we refrained from postulating hypotheses. Product satisfaction is not affected by one of the four cases. Nor recommending a ranking ($p = 0.84$) nor recommending a selection ($p = 0.77$) affects product satisfaction. In addition, low-quality recommendations of the ranking agent or the selection agent do not affect product satisfaction as well ($p = 0.40$ and $p = 0.24$).

The effects on decision satisfaction were a-priori rather unclear and we therefore see this part of the study as explorative. Recommendation agents will most likely not affect intrinsic consumer capabilities for information processing in order to make a decision. However, they may effect the perception of it. Estimation results reveal that no significant differences occur between the 5 cases (individual p-values exceed 0.36, Wald-test $p = 0.81$).

Table 4.5: Estimation results from the analysis for the effect of a recommendation and of recommendation quality on system, product and system satisfaction levels

| | | System satisfaction | | Product satisfaction | | | Decision satisfaction | |
|---|---|---|---|---|---|---|---|---|
| | hypothesis | estimate | p-value | estimate | p-value | hypothesis | estimate | p-value |
| Ranking | H4a | 0.83 | 0.00 | 0.05 | 0.84 | H5a | 0.03 | 0.87 |
| Selection | H4b | 0.31 | 0.23 | -0.06 | 0.77 | H5b | -0.08 | 0.70 |
| Low-quality ranking | H4c | -0.84 | 0.00 | -0.20 | 0.40 | H5c | -0.17 | 0.43 |
| Low-quality selection | H4d | 0.01 | 0.98 | 0.26 | 0.24 | H5d | 0.19 | 0.36 |
| Product involvement | – | 0.21 | 0.00 | 0.29 | 0.00 | – | 0.20 | 0.00 |
| Decision involvement | – | -0.05 | 0.63 | 0.26 | 0.00 | – | 0.18 | 0.03 |
| Number of observations | – | 167 | | 167 | | – | | |

Table 4.6: Estimation results of an analysis for the effect of system, product and decision satisfaction on overall satisfaction

| Attribute | hypothesis | estimate | p-value |
|---|---|---|---|
| System | H5a | 0.12 | 0.03 |
| Product | H5b | 0.27 | 0.00 |
| Decision | H5c | 0.57 | 0.00 |
| | | | |
| Product involvement | – | 0.02 | 0.67 |
| Decision involvement | – | 0.04 | 0.54 |
| | | | |
| Number of observations | | 167 | |

**Overall satisfaction**

We consider the above mentioned three attribute satisfaction levels as the main determinants of overall satisfaction (Oliver, 1993). Perceived performance (effort and accuracy) on overall satisfaction is mediated by attribute satisfaction levels and therefore not included in the model (Spreng *et al.*, 1996). Estimation results are presented in Table 4.6.

Attribute satisfaction levels are expected to directly and positively influence overall satisfaction. Estimation results reveal that indeed the three considered attribute levels - system ($p = 0.03$), product ($p = 0.00$) and decision ($p = 0.00$) - positively and significantly affect overall satisfaction. This supports our hypotheses H5a, H5b and H5c. We tested for additional direct effects of low and high quality recommendations on overall satisfaction. These appeared to be highly insignificant ($p > 0.63$).

However, our main interest lies in differences in effect sizes. That is, which element affects overall satisfaction the most. System satisfaction appears not to be of great importance to overall satisfaction. Decision satisfaction is the main determinant of overall satisfaction followed by product satisfaction. This reduces the direct impact of a recommendation agent on overall satisfaction.

The discussion above on the effect of a recommendation and of recommendation quality on consumer decision-making has provided some interesting insights. We have summarized the hypotheses postulated in our study and the support for these hypotheses in Table 4.7. We continue with a discussion of these results in the following section.

Table 4.7: Overview of hypotheses: direction of effects [a] and support [b]

| | Ranking | | | Ranking low quality | | | Selection | | | Selection low quality | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | hyp. | effect | support | hyp. | effect | support | hyp. | effect | support | hyp. | effect | support |
| Effort | H1a | < | n.s. | H1b | < | p.s. | H1c | > | p.s. | H1d | = | s |
| Accuracy | | | | | | | | | | | | |
| Revealed | H2a | x | | H2b | > | s | H2c | x | | H2d | < | s |
| Experienced | H3a | = | s | H3b | > | n.s. | H3c | = | s | H3d | = | s |
| Satisfaction | | | | | | | | | | | | |
| System | H4a | > | s | H4b | > | n.s. | H4c | < | s | H4d | = | s |
| | System satisfaction | | | Product satisfaction | | | Decision satisfaction | | | | | |
| Total satisfaction | H5a | + | s | H6b | + | s | H6c | + | s | | | |

[a] < a decrease, = no effect, > an increase, + positive effect, x no hypothesis postulated

[b] s supported, n.s. not supported, p.s. partly supported

## 4.6 Discussion

Recommendation quality is an important aspect of a recommendation agent. It is an issue that has received little attention in the literature. However, given the rise of the Internet this topic has become more important. The Internet provides the consumer with an increasing number of electronic agents to assist in information search and decisions making.

To investigate the effects of differences in recommendation quality we employed a recommendation agent based on consumers' preferences for ranking and for selecting alternatives. The quality of both agents was manipulated and effects on effort, accuracy and satisfaction were investigated accordingly.

Findings of our study indicate that the effect on revealed effort and accuracy is dependent on the quality of the agent. This supports findings of Aksoy *et al.* (2006) who translated quality in similarity between agent and consumer on attribute importance. A low-quality ranking counteracts benefits of such a recommendation agent. In addition, in the case of a low-quality ranking effort increased above the level of the non-aided case. Still, changes in effort and accuracy are not perceived as such by the consumer for either a low-quality or a high-quality ranking.

A selection of alternatives is however less sensitive for the recommendation quality. Consumers cannot asses this quality as they have in general no reference to the full set of alternatives. A selection provides a clear reduction in information which is translated into a reduction of effort and an increase in accuracy. However this effect is more likely to be dependent on the quality of the recommendations instead of the perception of it.

The effects on revealed effort and accuracy are for both agents not translated into experienced effort levels. This supports an earlier finding of Bechwati and Xia (2003). However, this finding may also indicate that these experience levels are context dependent. We used a full between-subject design and participants may therefore have no reference for the choice task they participated in during our experiment. An issue that may hold especially for the cases where a selection of alternatives was presented. Another explanation may be that the stimuli during the experiment were not strong enough. The chosen set of 12 mp3-discmans may not be large enough to reveal the benefits of a ranking. In addition, the presentation of the selection concept may not be explicit enough to be noticed as a form of assistance.

The findings on recommendation quality are also reflected by system satisfaction. A ranking increases the satisfaction with the system and a low-quality ranking counteracts on this effect. In contrast, a recommended selection, high or low quality, has no effect on

system satisfaction. Considering the impact on system satisfaction, overall satisfaction is hardly influenced by it. Overall satisfaction with this type of e-service is of importance to customer retention. Product and especially decision satisfaction are the more important determinants of overall satisfaction. Both types of attribute satisfaction were not affected by the ranking or selection recommendation agent.

To summarize, the quality of a recommendation agent can affect revealed effort, revealed accuracy and system satisfaction levels. It appears that the perception of the assistance and, in more detail, the perception of the quality of the recommendation agent, plays an important role in these effects on decision behavior.

Several limitations hold for our study. The stimuli of ranking or selecting alternatives from a list of 12 products may not be strong enough to significantly demonstrate effects on consumer behavior. In addition, the absence of effects on experienced effort and accuracy levels may be an outcome of our full between-subject design and therefore context related.

An aspect not included in our study is consumers' trust in a recommendation agent. Trust is likely to be closely related to the perception of the quality of the agent as well as to the use of it. In addition, trust relates to the familiarity with decision-aid tools. No or little experience with an agent is likely to yield a low-trust level and can therefore counteract benefits of using a recommendation agent. In addition, we have not included consumer expectations of the recommendation agent in our study.

# 4.A MP3-discman attributes

Table 4.8: mp3-dismans included in study

| # | Sound quality | Automatic volume limitation [a] | Playback [b] | Memory [c] buffer | Eas of use [d] | Weight [e] | Price [f] |
|---|---|---|---|---|---|---|---|
| 1 | excellent | good | 50 | 100 | excellent | 200 | 140 |
| 2 | moderate | good | 16 | 120 | reasonable | 220 | 100 |
| 3 | excellent | good | 60 | 100 | good | 200 | 170 |
| 4 | good | good | 13 | 90 | reasonable/good | 240 | 120 |
| 5 | reasonable | reasonable | 48 | 100 | moderate | 205 | 100 |
| 6 | reasonable | reasonable | 48 | 45 | good | 210 | 140 |
| 7 | good | good | 80 | 45 | good | 225 | 180 |
| 8 | reasonable | reasonable | 20 | 100 | good | 230 | 100 |
| 9 | good | reasonable | 20 | 100 | reasonable/good | 250 | 140 |
| 10 | excellent | good | 24 | 480 | good | 250 | 170 |
| 11 | good | reasonable | 40 | 80 | good | 215 | 150 |
| 12 | moderate | good | 65 | 75 | excellent | 235 | 110 |

[a] Maintains volume output at levels below distortion threshold
[b] In hours
[c] In seconds
[d] Handling of the discman
[e] In grams
[f] In euros

## 4.B Measurements

Items are adapted from the Handbook of Marketing Scales (Bearden and Netemeyer, 1999) and translated from Dutch.

**Product involvement**

1. I find this product very appealing
2. I would like to be seen with this product
3. I want to have one of the presented alternatives
4. I know a lot of this product

**Decision involvement**

1. Even when a large set of alternatives is offered, it is still very important which product I choose
2. The presented alternatives are in my opinion very different
3. It is very important for me to make a good decision for this product
4. When making a decision the outcome is very important to me

**System satisfaction**

1. My preferences for this product are clearly resembled by the presented alternatives
2. Making a choice was easy, thanks to using the web site
3. Making a choice was easy, thanks to way information was presented
4. The way information was presented suits me very well
5. I could easily obtain a good overview of the presented alternatives, thanks the manner of information presentation

**Decision satisfaction**

1. The decision process to make a choice was very satisfying
2. I would describe my experience with making this choice as fun
3. Making a decision went fast and was easy
4. I would make the same decision again
5. It is fun to make choices like this

**Product satisfaction**

1. I really want to obtain the alternative I have chosen
2. I am very satisfied with the alternative I have chosen
3. I am very happy when I consider the alternative I have chosen
4. The ideal product is very similar to the alternative I have chosen
5. The alternative I have chosen satisfies all my criteria

**Overall satisfaction**

1. Taking everything into account I am very satisfied
2. I wish that each decision I make is as satisfactory as this one
3. I am very satisfied considering all aspects of making a decision
4. I am very satisfied with this experience
5. I would describe this experience as fun

**Effort**

1. I studied the presented alternatives thoroughly
2. It took me a lot of effort to review all alternatives
3. I could make a decision easily and fast
4. It was effortful to make a choice

**Accuracy**

1. The chosen alternative suits me well
2. If I was asked to make a choice from the presented list again, I would choose another alternative (R)
3. I have made the best choice given the presented list of alternatives
4. I am sure I made the right choice

**Manipulation check**

1. (effort) There were a lot of alternatives
2. (effort) There was a lot of information presented
3. (order) The order of presentation matches my preferences
4. (order) The order of presentation based on my preferences enabled me to make a quick decision
5. (recommendation) The list of alternatives that was recommended to me suits me well
6. (recommendation) The recommendation alternatives were very adequate and enabled me to make a quick decision

## 4.C Cronbach alpha values

Table 4.9: Cronbach's alpha values

| Measure | Cronbach $\alpha$ | Measure | Cronbach $\alpha$ |
|---|---|---|---|
| Experienced effort | 0.80 | Overall satisfaction | 0.85 |
| Experienced accuracy | 0.83 | System satisfaction | 0.83 |
| Product Involvement | 0.79 | Product satisfaction | 0.82 |
| Decision Involvement | 0.80 | Decision satisfaction | 0.74 |

# Chapter 5

# Identifying decision strategies in an Internet choice environment

## 5.1 Introduction

We make decisions every day and are probably not aware that several decision strategies are available to make these decisions. The decision strategy is an important element in decision-making as it determines the method and intensity of information processing and consequently the accuracy of the decision. For example, choosing the cheapest product is a quick and easy strategy but does not guarantee that the most adequate product is chosen. In contrast, grading each product on all attributes and selecting the one with the highest overall grade is more complicated and effortful. However, all information is used and the most adequate product is therefore chosen.

The findings of Chapter 4 showed that recommendation agents may alter consumer decision-making. Even more, two main determinants of decision-strategy usage, effort and accuracy, are affected by differences in quality of a recommendation agent. Therefore it is likely that decision-strategy usage is affected by the Internet and in particular by recommendation agents.

To be able to investigate changes in decision-strategy usage, in an environment like the Internet, a method for identification of decision strategies is required that is suitable for an electronic environment. Currently, two methods are mainly applied to identify decision strategies: the verbal-protocol method and self-stated usage (see, for example, Payne, 1976; Todd and Benbasat, 1991, 1999; Chu and Spires, 2001, 2003). The verbal-protocol method identifies the decision strategy ex post on participants' statements that

are recorded during the decision-making process. The method of self-stated usage lets participants themselves indicate which decision strategies have been applied.

Both existing methods have clear disadvantages that can affect the identification of decision strategies, especially in an environment like the Internet. The verbal-protocol method requires that participants think out loud and statements are recorded. The quality and completeness of these recorded statements determine the reliability of identified strategies. This reliability is also dependent on the expertise and skills of the judges who analyze these statements. The other approach, self-stated usage, is dependent on the expertise, skills, and motivation of the participant. Participants need to comprehend the differences between strategies in order to correctly identify the decision strategies used.

Given the limitations of both existing methods we investigate the possibility of a new method for identifying decision strategies. This method should simplify decision strategy identification and consequently improve decision strategy analysis. In addition, it should be applicable in an online context. We therefore focus on the development of a method that consists of a short and simple questionnaire. Participants can easily comprehend a questionnaire and it can be applied in various experimental settings, including the Internet. In addition, this new method should take multiple strategy usage into account as well. That is, several strategies may be used sequentially to make a decision (see for example Bettman *et al.*, 1990; Payne *et al.*, 1993; Todd and Benbasat, 1991).

The outline of this chapter is follows. We first discuss the considered decision strategies in Section 5.2. Issues related to design of the questionnaire are discussed in Section 5.3. In Sections 5.4 till 5.7 we discuss the four studies conducted to develop and validate our scale. We conclude with a discussion in Section 5.8.

## 5.2 Decision Strategies

We distinguish eight decision strategies that are commonly used in studies on decision-making (see for example, Ball, 1997; Fennema and Kleinmuntz, 1995; Todd and Benbasat, 1994; Paquette and Kida, 1988; Payne *et al.*, 1996; Chu and Spires, 2000). The considered strategies are, Weighted Additive (WAD), Equal Weights (EQW), Satisficing (SAT), Lexicographic (LEX), Elimination by Aspects (EBA), Majority of Conforming Dimensions (MCD), Frequency (FRQ), and Random Choice (RC). We provide a short description of each strategy in Table 5.1 and refer to Payne *et al.* (1993) for an extensive discussion.

These eight strategies cover the whole spectrum of decision strategies, which is bounded by effort and accuracy. WAD requires the highest level of effort and obtains the highest

Table 5.1: Decision strategies descriptions

| Decision strategy | description |
|---|---|
| Weighted Additive (WAD) | The values of each alternative on all the relevant attributes are considered as well as the relative importance or weights of these attributes. A weighted sum of attribute values determines a total score and the alternative with the highest score is chosen. |
| Equal weights (EQW) | All the attribute values for each alternative are considered however no distinction is made between attributes. A unweighted sum of attribute values determines a total score and the alternative with the highest score is chosen. |
| Elimination By Aspects (EBA) | The most important attribute is determined as well as a cutoff value for this attribute. All alternatives with values for that attribute satisfying this cutoff level are selected. Subsequently, the second most important attribute and its cutoff value is determined. Again, only the alternatives satisfying this cutoff level are selected. This procedure repeats until one alternative remains. |
| Satisficing (SAT) | The alternatives are considered one at a time, in the order they are occur in the presented set. Each attribute value is compared to a predefined cutoff level. If any attribute is below this level then the alternative is rejected. The first alternative to satisfy all criteria is chosen without further investigation of remaining alternatives. |
| Lexicographical (LEX) | The most important attribute is determined. All alternatives are evaluated on that attribute and the alternative with the best value for this most important attribute is selected (procedure repeats if there is a tie). |
| Majority of Confirming Dimensions (MCD) | Alternatives are pairwise compared on each attribute and the alternative with the majority of best attributes is maintained and compared with the next alternative. Procedure repeats till all alternatives have been evaluated. |
| Frequency (FRQ) | For each alternative the number of good features are determined, based on threshold values for each attribute. The alternative with the most 'good' attributes is chosen. |
| Random choice (RC) | The choice is made at random |

Table 5.2: General decision strategy characteristics

| Strategy | Compensatory vs non-compensatory | Information ignored | Consistent vs selective | Attribute vs alternative | Evaluation formed | Quantitative vs qualitative |
|---|---|---|---|---|---|---|
| Weighted Additive (WAD) | C | N | C | AL | Y | QN |
| Equal Weights (EQW) | C | Y | C | AL | Y | QN |
| Elimination by Aspects (EBA) | N | Y | S | AT | N | QL |
| Satisficing (SAT) | N | Y | S | AL | N | QL |
| Lexicographic (LEX) | N | Y | S | AT | N | QL |
| Majority of Conforming Dimensions (MCD) | C | Y | C | AT | Y | QN |
| Frequency (FRQ) | C | Y | C | AL | Y | QN |
| Random Choice (RC) | N | Y | - | - | N | - |

[1] Table adapted from Payne, Bettman, and Johnson (1993) page 32

expected level of accuracy. In contrast, RC requires a minimal level of effort and obtains an minimal expected level of accuracy.

### Decision strategy dimensions

Decision strategies can be classified on six dimensions. We have summarized this classification in Table 5.2, which is adapted from Payne *et al.* (1993).

We briefly elaborate on each dimension. A *compensatory* strategy can compensate inadequate attribute values by other attribute values of the same alternative. It is clear that for a strategy like LEX this is not the case as for this strategy a selection is made on one attribute only. The second dimension indicates if the decision strategy *ignores information* or not. Only WAD considers all information available. EQW, for example, ignores the information on differences in importance of attributes. The *consistent versus selective* dimension indicates if a strategy processes the same amount of information and in the same manner for all attributes and all alternatives. LEX for example is a selective strategy as it ignores attributes. The *attribute versus alternative* dimension indicates the order of processing information. For an alternative based strategy, attribute values of one alternative are processed before the next alternative is considered (for example FRQ). An attribute based decision strategy considers one attribute at a time for all alternatives and then continues with the next attribute (for example LEX). The fifth dimension indicates if an *evaluation is formed* for an alternative. That is, if an overall judgement is made like for example WAD does. The sixth dimension *quantitative versus qualitative* indicates the method of reasoning. That is, does the strategy require quantitative operations like taking a sum or not. For example, EBA is a qualitative strategy as it consists of simple comparisons of values, in contrast to FRQ were the sum of the number of 'good' attributes is taken.

Although strategies may be classified as equal on one or more of these six dimensions they may still differ when using a more detailed description. For example, WAD and EQW are both compensatory strategies but differ in the way attributes can compensate each other. WAD takes differences in importance of attributes into account, where EQW does not.

RC differs from the other seven strategies we consider. This strategy results in a choice and therefore it is a decision strategy. However, it is not an information processing strategy like the other strategies. Therefore RC is not well defined on the six dimensions of Table 5.2.

These eight decision strategies can also be classified as normative or as a heuristic (Payne *et al.*, 1993). Normative strategies are compensatory strategies that include all relevant information. For example, the WAD-strategy is normative strategy. Heuristics are more simplifying strategies using less information and tend to be noncompensatory. An example of such a strategy is the LEX-strategy.

## 5.3 Scale design

Traditionally the procedure as described by Churchill Jr. (1979) is used for scale development, especially in the marketing literature. Recently Rossiter (2002) extended this procedure into the C-OAR-SE framework for scale development. We use both frameworks as guidelines to develop our scale for identification of decision strategies.

Instead of measuring the entire decision strategy we propose to measure an indicator of each strategy. As decision-strategy usage will reflect on the unique characteristics of a strategy, this indicator will be based on these unique characteristics. We visualize this idea in Figure 5.1. Both strategies A and B are defined by several characteristics ($C$); strategy A by $C_1$ to $C_5$ and strategy B by $C_2$ to $C_6$. Strategies A and B share $C_2$ to $C_5$ and therefore $C_1$ identifies uniquely strategy A and $C_6$ strategy B. These unique characteristics will reflect on a set of measurable items ($I$). For example, in case strategy A is WAD and strategy B is EQW $C_1$ can indicate the weighted sum and $C_6$ the unweighted sum of attributes. A shared characteristic of both strategies is that all attributes are considered. We do not intend to measure such shared characteristics.

#### Experimental setting

All our studies are conducted in a computer-mediated environment. However, one study is conducted in a special prepared room to monitor participants in order to apply the verbal protocol method. A computer-mediated setting has already been frequently used in studies on decision strategies (Todd and Benbasat, 1999; Chu and Spires, 2003, among others).

To be more specific, our studies are conducted via the Internet. The use of the Internet has many advantages. First of all, data collection is automated and participation is not dependent on certain time slots and a research lab. In addition, a computer-mediated setting allows for complete randomization of presentation of information. In addition, the Internet is well known and therefore requires no additional skills of participants.

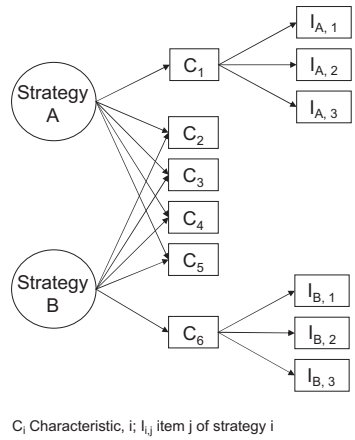


Figure 5.1: Conceptual framework

## 5.4 Item generation

To obtain an initial list of items we used two sources of information. First of all, two small studies were conducted to obtain descriptions on the decision-making process of consumers. In addition, the unique characteristics of decision strategies are used according to our discussion above.

### 5.4.1 Studies 1a and 1b

#### Study 1a

Participants took part in a pre-defined choice task and had to choose a mp3-discman. A mp3-discman is a portable cd-player capable of playing music files that are stored in mp3-format. This study was conducted in December 2003 and at that time this type of discman was relatively new on the market.

On entering the web site participants were briefly instructed on the product and the choice task. Each participant was asked to choose one mp3-discman from a list of ten alternatives. These discman's were described on eight attributes, including price. A full description is provided in Appendix 5.A. In addition, a screen shot of this choice task is provided in Figure 5.4 in Appendix 5.B.

**Study 1b**

Study 1b is in setup similar to study 1a. Again we used the web-site setting to gather information on decision-making. However in this case participants had to recall their last 'major' purchase. This may include a purchase of a television, computer, car, and so on. Participants also had to provide information on the product chosen as well as on alternatives and attributes considered when making that purchase decision. We asked for a description of the decision-making process as well.

**Results**

Study 1a was completed by 24 students and in general participants provided an extensive description of how they made their decision. A large majority of participants used a heuristic to make a choice for a mp3-discman. For example, EBA or LEX were frequently used. In addition, multiple-strategy usage could be identified for 15 out of the 24 cases.

The setup of study 1b resulted in descriptions on a broad range of products of 13 participants. Participants reported decisions which in general imply a high level of involvement. This can explain the higher level of detail of descriptions compared to those of study 1a. Again a majority of the participants used a heuristic in their decision-making process. However, only for 5 of the 13 participants multiple-strategy decisions could be identified. This may indicate that respondents forgot the initial screening of alternatives or that they only recall the dominating decision strategy.

Results of both experiments show that multiple-strategy decisions involve an alternative and/or attribute reduction step followed by a selection step, in line with findings of previous studies (for example Payne, 1976). The first step consisted of a heuristic and the second step of more normative strategies.

### 5.4.2 Initial list of items

Based on the unique characteristics of the considered decision strategies a list of keywords and accordingly items was determined. These unique characteristics are based on the descriptions and differences on the six dimensions of decision strategies discussed in Section 5.3.

We validated and extended this list of items by a comparison with the descriptions and keywords obtained from studies 1a and 1b. Items were also adjusted on vocabulary to obtain a better match with the statements made during these two studies. In addition, two experts judged the quality of the list, which let to some adjustments as well.

The procedure described above resulted in an initial list of 27 items that are used to identify the unique dimensions of the considered decision strategies as well as of multiple-strategy usage. This list of 27 items is presented in Table 5.3.

## 5.5 Item selection

In order to reduce the list of 27 items we conducted a study similar to study 1a. Participants took part in a pre-defined choice task and were requested to fill out the questionnaire containing the 27 items on decision strategies.

To reduce dependency of our results on product type we used two new products: a student apartment and bottles of wine. Both products are well suited for presentation in an online setting. In addition, the student apartment task is in line with other studies on decision strategies and matches well with the participants population (for example Payne, 1976; Todd and Benbasat, 1994; Chu and Spires, 2000).

### 5.5.1 Data collection

Participants were randomly assigned to the student apartment or the bottle of wine case. Before participants made a choice they were briefed on the choice task, on the product category, and on product attributes. Alternatives and attributes were presented in random order using a matrix format. To stimulate participation we rewarded one out of every fifteen participants with a coupon of fifteen euro.

Besides using different products we used different numbers of alternatives and attributes. Participants had to choose from 6 apartments or from 15 bottles of wine. The apartments were described on 6 attributes and the bottles of wine on 4 attributes. Details of both products are provided in Appendix 5.A.

After making a choice participants provided statements on the 27 items. Statements were measured on a 7-point Likert scale (totally disagree – totally agree). Furthermore, items were presented in random order.

### 5.5.2 Results

In total 114 undergraduate students participated in the experiment. After some basic screening 104 cases remained for further analysis. On average the 59 participants of the wine case required 50 seconds to make a choice. The 45 participants of the apartment case required 53 seconds to make a choice.

Table 5.3: Items generated to identify decision strategies

| Item | Decision Strategy | Description [a] |
|---|---|---|
| 1* | WAD | To be able to form an opinion on an alternative I have assigned an importance weight to each attribute |
| 2 | WAD | I have considered all attributes of an alternative, where these differ in importance |
| 3 | WAD | I have determined a weighted sum of all attributes for each alternative |
| 4 | EQW | I have compensated a low-scoring attribute with another attribute of an alternative, where all attributes are considered of equal importance |
| 5 | EQW | I have grouped the scores of all attributes into one score, where each attribute is considered of equal importance |
| 6* | EQW | I determined the sum of all attributes where each attribute is of equal importance to me |
| 7 | SAT | I started on top of the list and chose the first alternative that satisfied may criteria |
| 8 | SAT | As soon as an alternative satisfied my criteria, I selected that alternative and I refrained from considering other alternatives |
| 9* | SAT | If an alternative did not satisfy one of my criteria on one of the attributes I rejected that alternative |
| 10 | LEX | I determined the most important attribute(s) and chose the alternative with the highest score(s) |
| 11 | LEX | I chose the alternative that has the highest score(s) on the most important attribute(s) |
| 12* | LEX | An alternative needs to have the highest score on the most important attributes to be chosen |

[a] Items translated from Dutch

* Item deleted from list according to findings of Section 5.5

Table 5.3 continued: Items generated to identify decision strategies

| Item | Decision Strategy | Description |
|---|---|---|
| 13 | EBA | The most important attributes need to satisfy a minimal level |
| 14 | EBA | I reduced the number of alternatives by setting a minimal level for attribute(s) |
| 15* | EBA | I have assigned minimal levels to attribute(s) starting with the most important attribute |
| 16 | MCD | I compared alternatives pairwise |
| 17* | MCD | I compared two alternatives and of those two I chose the alternative with the better attributes |
| 18 | MCD | I compared two alternatives and determined for each attribute which alternative is the better one |
| 19 | FRQ | I chose the alternative with the most good attributes |
| 20* | FRQ | I determined for each alternative the number of good and bad attributes |
| 21 | FRQ | The number of good attributes is more important than the attribute levels themselves |
| 22 | RC | I chose an alternative at random |
| 23 | RC | I chose the first alternative directly without considering other alternatives |
| 24* | RC | It is not important which alternative I chose |
| 25 | MS | I firstly reduced the number of alternatives and made a choice from that reduced list |
| 26 | MS | Based on simple criteria I reduced the number of alternatives after which I made a choice |
| 27* | MS | I selected alternatives on a few attributes and made thorough decision from this selection |

[a] Items translated from Dutch

* Item deleted from list according to findings of Section 5.5

Table 5.4: Factor loadings [a]

| | Indicator of decision strategy | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Item | WAD | EQW | SAT | LEX | EBA | MCD | FRQ | RC | MS |
| 2 | 0.855 | | | | | | | | |
| 3 | 0.622 | | | | | | | | |
| 4 | | 0.878 | | | | | | | |
| 5 | | 0.801 | | | | | | | |
| 7 | | | 0.858 | | | | | | |
| 8 | | | 0.633 | | | | | | |
| 10 | | | | 0.900 | | | | | |
| 11 | | | | 0.622 | | | | | |
| 13 | | | | | 0.789 | | | | |
| 14 | | | | | 0.872 | | | | |
| 16 | | | | | | 0.873 | | | |
| 18 | | | | | | 0.729 | | | |
| 21 | | | | | | | 0.907 | | |
| 22 | | | | | | | | 0.776 | |
| 23 | | | | | | | | 0.800 | |
| 25 | | | | | | | | | 0.755 |
| 26 | | | | | | | | | 0.886 |

[a] Principal Component Analysis with Varimax rotation and Kaiser Normalization. Factor loadings, below 0.5 not shown.

To identify the 8 decision strategies and multiple strategy usage, we conducted a principal components analysis. Analysis of the factor loadings showed support for 9 components. We deleted all items with low loadings after a varimax rotation, resulting in a set of 17 items. These deleted items are indicated with a '*' in Table 5.3. The resulting factor loadings are presented in Table 5.4. Each factor is clearly linked to a decision strategy as loadings group over items of a single strategy. In addition, the results indicate a solution of two items per strategy. However, an issue of concern here is the FRQ component. Only one item scores high on this component.

In order to obtain insights on reliability and validity of the scale we extended our analysis with a confirmative factor analysis [CFA]. Results of this CFA are shown in Table 5.5. We have set the loading and variance of the one-item construct for FRQ to

Table 5.5: Results of confirmatory factor analysis of Study 2

| Item | standardized factor loading | composite reliability | proportion of extracted variance |
|---|---|---|---|
| WAD | | 0.60 | 0.43 |
| 2 | 0.59 | | |
| 3 | 0.72 | | |
| EQW | | 0.74 | 0.59 |
| 4 | 0.69 | | |
| 5 | 0.83 | | |
| SAT | | 0.64 | 0.49 |
| 7 | 0.48 | | |
| 8 | 0.87 | | |
| LEX | | 0.61 | 0.44 |
| 10 | 0.64 | | |
| 11 | 0.69 | | |
| EBA | | 0.58 | 0.41 |
| 13 | 0.66 | | |
| 14 | 0.62 | | |
| MCD | | 0.71 | 0.58 |
| 16 | 0.44 | | |
| 18 | 0.99 | | |
| FRQ | | | |
| 21 | 0.95 [a] | | |
| RC | | 0.68 | 0.52 |
| 22 | 0.76 | | |
| 23 | 0.69 | | |
| MS | | 0.70 | 0.54 |
| 25 | 0.67 | | |
| 26 | 0.79 | | |

[a] Factor loading set on $0.95\sigma$ and variance set on $0.1\sigma^2$

0.95 times the standard deviation of the corresponding item and 0.1 times the variance of the item, respectively (Anderson and Gerbing, 1988)

The results of the CFA in Table 5.5 look promising. Measures of fit indicate that the model fit is satisfactory ($NNFI = .93$, $CFI = 0.95$, Bagozzi and Yi (1988); Baumgartner and Homburg (1996)). Except for two constructs all others exceed the minimum composite reliability level of 0.6. All items score significant ($p < 0.05$) on their corresponding constructs except for FRQ ($p < 0.10$), an indication for convergent validity.

The proportion of extracted variances can be an issue of concern. Only four values exceed the recommended value of 0.5 (Bagozzi and Yi, 1988). However, this finding can be a result of low involvement with either product or the experiment. In addition, the size of the initial list could be too large for participants. Furthermore, randomization is known to reduce model performance.

## 5.6 Comparison of methods

The verbal-protocol method and self-stated usage are two common methods for identification of decision strategy usage. Via an experiment we compared both methods with each other and with our scale.

Limitations of the two existing methods may affect identification of strategies. Consequently a large variation may exist between results of these methods and our scale. As indicated in the introduction, the verbal-protocol method induces a dependency on the completeness of the recorded statements. It requires that participants think out loud and elaborate extensively on the decision-making process. Self-stated usage is highly dependent on the expertise, skills, and motivation of the participant.

### 5.6.1 Data collection

A requirement of the verbal-protocol method is that statements need to be recorded. We therefore conducted an study in a specially prepared room that allows for monitoring of participants. It is not expected that this setting will influence results of the other two methods.

On start of the experiment a research assistant briefly introduced participants on the setting of the experiment. Participants first took part in a practice task. The objective of this short task was to let participants familiarize themselves with thinking out loud and being monitored. During this task participants chose a student apartment, similar to study 2 in Section 5.5. When a silence of more then 10 seconds was noticed by the research assistant, the participant was stimulated to speak out loud.

Directly following the practice task participants chose a mp3-discman from a list of 12, similar to study 1a. After the decision for the mp3-discman was made, the assistant left the room and the participant was requested to fill out the questionnaire containing the items of our scale. This was followed by a written instruction on the considered decision strategies. Participants indicated which strategies they thought to have used. Finally, participants were debriefed and rewarded with a coupon of 5 euro for participation.

### 5.6.2 Results

In total 20 undergraduate students participated in this experiment. Participants were recorded on video. The experimental setting revealed to influence the decision-making process of participants. Average time to make a choice was 114 seconds, which is twice the time required in study 2 of Section 5.5. Participants of that study required on average 53 seconds to make a choice.

Two judges coded independently the verbal statements. In general, they obtained equal strategies from recorded statements. In the exceptional case of a disagreement, both judges identified a strategy for that case in close deliberation.

The 17 items of our scale obtained from study 2 were averaged over corresponding strategies to yield an indicator for decision strategy usage. Only FRQ is indicated directly by its corresponding item. A strategy is identified as being used when the corresponding indicator was above neutral on average, that is a score above the value of 4.[1]

Frequencies of decision strategy usage are presented in Figure 5.2. The three methods - verbal protocol, self-stated usage and our scale - indicate that WAD, LEX and EBA are the dominating strategies. RC has never been used in this experimental setting. Multiple strategies are used for several decisions. Based on self-stated usage 8 out of 20 cases involved multiple strategies. The verbal-protocol method indicated 13 cases. Based on the number of strategies derived from our scale there are 16 cases with multiple strategies. The measure for multiple strategy usage included in the questionnaire indicated 14 cases.

The verbal-protocol method and our scale indicate a near equal number of multiple strategy cases. However, both methods indicate on some respect different case. They agree only on 65 per cent of the cases on whether multiple strategies have been applied or not. The self-stated method underestimated multiple strategy usage. This may be explained by that participants only recognize their dominating strategy. In addition, identification of multiple strategies can be perceived as too complex.

[1] Given 7 point Likert scale used in the questionnaire, the value 4 indicates a neutral score.

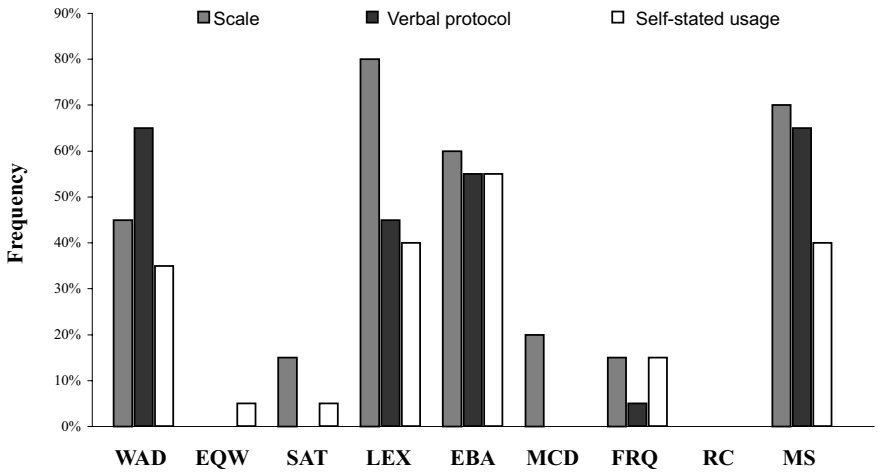


Figure 5.2: Frequency decision strategies

In general the multiple strategy cases involved a mixture of compensatory and non-compensatory strategies. The statements recorded clearly demonstrated a quick reduction of the number of alternatives, which is followed by a more thorough choice process on the remaining set of alternatives. This observation is in line with previous findings in the literature as well as with findings of Study 1. This may also explain the high frequencies of WAD, LEX and EBA in Figure 5.2.

Table 5.6 provides an overview of the similarity in decision strategy identification of the three methods. We provide three levels of similarity: no match, partial match and full match. With a partial match we indicate that two methods do not fully agree on the identified decision strategies. However, still at least one equal strategy is identified by both methods. For example, our scale and the verbal-protocol method disagree completely on 10 percent of the cases and fully agree in 20 per cent of the cases. At least one strategy is identified by both methods in 70 per cent of the cases.

There is a large variation in identified decision strategies. In general there is no full agreement. Only in 5 per cent of the cases do all the three methods fully agree. In 50 per cent of the cases there is some agreement between identification methods. This large variation may have several causes. First of all, the indicated limitations of the existing methods may affect identification of strategies. Self-stated usage may be too complex and recorded statements may be incomplete. In addition, as the scale is still in development, this variation in results might indicate flaws in our scale.

Table 5.6: Comparison between decision strategy identification based on the scale, verbal-protocol method, and self-stated usage based on 20 cases

| | Scale vs Verbal protocol | Scale vs Stated usage | Verbal protocol Stated usage | All [b] |
|---|---|---|---|---|
| no match | 10% | 20% | 25% | 45% |
| partial match [a] | 70% | 65% | 65% | 50% |
| full match | 20% | 15% | 10% | 5% |
| | *LEX & EBA considered as one strategy* | | | |
| no match | 5% | 20% | 15% | 25% |
| partial match [a] | 50% | 50% | 60% | 55% |
| full match | 45% | 30% | 25% | 20% |

[a] A partial match indicates that there is a disagreement on the number of strategies and/or classified strategies. At least one strategy matches between two methods.

[b] Agreement on decision strategy identification when all three methods are compared simultaneously.

Findings of this study indicate that it can be difficult to distinguish between the LEX and EBA strategy by a participant, an observant (judge) or our scale. Both strategies are frequently used. Judges of the verbal statements indicated that it was in several cases difficult to distinguish between both strategies. In addition, participants indicated themselves the use of both strategies for some cases. Our scale demonstrated a positive correlation between both strategies.

We therefore identified the decision strategies again. However, we now assume that the LEX and EBA form one strategy. Both methods are very similar and the LEX strategy can be seen as a special case of the EBA. After this re-identification of strategies our scale and the verbal-protocol method are more in line with each other. In 45 percent of the cases an equal set of strategies is obtained and in 50 percent a partial match. The similarity of both methods with the self-stated usage improves as well, however the magnitude is smaller. This finding may be the result of fewer multiple strategies identified by the latter method.

The objective of this study was to obtain some insights into possible differences between the considered methods for decision strategy identification. The three methods appear to vary considerable. These findings demonstrate the complexity of identifying

decision strategies. The limitations of the verbal-protocol method and self-stated usage may have a considerable impact. Especially, when we consider that our participants are well educated. They are expected to be able to express their decision-making process correctly and to be able to comprehend the differences between strategies. The development of a method like our scale, less reliable on participants and judges skills or experimental settings is therefore desirable. However, findings of this study may also indicate that our scale contains some design flaws. Still, our scale matches better with the existing methods than that these match each other.

## 5.7 Measurement validity

We conduct a fourth study to assess the reliability and validity of our scale. For this purpose different experimental settings were taken into account. Literature provides directions of the effect of these settings on decision-making, which should be detected by our scale. Moreover, the scale should be robust to these differences in experimental settings

To accommodate for different settings we altered the task complexity of the decision. We first altered the number of alternatives. This involves a reduction in the amount of information presented. Literature indicates that this reduction may lead to an increase in compensatory strategies and a decline in multiple-strategy usage (Payne *et al.*, 1993). In addition, we increased the time pressure for making a decision. There is a strong indication that time pressure accelerates the processing of information and/or less effortful strategies like heuristics are used more often (Payne *et al.*, 1993).

### 5.7.1 Data collection

We requested undergraduate students to participate in our study via the school's online message board. Participants were assigned at random to one of the three cases, (1) standard case with 12 alternatives, (2) reduced case with 5 alternatives and (3) the time pressure case. For case 2, the 5 alternatives were selected at random.

Participants assigned to the time pressure case were confronted with a timer indicating the remaining seconds for making a decision (see Figure 5.5 in Appendix 5.B. After 40 seconds a message popped-up to indicate that the time available to make a decision had elapsed and a choice has to be made immediately.[2]

[2]Several test sessions revealed that these 40 seconds were experienced as very short but still reasonable for making a choice.

After a brief introduction on the choice task and product, participants were requested to make a choice for a mp3-discman, similar to study 1a. The alternatives (5 or 12) were presented in random order. Each mp3-discman was described on 8 attributes, which are presented in random order. After a choice was made the questionnaire started. As a reward participants could win a digital camera of 250 euro or one out of two coupons of 50 euro.

### 5.7.2 Results

In total 114 students participated in this experiment. After some basic screening 12 cases were deleted from our analysis. The distribution of participants over the three cases is as follows, 32 participated in the standard case, 31 participated in the reduced number of alternatives case, and 39 participated in the time pressure case.

Participants of the standard case required on average 93 seconds to make a choice. The reduction of the number of alternatives yielded an average decision time of 50 seconds. Participants of the time pressure case required 37 seconds to make a choice. This is close to the restriction of 40 seconds and 11 participants required more than these 40 seconds. Only 2 respondents required more than 50 seconds to decide which mp3-discman to choose.

#### Manipulation checks

Our first manipulation check involves the perception of the amount of information. We included a two-item measure for this purpose in the questionnaire (Cronbach alpha 0.70). Participants of the reduced alternatives case experienced a significant lower level of information compared to the standard case ($p = 0.00$) as well as compared to the time pressure case ($p = 0.00$). The standard and time pressure case did not differ significantly on perception of the amount of information ($p = 0.26$).

The second manipulation check concerns the perception of time pressure. We again included a two-item measure (Cronbach alpha 0.77). Participants of the time pressure case experienced a significantly higher time pressure level ($p = 0.00$) compared to the standard case as well as compared to participants of the reduced alternatives case ($p = 0.00$). The standard case and reduced alternative case did not differ in time pressure levels ($p = 0.51$).

**Reliability and validity**

A first analysis of the data revealed complications for the WAD strategy. Correlation between the corresponding items is negative. This finding is in contrast to study 2 where a significant positive correlation was found for these two items.

A more extensive analysis using a confirmative factor analysis confirmed the problem with the WAD-items. In addition, EQW is also not well defined on its corresponding items. Although the items of either WAD or EQW resemble the same strategy they may not resemble the same unique characteristic, therefore demonstrating a low correlation.

An analysis on the remaining strategy items using a CFA revealed low reliability and validity of the scale. Results of this CFA are shown in Table 5.7. The fit of the model is satisfactory (NNFI=0.94, CFI=0.97). However, composite reliability and proportion of extracted variance measures are not satisfactory. Despite that some values are above or near the desired minimum levels of 0.6 and 0.5, respectively (Bagozzi and Yi, 1988).

The findings of this part of the study are disappointing and indicate several design flaws in our questionnaire. Compared to study 3 we used a different product and two additional experimental settings. This may have caused unexpected variation in answers, yielding the low reliability and validity. For example the mp3-discman contained more numerical attributes then the other two products. Therefore, mathematical terms like weights or summation included in the items may have a more clear or even an other interpretation, affecting response.

## 5.8 Discussion

This study on the development of a questionnaire to identify decision strategies emerged from the question whether recommendation agents can affect decision-strategy usage. For example, the study in Chapter 4 showed that two main determinants of decision strategy usage, effort and accuracy, are affected by differences in quality of a recommendation agent.

To be able to answer this question a method for strategy identification is required that is suitable for an environment like the Internet. Two existing methods, verbal protocols and self-stated usage, have clear limitations. Our criteria for a new method include low requirements on participants skills and independence of the experimental setting. We therefore intend to identify decision strategies by a short and simple questionnaire.

Instead of measuring all features of the decision strategy we proposed to measure just one indicator of each strategy. Accordingly, this indicator should be based on the unique

Table 5.7: Results of confirmatory factor analysis of study 5 [a]

| | standardized factor loading | composite reliability | proportion of extracted variance |
|---|---|---|---|
| SAT | | 0.59 | 0.45 |
| 7 | 0.38 | | |
| 8 | 0.87 | | |
| LEX | | 0.56 | 0.41 |
| 10 | 0.8 | | |
| 11 | 0.43 | | |
| EBA | | 0.51 | 0.35 |
| 13 | 0.53 | | |
| 14 | 0.64 | | |
| MCD | | 0.51 | 0.35 |
| 16 | 0.66 | | |
| 18 | 0.51 | | |
| FRQ | | | |
| 21 | 0.96 | | |
| RC | | 0.40 | 0.27 |
| 22 | 0.37 | | |
| 23 | 0.63 | | |
| MS | | 0.65 | 0.48 |
| 25 | 0.71 | | |
| 26 | 0.68 | | |

[a] Confirmatory factor analysis after deletion of WAD and EQW items.

characteristics of that decision strategy. This setup yields a minimal number of items for strategy identification.

We developed an initial list of items based on the unique characteristics of the decision strategies and descriptions of decision processes obtained from a small study. In addition, a second study was conducted to reduce our initial list of items. Findings of this study revealed a solution of two items per strategy, except for FRQ.

A third study was conducted to obtain insights on differences between the verbal-protocol method, self-stated usage and our questionnaire. Results revealed a large variation in strategy identification between all three methods. This may be the result of the limitations of the two existing methods. However, an additional issue might be that consumers may not be fully aware of their decision-making process in order to indicate decision strategy usage themselves or to comprehend the questionnaire. In addition, the experimental setting required for the verbal-protocol method - thinking out loud - may affect consumer decision-making as well.

We conducted a fourth study to investigate reliability and validity in several experimental settings. We reduced the number of alternatives and increased time pressure. This experiment revealed that our scale did not meet our expectations. Several design issues should be reconsidered in an eventual follow-up study. Although our selected items represent the corresponding strategy they may not represent the same unique characteristic of that strategy. Items should be revised with an even stronger focus on the identification of *one* unique characteristic of a decision strategy. Consequently, correlations between items are low as well as reliability. Items should therefore be revised with an even stronger focus on the identification of *one* unique characteristic of a decision strategy. This result introduces, however, also the option of the formative paradigm for scale development compared to the reflective paradigm we applied in this chapter. The formative paradigm states that a decision strategy is formed by its characteristics. That is, the sum of characteristics forms the decision strategy Diamantopoulos and Winklhofer (see for example 2001); Rossiter (see for example 2002); Jarvis *et al.* (see for example 2003)

We provided in this chapter a first setup for identifying decision strategies using a questionnaire in an environment like the Internet. Despite that the developed list of items did not meet our expectations we believe that the developed framework - the identification of decision strategies via an indicator based on a unique characteristic of that strategy - is still applicable for further research.

This study should therefore be considered to be the first of several studies. Given our framework for strategy identification, issues for further research include an improvement of the items used in this study, as mentioned above, or applying the formative paradigm. In addition, one might consider measuring more general aspects of decision-making like those mentioned in Table 5.2, compared to measuring decision strategies. That is, a trade-off can be made between the level of detail of the information on the decision process and the complexity of obtaining that information. Furthermore, different experimental settings should be used for development of a questionnaire for decision strategy identification.

# 5.A Products

## 5.A.1 mp3-discman

Table 5.8: mp3 alternatives

| # | Sound quality | Automatic volume limitation [a] | Playback [b] | Memory [c] buffer | Eas of use [d] | Weight [e] | Price [f] |
|---|---|---|---|---|---|---|---|
| 1 | excellent | good | 50 | 100 | excellent | 200 | 140 |
| 2 | moderate | good | 16 | 120 | reasonable | 220 | 100 |
| 3 | excellent | good | 60 | 100 | good | 200 | 170 |
| 4 | good | good | 13 | 90 | reasonable/good | 240 | 120 |
| 5 | reasonable | reasonable | 48 | 100 | moderate | 205 | 100 |
| 6 | reasonable | reasonable | 48 | 45 | good | 210 | 140 |
| 7 | good | good | 80 | 45 | good | 225 | 180 |
| 8 | reasonable | reasonable | 20 | 100 | good | 230 | 100 |
| 9 | good | reasonable | 20 | 100 | reasonable/good | 250 | 140 |
| 10 | excellent | good | 24 | 480 | good | 250 | 170 |
| 11 | good | reasonable | 40 | 80 | good | 215 | 150 |
| 12 | moderate | good | 65 | 75 | excellent | 235 | 110 |

[a] Maintains volume output at levels below distortion threshold

[b] In hours

[c] In seconds

[d] Handling of the discman

[e] In grams

[f] In euros

## 5.A.2 Student apartment

Table 5.9: Student apartment alternatives

| # | Floor | Number of | Rent [b] | Public [c] | University [d] | Down town [e] |
|---|---|---|---|---|---|---|
| | area [a] | apartment mates | | transport | | |
| 1 | 12 | 2 | 275 | 5 | 5 | 5 |
| 2 | 6 | 2 | 175 | $< 5$ | $< 5$ | $< 5$ |
| 3 | 25 | 1 | 350 | 5 | 5 | 5 |
| 4 | 16 | 2 | 240 | 10 | 10 | 10 |
| 5 | 30 | 1 | 350 | $< 5$ | $< 5$ | $< 5$ |
| 6 | 20 | 0 | 400 | 5 | 5 | 5 |
| 7 | 20 | 2 | 300 | $< 5$ | $< 5$ | $< 5$ |
| 8 | 20 | 3 | 350 | 5 | 5 | 5 |
| 9 | 25 | 3 | 300 | 5 | 5 | 5 |
| 10 | 15 | 1 | 230 | 10 | 10 | 10 |

[a] In square meters

[b] In euros per month

[c] Time required to reach public transport by foot in minutes

[d] Time required to reach the university by bike in minutes

[e] Time required to reach down town by bike in minutes

### 5.A.3 Wine

Table 5.10: Bottles of wine

| # | Country | Grape | Year | Description of taste | Wood [a] | Price |
|---|---|---|---|---|---|---|
| 1 | South-Africa | cabernet-sauvignon, merlot | 2000 | spicy, fruity, cherry, red and dark fruit | yes | 5.32 |
| 2 | South-Africa | syrah | 1999 | fruity, cherry, plum, almond, vanilla | no | 10.65 |
| 3 | South-Africa | syrah | 2002 | tasty, fruity, pepper, mocha | yes | 8.66 |
| 3 | Spain | tempranillo, mazuelo, garnacha | 1999 | spicy, fruity | yes | 4.66 |
| 4 | Spain | tempranillo | 1998 | fruity, vanilla | yes | 4.33 |
| 5 | Spain | cencibel | 1995 | fruity | no | 3.72 |
| 6 | Italy | nebbiolo | 1999 | fresh, fruity | yes | 9.99 |
| 7 | Italy | cabernet sauvignon, merlot | 1998 | fruity | no | 5.99 |
| 8 | Italy | sangiovese | 2002 | fruity, cherry | no | 3.86 |
| 9 | France | merlot | 2002 | fresh, fruity | no | 3.19 |
| 10 | France | pinot-noir | 2002 | spicy, red fruit | yes | 5.99 |
| 11 | France | tannat, cabernet sauvignon | 2001 | spicy, fruity, dark fruit | no | 5.66 |
| 12 | Australia | cabernet sauvignon | 2000 | spicy, red and dark fruit | no | 7.99 |
| 13 | Australia | cabernet sauvignon, merlot | 2001 | fruity, red and dark fruit | yes | 6.66 |
| 14 | Australia | merlot | 2001 | fruity, blackcurrant, raspberry, plum | yes | 5.99 |

[a] Matured in wooden barrels

# 5.B Screen shots web site

Figure 5.3: Welcome screen

Figure 5.4: Choice task

Figure 5.5: Choice task with increased time pressure

# Chapter 6

# Summary and concluding remarks

Several aspects of consumer choices related to the Internet have been studied in this thesis. First of all, we investigated the antecedents of channel attractiveness for both search and purchase tasks for multiple channels, including the Internet. In addition, we investigated online mortgage-loan applications, as an example of a complex service on the Internet. Finally, we performed two studies on consumer decision-making related to online decision aid tools, known as recommendation agents. We firstly performed a study on the effect of recommendation quality on decision-making. In addition, we proposed a new method for identification of decision strategy usage. In the following section we summarize the findings of the four studies. We focus on the main contributions and topics for further research.

## 6.1 Summary

In Chapter 2 we presented a study on the antecedents of search and purchase attractiveness in a multi-channel context. This study originated from the observation that consumers increasingly use multiple channels for search and purchase tasks. The research-shopper phenomenon is a good example of such multi-channel usage. That is, these shoppers use the Internet purely for gathering information on products that are purchased in brick-and-mortar stores. A novelty of our study is that we investigated channel attractiveness for two tasks - search and purchase - and for multiple channels. Other studies usually focus on one task or consider only a single channel. We focused on four channels, the brick-and-mortar store, the Internet, the telephone and the mail catalog.

The objective of our study was to identify and investigate the effect of specific channel characteristics on search and purchase attractiveness and to investigate how these effects

may differ between channels. Differences in attractiveness can occur as consumers can favor certain characteristics of a channel more for search and others more for purchase. We derived 14 channel characteristics as antecedents of channel attractiveness. In addition, we modeled channel attractiveness independently for the search task and the purchase task. The level of channel attractiveness for either search or purchase tasks was defined as the outcome of a cost/benefit trade-off of channel characteristics.

We collected data for our analysis via a survey, which was conducted in cooperation with *MarketResponse*. Next to collecting data on the four considered channels we also collected data on seven product categories. These seven categories are books, clothing, computers, electronic appliances, health insurances, holidays and mortgage loans. After some screening on response a final sample of 398 respondents was obtained.

The results of a reliability and validity analysis provided evidence for internal and external validity of the 14 considered constructs. Although the use of the seven product categories can improve generalization of results, it can also introduce heterogeneity. To be able to correct for this heterogeneity we used a fixed-effects model for our analysis.

Estimation results showed significant effects for several channel characteristics on channel attractiveness for either search or purchase or both. The assortment offered, the risk associated with the channel, and the enjoyment derived from a channel are perceived as attractive attributes for search and purchase. Information and convenience are pure search attributes and after-sale service is a pure purchase attribute. The remaining eight channel characteristics did not have a clear effect on either search of purchase attractiveness.

Considering the four channels included in the study, our findings show that the brick-and-mortar store is still perceived as very attractive for search and for purchase. The Internet is catching up with the brick-and-mortar store, especially concerning search activities. Still, due to several issues like concerns on privacy and risk, consumers refrain from using this channel for purchase activities. The catalog is not perceived as very attractive for either search or purchase. In addition, the telephone is not perceived as an attractive channel at all for either task. However, the telephone is perceived as an ideal channel in addition to other channels.

A limitation of our study may be that, although we had a large number of respondents, the number of respondents per product-channel combination is low. In addition, we used a panel of a Dutch marketing research company, which may differ from a US-panel. Furthermore, the selected set of seven products may still be too restrictive to capture the effects of the channel characteristics on search and purchase attractiveness. Finally,

this study does not provide information on the choice of a channel for either search or purchase tasks. These issues remain for further research.

Chapter 3 provided a study on the acquisition of mortgage loans using the Internet, as an example of a complex service in an online setting. The complexity surrounding these services can make them commercially less suited for the Internet. Currently, the number of complex services offered on the Internet is low and the number of retailers offering these services is even smaller.

Our objective was to contribute to the literature on online purchases with insights on online purchases of complex services. Findings in the literature on online purchases may not hold for complex services as these services clearly differ from, for example, products like compact discs and books. Complex services are characterized by many items per attribute, are often tailor-made, purchased infrequently, difficult to comprehend, and often require assistance during the decision-making process.

We defined four sets of determinants to explain online purchases of complex services. The first determinant is search behavior that we decomposed into two components, which are, online and competitive search behavior. The other three determinants are trust, product knowledge and socio-demographics. A novelty of our study is that we combined three data sources which are obtained during the online process of a mortgage-loan application. These three data sources are, data on the consumers' behavior on the web site, the information provided on the application form, and information whether the application led to a purchase.

Empirical results indicate that our set of four determinants provide a useful framework to investigate purchases of complex services using the Internet. Online search behavior - how a consumer searches the web site - provides valuable insights into purchase behavior of complex services. Both a direct visit to the mortgage-loan web site and an increasing fraction of time spend on this part of the web site, positively affect purchase. In addition, knowing if the applicant has also contacted competitors (competitive search behavior) is valuable information as this reduces the likelihood of a purchase. Trust, conceptualized as privacy, indicates a negative effect on purchase. Product knowledge - obtained via previous purchases - positively influences the purchases of complex services. The latter is in line with findings in the literature on other types of products in an offline or an online setting. In addition, estimation results indicate that a spouse is of importance and, interestingly, in general of negative influence.

An important application of our study is the ability to derive criteria for customer selection. The internet is a very convenient channel for information search. The option

to distinguish those customers with 'true' online-purchase intensions from those that just want to obtain information, may lead to a higher level of efficiency and subsequently a decrease in operational costs. The outcomes of our study can be used to select mortgage loan applicants on the likelihood of purchase or on the expected revenue related to an application. In Chapter 3 we provided an example for both criteria, applied to the sample of applications available to us.

A limitation of this study is that we did not obtain information on the phase between application and final decision. That is, we only observed the online application and the final decision. In addition, we had no information on previous visits to the web site of mortgage-loan applicants, which may be very informative. An issue for further research includes a study on the benefits of offering mortgage loans online. Such a study should indicate if the decision-making process for acquiring mortgage loans is more efficient when the Internet is used.

In Chapter 4 we studied the effect of the quality of a recommendation agent on consumer decision-making. The number of such recommendation agents on the Internet is increasing and the agent's quality is an important aspect of the e-service offered. We know that the quality of these recommendation agents differs and that recommendations made are not perfect. We considered two types of recommendation agents, one that ranks alternatives and one that selects alternatives. Ranking is currently the most common recommendation agent present on the Internet. However, selecting information is becoming more common as well.

We postulated 6 sets of hypotheses on the effect a recommendation agent may have on consumer decision-making and how these effects may depend on the recommendation quality. We postulated hypotheses on the effect on effort and accuracy related to a decision. In addition, we postulated hypothesis on the effect on four levels of satisfaction, which are, product, decision, system and overall satisfaction. Concerning the hypotheses on accuracy we made a distinction between a revealed and an experienced level, in contrast to the hypotheses on effort. Experienced accuracy derived from a selection of alternatives is a realization of consumer's revealed accuracy and agent's revealed accuracy. Experienced effort levels are a realization of revealed consumer effort.

To test our hypotheses we conducted a controlled experiment where participants took part in a pre-defined choice task. We distinguished five between-subject cases, which are, a non-aided task, a high and low-quality ranking task, and a high and low-quality selection task. Recommendations were derived from a utility model that determines an overall utility score for each alternative on provided preference ratings. This overall score was

subsequently used to rank or to select alternatives. The quality of both recommendation agents was manipulated by adding a random 'error'-term to this overall utility score. The magnitude of this term was in such order that indeed the quality of the recommendations was reduced, but that the agent remained an improvement over a random ordered list and a random selection.

Findings of our study indicate that the effect of a recommendation agent on consumer decision-making can depend on the quality of this agent. However, this effect of agent's quality is dependent on the type of recommendation agent. Moreover, there are clear differences between revealed (demonstrated) and perceived (experienced) behavior of consumers. A low-quality ranking counteracts the reduction in revealed effort and accuracy of a high-quality ranking. However, consumers did not perceive this low-quality of the ranking as such. Both the low and high-quality rankings were perceived equally beneficial in terms of effort and accuracy.

The selection of alternatives provides a clear reduction in information which was translated in a reduction of effort and an increase in accuracy. These benefits are, similar to effort, counteracted by a low-quality selection. However, it is likely that this effect is not a result from changes in consumer decision-making, but is purely a result of the change in quality of the selection. That is, consumers do not use different decision processes for the low and high-quality selection cases. Consumers will in general not perceive the quality of a selection as they have no information on all available alternatives. This proposition is supported by the finding that experienced effort and accuracy levels did not change when a high or low-quality selection was recommended.

Concerning the effect on satisfaction levels our findings indicate that a ranking of alternatives increases the satisfaction with the system and a low-quality ranking counteracts this effect. In contrast and surprisingly, a recommended selection, high or low quality, has no effect on system satisfaction. In addition, overall satisfaction is hardly influenced by system satisfaction reducing the impact of recommendation quality. Product and especially decision satisfaction are the more important determinants of overall satisfaction. Both these types of attribute satisfaction were not affected by a ranking or a selection agent of high or low quality.

Some limitations may hold for our study. The stimuli of ranking or selecting from a list of 12 products may not be strong enough to significantly demonstrate effects on consumer behavior. In addition, the absence of effects on experienced effort and accuracy levels may be an outcome of our full between-subject design and therefore context related.

An issue for further research is the inclusion of consumer's trust in the study. Trust is likely to be closely related to the perception of the quality of the agent as well as to the use of it. In addition, we have not included consumer expectations of the recommendation agent in our study. Another issue for further research concerns consumer preferences, which may not be well-defined and easily influenced (constructive preferences). The decision environment may therefore be perceived as it is, yielding no differences in effort and accuracy perceptions.

In Chapter 5 we focussed on the development of a new method to identify decision strategies in an environment like the Internet. This study emerged from the question whether recommendation agents can affect decision-strategy usage. The decision strategy is an important element in decision-making as it determines the method and intensity of information processing and consequently the accuracy of the decision.

The objective of this study was to develop a method, which consists of a short and simple questionnaire, to identify decision strategies. The two existing methods for strategy identification have clear limitations. The verbal-protocol method relies on the quality and completeness of recorded statements. Self-stated usage is dependent on the expertise, skills, and motivation of the participant. Therefore, it is desirable to develop a method less reliable on participants and judges skills or experimental settings.

To identify a decision strategy we proposed to measure an indicator of each strategy instead of measuring the whole decision strategy. This indicator is accordingly derived from a unique characteristic of the decision strategy. This framework reduces the length of a questionnaire considerably.

We started with an initial list of items for our questionnaire. This list was extended and refined according to statements on open-ended questions of a small study. In addition, two experts judged the quality of this initial list. As we desired a small number of items and the initial list of items was purified and reduced with a second study. This yielded a solution of two items per strategy.

A follow-up study was conducted to investigate the performance of our scale compared to both existing identification methods. This analysis revealed considerable differences between the three methods. However, our scale matched better with the two existing methods than that these matched with each other. These results demonstrate again the complexity of identifying decision strategies. Furthermore, these differences may indicate that the limitations of the verbal-protocol method and self-stated usage may have had a considerable impact.

Finally, a fourth study was conducted to obtain insights on reliability and validity of our scale. For this purpose different experimental settings were taken into account. We altered the number of alternatives and increased time pressure. However, the analysis of this fifth study revealed that the reliability and validity of the developed list of items was not satisfactory.

Still, the developed framework of focusing on an indicator of a strategy instead of focusing on the whole strategy provides a sound basis for further research. However, items should be revised with an even stronger focus on the identification of *1* unique characteristic of a decision strategy. An additional issue for further research is that although selected items represent the corresponding strategy they may not represent the same unique characteristic of that strategy. Consequently, researchers may consider the formative paradigm for scale development compared to the reflective paradigm we applied. The formative paradigm states that a decision strategy is formed by its characteristics instead of that the decision strategy reflects on its characteristics.

# Nederlandse samenvatting (Summary in Dutch)

Het internet heeft de wereld in een rap tempo veroverd. Het is een ideaal medium voor communicatie, marketing en distributiedoeleinden. Een interessant kenmerk van het internet is dat, door de bezoeken aan websites te registreren, er een waardevolle bron van informatie ontstaat over online consumentengedrag (*clickstream data*). Deze informatie kan vervolgens gebruikt worden om producenten en consumenten te assisteren in hun beslissingsprocessen.

Ondanks het veelvuldige gebruik van het internet zijn bepaalde aspecten van consumentengedrag in relatie tot het internet vooralsnog onduidelijk. In dit proefschrift zijn enkele van deze aspecten onderzocht, welk we hieronder hoofdstuksgewijs zullen bespreken.

In hoofdstuk 2 is de aantrekkelijkheid van een kanaal, zoals het internet of een winkel, onderzocht voor het zoeken van informatie en het aankopen van producten. Deze studie is ontstaan uit de waarneming dat consumenten steeds vaker meerdere kanalen gebruiken. Een goed voorbeeld hiervan is de consument die het internet gebruikt voor het verzamelen van informatie en uiteindelijk het product koopt in een 'klassieke' winkel om de hoek. Dit fenomeen is ook wel bekend onder de naam *research shopper*. Een vooruitstrevendheid van deze studie is dat de aantrekkelijkheid van een kanaal voor zowel zoek- als aankoopdoeleinden en voor meerdere kanalen onderzocht wordt. Andere studies richten zich gebruikelijk op één taak of op één kanaal.

Data voor deze studie werd verzameld middels een enquête uitgevoerd in samenwerking met *MarketResponse*. We hebben daarbij onderscheid gemaakt tussen vier kanalen: de winkel, het internet, de telefoon en de catalogus. Daarnaast hebben wij ook onderscheid gemaakt tussen zeven productcategorieën: boeken, kleding, computers, elektronische apparaten, ziektekostenverzekeringen, vakanties en hypotheken. Deelnemers aan de enquête zijn daarbij ondervraagd op veertien kanaaleigenschappen: assortiment, prijs, promotie,

informatie, clientèle, service, gemak, plezier, risico, privacy, tijd, kosten, onderhandeling en service na aankoop. In totaal is een verzameling van 389 observaties verkregen.

Schattingresultaten geven significante effecten aan voor verscheidene kanaaleigenschappen op de aantrekkelijkheid voor zoek- en aankoopdoeleinden. Het assortiment, risico geassocieerd met een kanaal en het plezier in het gebruik van een kanaal zijn aantrekkelijke eigenschappen voor zowel zoek als aankoopdoeleinden. Informatie en gemak zijn pure zoekeigenschappen. After-sales service is een pure aankoopeigenschap van een kanaal. De resterende eigenschappen hadden geen significant aantoonbaar effect op zoek- en aankoopaantrekkelijkheid van een kanaal.

Gelet op de vier kanalen meegenomen in onze studie, geven resultaten aan dat de 'klassieke' winkel nog steeds het meest aantrekkelijk is voor zoek en aankoopdoeleinden. Het internet is bezig met een inhaalslag, vooral wat betreft het zoeken van informatie. Gebruik van het internet voor aankoopdoeleinden wordt (nog steeds) gehinderd door onzekerheden op het gebied van privacy en risico's. Een catalogus wordt niet als zeer aantrekkelijk ervaren wat ook geldt voor de telefoon. Maar de telefoon wordt wel gezien als een ideaal aanvulling op de andere kanalen.

In hoofdstuk 3 bespreken we een studie naar hypotheekaanvragen via het internet, als een voorbeeld van een complex product. Complexe producten kenmerken zich door de vele mogelijkheden per productattribuut, zijn vaak op maat gemaakt, worden infrequent gekocht, zijn moeilijk te begrijpen en bij de aankoop is vaak assistentie nodig. De complexiteit van dit soort producten kan ervoor zorgen dat ze vanuit commercieel oogpunt minder geschikt zijn voor verhandeling via het internet. Het aantal complexe producten op het internet is vooralsnog beperkt en het aantal aanbieders nog beperkter.

Wij hebben vier verzamelingen van determinanten geïdentificeerd om de aankoop van een complex product te verklaren. De eerste determinant is zoekgedrag, waarbij we onderscheid maken tussen online en competitief zoekgedrag. De andere drie determinanten zijn vertrouwen, product kennis en socio-demografische kenmerken. Een vooruitstrevendheid van onze studie is daarbij dat wij drie bronnen van data combineren die zijn ontstaan gedurende het proces van een hypotheekaanvraag op het internet. Deze drie bronnen zijn (1) data over het gedrag van de aanvrager op de website, (2) de informatie ingevuld op het aanvraagformulier en (3) informatie of de aanvraag heeft geleid tot het afsluiten van de hypotheek.

Resultaten van deze studie geven aan dat onze opzet van vier typen determinanten goed werkt voor het onderzoeken van online aankopen van complexe producten. Het zoekgedrag op de website - een direct bezoek aan de hypotheekafdeling van de website

en het aandeel van de tijd doorgebracht op de hypotheekafdeling - beïnvloedt de kans op aankoop in positieve zin. Daarnaast beïnvloedt competitief zoekgedrag - weten of de aanvrager ook contact heeft met concurrenten - de kans op een aankoop negatief. Vertrouwen - vormgegeven als privacy - heeft ook een negatief effect. Product kennis - verkregen door eerdere aankopen - daarentegen is van positieve invloed op de aankoopkans. Daarnaast blijkt een partner een belangrijke en interessante negatieve invloed te hebben om een hypotheek af te sluiten via het internet.

Een belangrijke toepassing van onze studie is de mogelijkheid om criteria op te stellen voor selectie van klanten. Het internet is een handig middel voor snelle informatieverzameling. Het is zodoende waardevol om de informatiezoekers te kunnen scheiden van consumenten die werkelijk de intentie hebben om een product te kopen. Dit kan leiden tot een hoger efficiencyniveau en daarmee tot lagere operationele kosten voor een bedrijf. Onze resultaten kunnen gebruikt worden om hypotheekaanvragen te selecteren op de kans van afsluiten of de verwachte opbrengst. In onze studie geven wij een voorbeeld van beide selectie criteria.

In hoofdstuk 4 hebben wij het effect van de kwaliteit van aanbevelingen op consumentengedrag onderzocht. Op het internet neemt het aantal aanbevelingssystemen toe. De aanbeveling "Andere consumenten die dit product kochten, kochten ook ..." is algemeen bekend. De kwaliteit van een aanbevelingssysteem is een belangrijk onderdeel van de e-service die geboden wordt. Deze kwaliteit kan echter om meerdere redenen verschillen. We hebben het effect van verschillen in de kwaliteit voor twee systemen onderzocht: een systeem die producten rangschikt en een systeem die een selectie van producten maakt. Het rangschikken van alternatieven is momenteel het meest voorkomende systeem op het Internet.

We hebben zes sets van hypothesen geformuleerd over het effect van een aanbevelingssysteem en hoe dit effect afhankelijk is van de kwaliteit van de aanbeveling. We hebben daarbij hypothesen opgesteld over het effect op inzet (effort) van de consument en de nauwkeurigheid (accuracy) van de beslissing. Daarnaast hebben wij ook hypothesen opgesteld over het effect op vier niveau's van tevredenheid: product-, beslissings-, systeem-, en totale tevredenheid. Wat betreft de hypothesen over nauwkeurigheid hebben we een onderscheid gemaakt tussen getoonde en door de consument ervaren nauwkeurigheid. Ervaren nauwkeurigheid is daarbij een realisatie van getoonde nauwkeurigheid van de consument en die van het systeem.

Om onze hypothesen te kunnen testen hebben we een gecontroleerd experiment uitgevoerd. Participanten aan het experiment hebben deelgenomen aan een vooraf gedefi-

nieerde keuze-opdracht. Daarbij hebben we onderscheid gemaakt tussen 5 situaties: (1) geen hulp, (2&3) hoge en lage kwaliteit rangschikking, en (4&5) hoge en lage kwaliteit selectie. De lage kwaliteit van de rangschikking en selectie was dusdanig dat de aanbevelingen verslechterden maar wel een verbetering bleven ten opzichte van een willekeurige gerangschikte lijst of een willekeurige selectie.

Bevindingen van onze studie laten zien dat het effect van een aanbevelingssysteem op consumentengedrag afhankelijk is van de kwaliteit van het systeem. Dit resultaat verschilt wel tussen de twee typen systemen. Daarnaast zijn er ook duidelijke verschillen tussen getoond en ervaren gedrag van consumenten. Een lage kwaliteit rangschikking werkt bijvoorbeeld de reductie in inzet door een hoge kwaliteit rangschikking tegen. Daarnaast verlaagt een lage kwaliteit rangschikking de nauwkeurigheid van de beslissing. Consumenten beleefden deze lage kwaliteit echter niet als dusdanig. Zowel de lage als hoge kwaliteit rangschikking werden op gelijke wijze ervaren.

De selectie van alternatieven geeft een duidelijke reductie in informatie wat leidt tot een reductie in inzet en een toename in nauwkeurigheid. Deze voordelen van een selectie van alternatieven wordt volledig teniet gedaan door een lage kwaliteit selectie. Dit effect kan echter puur het gevolg zijn van de verandering in kwaliteit van het systeem dan dat er ook een verandering in consumentengedrag heeft plaatsgevonden. Dit kan erop duiden dat consumenten geen verschillende beslissingsprocessen gebruiken voor een lage en hoge kwaliteit selectie. Een consument heeft een referentiekader nodig en kan bij afwezigheid van dit kader de selectie accepteren zoals deze gepresenteerd is. Deze gedachte wordt ondersteund door de bevinding dat de ervaren inzet door de consument niet verandert bij een lage of hoge kwaliteit selectie.

Onze resultaten geven ook aan dat een rangschikking van alternatieven de tevredenheid doet toenemen met het systeem en een lage kwaliteit rangschikking dit effect volledig teniet doet. Daarentegen een laag of hoge kwaliteit selectie heeft geen effect op de tevredenheid met het systeem. Doordat de totale tevredenheid nauwelijks beïnvloed wordt door systeemtevredenheid is het effect van de kwaliteit van het systeem hierop beperkt. Product en vooral beslissingstevredenheid zijn van groter belang voor totale tevredenheid. Deze worden echter niet aantoonbaar significant beïnvloedt door kwaliteitsverschillen in het aanbevelingssysteem.

In hoofdstuk 5 hebben wij ons gericht op het opzetten van een nieuwe methode voor het meten van beslissingsstrategieën die beter geschikt is voor een elektronische omgeving dan bestaande methoden. Deze studie resulteerde uit de vraag of aanbevelingssystemen ook het gebruik van beslissingsstrategieën kunnen beïnvloeden. Bestaande methoden

hebben duidelijke beperkingen. De 'verbal-protocol' methode is sterk afhankelijk van de kwaliteit en compleetheid van opgenomen uitspraken van deelnemers aan het experiment en de expertise van onafhankelijke beoordelaars van deze uitspraken. 'Self-stated usage' is afhankelijk van de expertise, vaardigheden en motivatie van de deelnemer aan het experiment.

De beslissingsstrategie is een belangrijk element in het beslissingsproces, want de strategie bepaalt de manier en intensiteit van informatieverwerking en uiteindelijk de nauwkeurigheid van de beslissing. Om een strategie te kunnen identificeren stellen wij voor om een indicator van een strategie te meten in plaats van de gehele strategie. Deze indicator kan afgeleid worden uit unieke karakteristieken van een strategie.

Het doel van deze studie was een methode te ontwikkelen die bestaat uit een korte en simpele vragenlijst. Met behulp van meerdere experimenten is een vragenlijst samengesteld met twee vragen per strategie. Een vervolgstudie werd uitgevoerd om te onderzoeken hoe onze vragenlijst zich verhoudt tot de twee bestaande methoden. Deze analyse liet zien dat er aanzienlijke verschillen zijn tussen de drie methoden. Echter, onze vragenlijst komt beter overeen met beide methoden dan deze methoden met elkaar overeenkomen. Uiteindelijk is een vijfde experiment uitgevoerd om inzicht te krijgen in de betrouwbaarheid en validiteit van de vragenlijst. De resultaten van deze analyse geven aan de betrouwbaarheid en validiteit niet naar tevredenheid is en verder onderzoek noodzakelijk is. De onderzoeksopzet van het meten van een indicator in plaats van een gehele strategie geeft een goede basis voor dit vervolgonderzoek.

# Bibliography


Aksoy, L., P. N. Bloom, N. H. Lurie, and B. Cooil (2006), Should Recommendation Agents Think Like People?, *Journal of Service Research*, **8**, 291–315.

Alba, J. W. and J. W. Hutchinson (1987), Dimensions of Consumer Expertise, *Journal of Consumer Research*, **13**, 411–454.

Alba, J. W., J. G. Lynch, B. Weitz, C. Janiszewski, R. Lutx, A. Sawyer, and S. Wood (1997), Interactive Home Shopping: Consumer, Retailer, and Manufacturer Incentives to Paticipate in Electronic Marketplaces, *Journal of Marketing*, **61**, 38–53.

Ancarani, F. and V. Shankar (2004), Price Levels and Price Dispersion within and Across Multiple Retailer Types: Futher Evidence and Extensions, *Journal of the Academy of Marketing Science*, **32**, 176–187.

Anderson, J. C. and D. W. Gerbing (1988), Structural Equation Modeling in Practice: A Review and Recommended Two-Step Approach, *Psychological Bulletin*, **103**, 411–423.

Anderson, R. E. and S. S. Srinivasan (2003), E-Satisfaction and E-Loyalty: A Contingency Framework, *Psychology & Marketing*, **20**, 123–138.

Ansari, A., S. Essegaier, and R. Kohli (2000), Internet recommendation systems, *Journal of Marketing Research*, **27**, 363–375.

Ansari, A. and C. F. Mela (2003), E-Customization, *Journal of Marketing Research*, **40**, 131–145.

Ansari, A., C. F. Mela, and S. A. Neslin (2005), Customer Channel Migration, Tech. rep., Fuqua School of Business, Duke University.

Ariely, D. (2000), Controlling the information flow: Effects on consumers' decision making and preferences, *Journal of Consumer Research*, **27**, 233–248.

Bagozzi, R. P. and Y. Yi (1988), On the Evaluation of Structural Equation Models, *Journal of the Academy of Marketing Science*, **16**, 74–94.

Baker, J., A. Parasuraman, D. Grewal, and G. B. Voss (2002), The Influence of Multiple Store Environment Cues on Perceived Merchandise Value and Patronage Intentions, *Journal of Marketing*, **66**, 120–141.

Bakos, J. Y. (1997), Reducing Buyer Search Costs: Implications for Electronic Marketplaces, *Management Science*, **43**, 1676–1692.

Ball, C. (1997), A Comparison of Single-Step and Multiple-Step Transition Analysis of Multiattribute Decision Strategies, *Organizational Behavior and Human Decision Processes*, **69**, 195–204.

Baumgartner, H. and C. Homburg (1996), Applications of structural equation modeling in marketing and consumer research: A review, *International Journal of Research in Marketing*, **13**, 139–161.

Bazerman, M. H. (2001), Consumer Research for Consumers, *Journal of Consumer Research*, **27**, 499–504.

Bearden, W. O. and R. G. Netemeyer (1999), *Handbook of Marketing Scales: Multi-Item Measures for Marketing and Consumer Behavior Research*, second edn., Sage Publications, Thousand Oaks, California.

Beatty, S. E. and M. E. Ferrell (1998), Impulse Buying: Modeling Its Precursors, *Journal of Retailing*, **74**, 169–191.

Bechwati, N. N. and L. Xia (2003), Do Computers Sweat? The Impact of Perceived Effort of Online Decision Aids on Consumers' Satisfaction With the Decision Process, *Journal of Consumer Psychology*, **13**, 139–148.

Bell, D. R., T.-H. Ho, and C. S. Tang (1998), Determining Where to Shop: Fixed and Variable Costs of Shopping, *Journal of Marketing Research*, **35**, 352–369.

Bell, D. R. and J. M. Lattin (1998), Shopping Behavior and Consumer Preference for Store Price Format: Why "Large Basket" Shoppers Prefer EDLP, *Marketing Science*, **17**, 66–88.

Benbasat, I. and B. R. Nault (1990), An Evaluation of Empirical Research on Managerial Supports Systems, *Decision Support Systems*, **6**, 203–226.

Bettman, J. R., E. J. Johnson, and J. W. Payne (1990), A Componential Analysis of Cognitive Effort in Choice, *Organizational Behavior and Human Decision Processes*, **45**, 111–139.

Bettman, J. R., M. F. Luce, and J. W. Payne (1998), Constructive Consumer Choice Processes, *Journal of Consumer Research*, **1998**, 187–217.

Bettman, J. R. and M. A. Zins (1979), Information Format and Choice Task Effects in Decision Making, *Journal of Consumer Research*, **6**, 141–153.

Bhatnagar, A. and B. T. Ratchford (2004), A model of retail format competition for non-durable goods, *International Journal of Research in Marketing*, **21**, 39–59.

Biswas, D. (2004), Economics of Information in the Web Economy: Towards a new theory?, *Journal of Business Research*, **57**, 724–733.

Blattberg, R., C. Kim, and S. A. Neslin (2004), Database marketing, forthcoming.

Bolton, R. N., K. N. Lemon, and P. C. Verhoef (2004), The theoretical Underpinnings of Customer Asset Management, *Journal of the Academy of Marketing Science*, **32**, 271–292.

Brynjolfsson, E. and M. D. Smith (2000), Frictionless Commerce? A Comparison of Internet and Conventional Retailers, *Management Science*, **46**, 563–585.

Bucklin, R. E. and C. Sismeiro (2003), A Model of Web Site Browsing Behavior Estimated on Click Stream Data, *Journal of Marketing Research*, **40**.

Bult, J. R. and T. Wansbeek (1995), Optimal Selection for Direct Mail, *Marketing Science*, **14**, 378–394.

Childers, T. L., C. L. Carr, J. Peck, and S. Carson (2001), Hedonic and Utilitarian Motives for Online Retail Shopping Behavior, *Journal of Retailing*, **77**, 511–535.

Chu, P. C. and E. E. Spires (1999), Cross-Cultural Differences in Choice Behavior and Use of Decision Aids: A Comparison of Japan and the United States, *Organizational Behavior and Human Decision Processes*, **77**, 147–170.

Chu, P. C. and E. E. Spires (2000), The Joint Effects of Effort and Quality on Decision Strategy Choice with Computerized Decision Aids, *Decision Sciences*, **31**, 259–292.

Chu, P. C. and E. E. Spires (2001), Does Time Constrain on Users Negate the Efficacy of Decision Support Systems?, *Organizational Behavior and Human Decision Processes*, **85**, 226–249.

Chu, P. C. and E. E. Spires (2003), Perceptions of accuracy and effort of decision strategies, *Organizational Behavior and Human Decision Processes*, **91**, 203–214.

Churchill Jr., G. A. (1979), A Paradigm for Developing Better Measures of Marketing Constructs, *Journal of Marketing Research*, **16**, 64–73.

Darian, J. C. (1987), In-home shopping are there Consumer Segments, *Journal of Retailing*, **63**, 163–186.

Davis, H. L. and B. P. Regeaux (1974), Perception of Marital Roles in Decision Processes, *Journal of Consumer Research*, **1**, 51–62.

Davis, R., M. Buchanan-Oliver, and R. J. Brodie (2000), Retail Service Branding in Electronic Commerce Environments, *Journal of Service Research*, **3**, 178–186.

Degeratu, A. M., A. Rangaswamy, and J. Wu (2000), Consumer Choice Behavior in Online and Traditional Supermarkets: The Effect of Brand Name, Price, and Other Search Attributes, *International Journal of Research in Marketing*, **17**, 55–78.

Diamantopoulos, A. and H. W. Winklhofer (2001), Index Construction with Formative Indicators: An Alternative to Scale Development, *Journal of Marketing Research*, **38**, 269–277.

Dickson, J. and G. Albaum (1977), A Method for Developing Tailormade Semantic Differantials for Specific Marketing Content Areas, *Journal of Marketing Research*, **14**, 87–91.

Diehl, K. (2005), When Two Rights Make a Wrong: Searching Too Much in Ordered Environments, *Journal of Marketing Research*, **42**, 313–322.

Diehl, K., L. J. Kornish, and J. G. Lynch (2003), Smart Agents: When Lower Search Costs for Quality Information Increase Price Sensitivity, *Journal of Consumer Research*, **30**, 56–71.

Diehl, K. and G. Zauberman (2005), Searching Ordered Sets: Evaluations from Sequences under Search, *Journal of Consumer Research*, **31**, 824–832.

Evanschitzky, H., G. R. Iyer, J. Hesse, and D. Ahlert (2004), E-satisfaction: a re-examination, *Journal of Retailing*, **80**, 239–247.

Fennema, M. G. and D. N. Kleinmuntz (1995), Anticipations of Effort and Accuracy in Multiattribute Choice, *Organizational Behavior and Human Decision Processes*, **63**, 21–32.

Forsythe, S. M. and B. Shi (2003), Consumer patronage and risk perceptions in Internet shopping, *Journal of Business Research*, **56**, 867–875.

Fox, E. J., A. L. Montgomery, and L. M. Lodish (2004), Consumer Shopping and Spending Across Retail Formats, *Journal of Business*, **77**, S25–S60.

Franses, P. H. and R. Paap (2001), *Quantitative Models in Marketing Research*, Cambridge University Press, Cambridge.

Geyskens, I., K. Gielens, and M. G. DeKimpe (2002), The Market Valuation of Internet Channel Additions, *Journal of Marketing*, **66**, 102–119.

Geyskens, I., J.-B. E. M. Steenkamp, and N. Kumar (1998), Generalizations about trust in marketing channel relationships using meta-analysis, *International Journal of Research in Marketing*, **15**, 223–248.

Gotlieb, J. B., D. Grewal, and S. W. Brown (1994), Consumer Satisfaction and Perceived Quality: Complementary or Divergent Constructs, *Journal of Applied Psychology*, **79**, 875–885.

Greene, W. H. (1993), *Econom*tric *Analysis*, Prentice Hall Inc., New- Jersey.

Gupta, A., B. Su, and Z. Walter (2004), An Emperical Study of Consumer Switching from Traditional to Electronic Channels: A Purchase-Decision Process Perspective, *International Journal of Electronic Commerce*, **8**, 131–161.

Häubl, G. and V. Trifts (2000), Consumer Decision Making in Online Shopping Environments: The Effects of Interactive Decision Aids, *Marketing Science*, **19**, 4–21.

Heckman, J. J. (1976), The Common Structure of Statistical Models of Truncation, Sample Selection and Limited Dependent Variables and a Simple Estimator for Such Models, *Annals of Economic and Social Measurement*, **5**, 475–492.

Hoffman, D. L. and T. P. Novak (1996), Marketing in Hypermedia Computer-Mediated Environments: Conceptual foundations, *Journal of Marketing*, **60**, 50–68.

Homburg, C., W. D. Hoyer, and M. Fassnacht (2002), Service Orientation of a Retailer's Business Strategy: Dimensions, Antecedents, and Performance Outcomes, *Journal of Marketing*, **66**, 86–101.

Inman, J. J., V. Shankar, and R. Ferraro (2004), The Roles of Channel-Category Associations and Geodemographics in Channel Patronage, *Journal of Marketing*, **68**, 51–71.

Jarvis, C. B., S. B. MacKenzie, and P. M. Podsakoff (2003), A Critical Review of Construct Indicators and Measurement Model Misspecification in Marketing and Consumer Research, *Journal of Consumer Research*, **30**, 199–277.

Johnson, E. J., W. W. Moe, P. S. Fader, S. Bellman, and G. L. Lohse (2004), On the Depth and Dynamics of Online Search Behavior, *Management Science*, **50**, 299–308.

Kelley, C. (2002), Capturing Cross-Channel Dollars.

Kiang, M. Y., T. S. Raghu, and K. H.-M. Shang (2000), Marketing on the Internet - Who Can Benefit from an Online Marketing Approach?, *Decision Support Systems*, **27**, 383–393.

Kleinmuntz, D. N. and D. A. Schkade (1993), Information Displays and Decision Processes, *Psychological Science*, **4**, 221–227.

Kunkel, J. H. and L. L. Berry (1968), A behavioral Conception of Retail Image, *Journal of Marketing*, **32**, 21–27.

McKinny, V., K. Yoon, and F. M. Zahedi (2002), The Measurement of Web-Customer Satisfaction: An Expectation and Disconformation Approach, *Information Systems Research*, **13**, 296–315.

McKnight, D. H., V. Choudhury, and C. Kacmar (2002), Developing and Validating Trust Measures for E-Commerce: An Integrative Typology, *Information Systems Research*, **13**, 334–359.

Messinger, P. R. and C. Narasimhan (1997), A Model of Retail Formats Based on Consumers' Economizing on Shopping Time, *Marketing Science*, **16**, 1–23.

Moe, W. W. (2003), Buying, Searching, or Browsing; Differentiating between Online Shoppers using In-Store Navigational Clickstream, *Journal of Consumer Psychology*, **13**, 29–39.

Moe, W. W. and P. S. Fader (2003), Dynamic Conversion Behavior at E-Commerce Sites, unpublished working paper, the Wharton School.

Montoya-Weiss, M. M., G. B. Voss, and D. Grewal (2003), Determinants of Online Channel Use and Overall Satisfactin With a Relational, Multichannel Service Provider, *Journal of the Academy of Marketing Science*, **31**, 448–458.

Morton, F. S., F. Zettelmeyer, and J. Silva-Risso (2003), The Effect of Information and Institutions on Price Negotiations: Evidence from Matched Survey and Uato Transaction Data, Tech. rep., afmaken.

Nunes, P. F. and F. V. Cespedes (2003), The Customer has Escaped, *Harvard Business Review*, 96–105.

Nunnally, J. C. (1978), *Psychometric theory*, 2nd edn., McGraw-Hill Book Company.

Oliver, R. L. (1993), Cognitive, Affective, and Attribute Bases of the Satisfaction Response, *Journal of Consumer Research*, **20**, 418–430.

Oliver, R. L. (1999), Whence Consumer Loyalty?, *Journal of Marketing*, **63**, 33–44.

Paquette, L. and T. Kida (1988), The Effect of Decision Strategy and Task Complexity on Decision Performance, *Organizational Behavior and Human Decision Processes*, **41**, 128–142.

Park, C. and J.-K. Jun (2003), A cross-cultural comparison of Internet buying behavior; Effects of Internet usage, perceived risks, and innovativeness, *International Marketing Review*, **20**, 534–553.

Park, C. W., E. S. Iyer, and D. C. Smith (1989), The Effects of Situational Factors on In-Store Grocery Shopping Behavior: The Role of Store Environment and Time Available for Shopping, *Journal of Consumer Research*, **15**, 422–433.

Payne, J. W. (1976), Task Complexity and Contingent Processing in Decision Making: An Information Search and Protocol Analysis, *Organizational Behavior and Human Decision Processes*, **16**, 366–387.

Payne, J. W. (1982), Contingent Decision Behavior, *Psychological Bulletin*, **92**, 382–402.

Payne, J. W., J. R. Bettman, and E. J. Johnson (1993), *The Adaptive Decision Maker*, Cambridge University Press, New York, USA.

Payne, J. W., J. R. Bettman, and M. F. Luce (1996), When Time is Money: Decision Behavior under Opportunity-Cost Time Pressure, *Organizational Behavior and Human Decision Processes*, **66**, 131–152.

Pedersen, P. E. (2000), Behavioral Effects of Using Software Agents for Product and Merchant Brokering; An experimental study of consumer decision-making, *International Journal of Electronic Commerce*, **5**, 125–141.

Peterson, R. A., S. Balasubramanian, and B. J. Bronnenberg (1997), Exploring the Implications of the Internet for Consumer Marketing, *Journal of the Academy of Marketing Science*, **25**, 329–346.

Rash, S. and A. Linter (2001), The Multichannel consumer: The need to Integrate Online and Offline Channels in Europe, Tech. rep., Boston Consultancy Group, München.

Ratchford, B. T., M.-S. Lee, and D. Talukdar (2003), The Impact of the Internet on Information Search for Automobiles, *Journal of Marketing Research*, **40**, 193–209.

Ratchford, B. T., D. Talukdar, and M.-S. Lee (2001), A Model for Consumer Choice of the Internet as Information Source, *International Journal of Electronic Commerce*, **5**, 7–21.

Reinartz, W., J. S. Thomas, and V. Kumar (2005), Balancing Acquisition and Retention Resources to Maximize Customer Profitability, *JM*, **69**, 193–209.

Roberts, J. H. and J. M. Lattin (1997), Consideration: review of research and prospects for future insights, *Journal of Marketing Research*, **34**, 406–410.

Rossiter, J. R. (2002), The C-OAR-SE procedure for scale development in marketing, *International Journal of Research in Marketing*, **19**, 305–335.

Rust, R. T. and K. N. Lemon (2001), E-service and the conusmer, *International Journal of Electronic Commerce*, **5**, 85–101.

Rust, R. T. and A. J. Zahorik (1993), Customer Satisfaction, Customer Retention, and Market Share, *Journal of Retailing*, **69**, 193–215.

Samli, A. C., J. P. Kelly, and H. Hunt (1998), Improving the Retail Performance by Constrating Management- and Customer-Perceived Store Images: A Diagnostic Tool for Corrective Action, *Journal of Business Research*, **43**, 27–38.

Shankar, V., A. K. Smith, and A. Rangaswamy (2003), Customer Satisfaction and loyalty in online and offline environements, *International Journal of Research in Marketing*, **20**, 153–175.

Shugan, S. M. (1980), The Cost of Thinking, *Journal of Consumer Research*, **7**, 99–111.

Spreng, R. A., S. B. Mackenzie, and R. W. Olshavsky (1996), A Reexamination of the Determininants of Consumer Satisfaction, *Journal of Marketing*, **60**, 15–32.

Srinivasan, N. and B. T. Ratchford (1991), An Emperical Test of a Model of External Search for Automobiles, *Journal of Consumer Research*, **18**, 233–242.

Steenkamp, J.-B. E. M. and M. Wedel (1991), Segmenting Retail Markets on Store Image Using a Consumer-Based Methodology, *Journal of Retailing*, **67**, 300–320.

Stewart, K. A. and A. H. Segars (2002), An Empirical Examination of the Concern for Information Privacy Instrument, *Information Systems Research*, **13**, 36–49.

Stone, M., M. Hobbs, and M. Khaleeli (2002), Multichannel Customer Managements: The Benefits and Challenges, *Journal of Database Marketing*, **10**, 39–52.

Strebel, J., T. Erdem, and J. Swait (2004), Consumer Search in High Technology Markets: Exploring the Use of Traditional Information Channels, *Journal of Consumer Psychology*, **14**, 96–104.

Su, C., E. F. Fern, and K. Ye (2003), A Temporal Dynamic Model of Spousal Family Purchase-Decision Behavior, *Journal of Marketing Research*, **40**, 268–281.

Todd, P. and I. Benbasat (1991), An Experimental Investigation of the Impact of Computer Based Decision Aids on Decision Making Strategies, *Information Systems Research*, **2**, 87–115.

Todd, P. and I. Benbasat (1994), The Influence of Decision Aids on Choice Strategies: An Experimental Analysis of the Role of Cognitive Effort, *Organizational Behavior and Human Decision Processes*, **60**, 36–74.

Todd, P. and I. Benbasat (1999), Evaluating the Impact of DSS, Cognitive Effort, and Incentives on Strategy Selection, *Information Systems Research*, **10**, 356–374.

U.S. Census Bureau (2003), Retail E-Commerce Sales in First Quarter 2003, http://www.census.gov/mrts/www/mrts.html.

Van Kenhove, P., K. De Wulf, and W. Van Waterschoot (1999), The Impact of Task Definition on Store-Attribute Saliences and Store Choice, *Journal of Retailing*, **75**, 125–137.

Vekatesan, R. and V. Kumar (2004), A Customer Lifetime Value Framework for Customer Selection and Resource Allocation, *JM*, **67**, 30–45.

Vermeir, I. and P. Van Kenhove (2005), The influence of need for closure and perceived time pressure on search effort for price and promotional information in a grocery shopping context, *Psychology and Marketing*, **22**, 71–72.

Vroomen, B., B. Donkers, P. C. Verhoef, and P. H. Franses (2005), Selecting Profitable Customers for Complex Services on the Internet, *Journal of Service Research*, **8**, 37–47.

Wendel, S. and B. G. C. Delleart (2005), Situation Variation in Consumers' Media Channel Consideration, working paper, Faculty of Economics and Business Administration, Maastricht University, The Netherlands.

West, P. M., D. Ariely, S. Bellman, E. Bradlow, J. Huber, E. J. Johnson, B. Kahn, J. Little, and D. A. Schkade (1999), Agents to the Rescue?, *Marketing Letters*, **10**, 285–300.

Yoo, C., J. Park, and D. J. MacInnes (1998), Effects of Store Characteristics and In-Store Emotional Experiences on Store Attitude, *Journal of Business Research*, **42**, 253–263.

Zimmer, M. R. and L. L. Golden (1988), Impressions of Retail Sores: A Content analysis of Consumer Images, *Journal of Retailing*, **64**, 265–291.

# Author index

# Curriculum Vitae

Björn Leon Kristian Vroomen (1976) obtained his masters' degree in econometrics in 2000 from the Erasmus University Rotterdam. In that same year he joined ERIM as a Ph.D.-candidate in order to carry out his doctoral research on the subject of consumer decision making in relation to the Internet. His research resulted in several publications in international journals. Björn is affiliated with the CPB Netherlands Bureau for Economic Policy Analysis as of September 2004.

Erasmus Research Institute of Management

## ERIM Ph.D. Series Research in Management

ERIM Electronic Series Portal: http://hdl.handle.net/1765/1

1. Meer, J.R., van der, *Operational Control of Internal Transport*, Promotors: Prof. dr. M.B.M. de Koster & Prof. dr. ir. R. Dekker, EPS-2000-001-LIS, ISBN: 90-5892-004-6, http://hdl.handle.net/1765/85
2. Fleischmann, M., *Quantitative Models for Reverse Logistics*, Promotors: Prof. dr. ir. J.A.E.E. van Nunen & Prof. dr. ir. R. Dekker, EPS-2000-002-LIS, ISBN: 35-4041-711-7, http://hdl.handle.net/1765/104
3. Romero Morales, D., *Optimization Problems in Supply Chain Management*, Promotors: Prof. dr. ir. J.A.E.E. van Nunen & Dr. H.E. Romeijn, EPS-2000-003-LIS, ISBN: 90-9014078-6, http://hdl.handle.net/1765/86
4. Roodbergen, K.J., *Layout and Routing Methods for Warehouses*, Promotors: Prof. dr. M.B.M. de Koster & Prof. dr. ir. J.A.E.E. van Nunen, EPS-2001-004-LIS, ISBN: 90-5892-005-4, http://hdl.handle.net/1765/86
5. Campbell, R.A.J., *Rethinking Risk in International Financial Markets*, Promotor: Prof. dr. C.G. Koedijk, EPS-2001-005-F&A, ISBN: 90-5892-008-9, http://hdl.handle.net/1765/30
6. Chen, Y., *Labour Flexibility in China's Companies: An Empirical Study*, Promotors: Prof. dr. A. Buitendam & Prof. dr. B. Krug, EPS-2001-006-ORG, ISBN: 90-5892-012-7, http://hdl.handle.net/1765/307
7. Heugens, P.M.A.R., *Strategic Issues Management: Implications for Corporate Performance*, Promotors: Prof. dr. ir. F.A.J. van den Bosch & Prof. dr. C.B.M. van Riel, EPS-2001-007-STR, ISBN: 90-5892-009-7, http://hdl.handle.net/1765/35
8. Speklé, R.F., *Beyond Generics: A closer look at Hybrid and Hierarchical Governance*, Promotor: Prof. dr. M.A. van Hoepen RA, EPS-2001-008-F&A, ISBN: 90-5892-011-9, http://hdl.handle.net/1765/35
9. Puvanasvari Ratnasingam, P., *Interorganizational Trust in Business to Business E-Commerce*, Promotors: Prof. dr. K. Kumar & Prof. dr. H.G. van Dissel, EPS-2001-009-LIS, ISBN: 90-5892-017-8, http://hdl.handle.net/1765/35

10. Mol, M.M., *Outsourcing, Supplier-relations and Internationalisation: Global Source Strategy as a Chinese Puzzle*, Promotor: Prof. dr. R.J.M. van Tulder, EPS-2001-010-ORG, ISBN: 90-5892-014-3, http://hdl.handle.net/1765/35

11. Wolters, M.J.J., *The Business of Modularity and the Modularity of Business*, Promotors: Prof. mr. dr. P.H.M. Vervest & Prof. dr. ir. H.W.G.M. van Heck, EPS-2002-011-LIS, ISBN: 90-5892-020-8, http://hdl.handle.net/1765/92

12. Oosterhout, J., van, *The Quest for Legitimacy: On Authority and Responsibility in Governance*, Promotors: Prof. dr. T. van Willigenburg & Prof.mr. H.R. van Gunsteren, EPS-2002-012-ORG, ISBN: 90-5892-022-4, http://hdl.handle.net/1765/36

13. Koppius, O.R., *Information Architecture and Electronic Market Performance*, Promotors: Prof. dr. P.H.M. Vervest & Prof. dr. ir. H.W.G.M. van Heck, EPS-2002-013-LIS, ISBN: 90-5892-023-2, http://hdl.handle.net/1765/92

14. Vis, I.F.A., *Planning and Control Concepts for Material Handling Systems*, Promotors: Prof. dr. M.B.M. de Koster & Prof. dr. ir. R. Dekker, EPS-2002-014-LIS, ISBN: 90-5892-021-6, http://hdl.handle.net/1765/86

15. Bijman, W.J.J., *Essays on Agricultural Co-operatives: Governance Structure in Fruit and Vegetable Chains*, Promotor: Prof. dr. G.W.J. Hendrikse, EPS-2002-015-ORG, ISBN: 90-5892-024-0, http://hdl.handle.net/1765/86

16. Teunter, L.H., *Analysis of Sales Promotion Effects on Household Purchase Behavior*, Promotors: Prof. dr. ir. B. Wierenga & Prof. dr. T. Kloek, EPS-2002-016-ORG, ISBN: 90-5892-029-1, http://hdl.handle.net/1765/86

17. Loef, J., *Incongruity between Ads and Consumer Expectations of Advertising*, Promotors: Prof. dr. W.F. van Raaij & Prof. dr. G. Antonides, EPS-2002-017-MKT, ISBN: 90-5892-028-3, http://hdl.handle.net/1765/86

18. Ganzaroli, A., *Creating Trust between Local and Global Systems*, Promotors: Prof. dr. K. Kumar & Prof. dr. R.M. Lee, EPS-2002-018-LIS, ISBN: 90-5892-031-3, http://hdl.handle.net/1765/36

19. Fenema, P.C., van, *Coordination and Control of Globally Distributed Software Projects*, Promotor: Prof. dr. K. Kumar, EPS-2002-019-LIS, ISBN: 90-5892-030-5, http://hdl.handle.net/1765/36

20. Delporte-Vermeiren, D.J.E., *Improving the Flexibility and Profitability of ICT-enabled Business Networks: An Assessment Method and Tool*, Promotors: Prof. mr. dr. P.H.M. Vervest & Prof. dr. ir. H.W.G.M. van Heck, EPS-2003-020-LIS, ISBN: 90-5892-040-2, http://hdl.handle.net/1765/35

21. Wijk, R.A.J.L. van, *Organizing Knowledge in Internal Networks: A Multilevel Study*, Promotor: Prof. dr. ir. F.A.J. van den Bosch, EPS-2003-021-STR, ISBN: 90-5892-039-9, http://hdl.handle.net/1765/34

22. Peeters, L.W.P., *Cyclic Railway Timetable Optimization*, Promotors: Prof. dr. L.G. Kroon & Prof. dr. ir. J.A.E.E. van Nunen, EPS-2003-022-LIS, ISBN: 90-5892-042-9, http://hdl.handle.net/1765/42

23. Jong, C., de, *Dealing with Derivatives: Studies on the Role, Informational Content and Pricing of Financial Derivatives*, Promotor: Prof. dr. C.G. Koedijk, EPS-2003-023-F&A, ISBN: 90-5892-043-7, http://hdl.handle.net/1765/104

24. Waal, T., de, *Processing of Erroneous and Unsafe Data*, Promotor: Prof. dr. ir. R. Dekker, EPS-2003-024-LIS, ISBN: 90-5892-045-3, http://hdl.handle.net/1765/87

25. Hooghiemstra, R., *The Construction of Reality*, Promotors: Prof. dr. L.G. van der Tas RA & Prof. dr. A.Th.H. Pruyn, EPS-2003-025-F&A, ISBN: 90-5892-047-X, http://hdl.handle.net/1765/87

26. Dijksterhuis, M., *Organizational Dynamics of Cognition and Action in the Changing Dutch and US Banking Industries*, Promotors: Prof. dr. ir. F.A.J. van den Bosch & Prof. dr. H.W. Volberda, EPS-2003-026-STR, ISBN: 90-5892-048-8, http://hdl.handle.net/1765/103

27. Fok, D., *Advanced Econometric Marketing Models*, Promotor: Prof. dr. P.H.B.F. Franses, EPS-2003-027-MKT, ISBN: 90-5892-049-6, http://hdl.handle.net/1765/103

28. Wielemaker, M.W., *Managing Initiatives: A Synthesis of the Conditioning and Knowledge-Creating View*, Promotors: Prof. dr. H.W. Volberda & Prof. dr. C.W.F. Baden-Fuller, EPS-2003-028-STR, ISBN 90-5892-050-X, http://hdl.handle.net/1765/103

29. Berghe, D.A.F., *Working Across Borders: Multinational Enterprises and the Internationalization of Employment*, Promotors: Prof. dr. R.J.M. van Tulder & Prof. dr. E.J.J. Schenk, EPS-2003-029-ORG, ISBN 90-5892-05-34, http://hdl.handle.net/1765/104

30. Miltenburg, P.R., *Effects of Modular Sourcing on Manufacturing Flexibility in the Automotive Industry: A Study among German OEMs*, Promotors: Prof. dr. J. Paauwe & Prof. dr. H.R. Commandeur, EPS-2003-030-ORG, ISBN: 90-5892-052-6, http://hdl.handle.net/1765/103

31. Graaf, G. de, *Tractable Morality: Customer Discourses of Bankers, Veterinarians and Charity Workers*, Promotors: Prof. dr. F. Leijnse & Prof. dr. T. van Willigenburg, EPS-2003-031-ORG, ISBN: 90-5892-051-8, http://hdl.handle.net/1765/103

32. Gilsing, V.A., *Exploration, Exploitation and Co-evolution in Innovation Networks*, Promotors: Prof. dr. B. Nooteboom & Prof. dr. J.P.M. Groenewegen, EPS-2003-032-ORG, ISBN 90-5892-054-2, http://hdl.handle.net/1765/104

33. Flier, B., *Strategic Renewal of European Financial Incumbents: Coevolution of Environmental Selection, Institutional Effects, and Managerial Intentionality*, Promotors: Prof. dr. ir. F.A.J. van den Bosch & Prof. dr. H.W. Volberda, EPS-2003-033-STR, ISBN: 90-5892-055-0, http://hdl.handle.net/1765/107

34. Langen, P.W., de, *The Performance of Seaport Clusters: A Framework to Analyze Cluster Performance and an Application to the Seaport Clusters of Durban, Rotterdam and the Lower Mississippi*, Promotors: Prof. dr. B. Nooteboom & Prof. drs. H.W.H. Welters, EPS-2004-034-LIS, ISBN: 90-5892-056-9, http://hdl.handle.net/1765/113

35. Brito, M.P., de, *Managing Reverse Logistics or Reversing Logistics Management?*, Promotors: Prof. dr. ir. R. Dekker & Prof. dr. M. B. M. de Koster, EPS-2004-035-LIS, ISBN: 90-5892-058-5, http://hdl.handle.net/1765/113

36. Appelman, J.H., *Governance of Global Interorganizational Tourism Networks: Changing Forms of Co-ordination between the Travel Agency and Aviation Sector*, Promotors: Prof. dr. F.M. Go & Prof. dr. B. Nooteboom, EPS-2004-036-MKT, ISBN 90-5892-060-7, http://hdl.handle.net/1765/119

37. Popova, V., *Knowledge Discovery and Monotonicity*, Promotor: Prof. dr. A. de Bruin, EPS-2004-037-LIS, ISBN 90-5892-061-5, http://hdl.handle.net/1765/120

38. Muller, A.R., *The Rise of Regionalism: Core Company Strategies Under The Second Wave of Integration*, Promotor: Prof. dr. R.J.M. van Tulder, EPS-2004-038-ORG, ISBN 90-5892-062-3, http://hdl.handle.net/1765/127

39. Berens, G., *Corporate Branding: The Development of Corporate Associations and their Influence on Stakeholder Reactions*, Promotor: Prof. dr. C. B. M. van Riel, EPS-2004-039-ORG, ISBN 90-5892-065-8, http://hdl.handle.net/1765/127

40. Six, F.E., *Trust and Trouble: Building Interpersonal Trust Within Organizations*, Promotors: Prof. dr. B. Nooteboom & Prof. dr. A.M. Sorge, EPS-2004-040-ORG, ISBN 90-5892-064-X, http://hdl.handle.net/1765/127

41. Slager, A.M.H., *Banking across Borders*, Promotors: Prof. dr. D.M.N. van Wensveen & Prof. dr. R.J.M. van Tulder, EPS-2004-041-ORG, ISBN 90-5892-066-6, http://hdl.handle.net/1765/130

42. Mandele, L.M., van der, *Leadership and the Inflection Point: A Longitudinal Perspective*, Promotors: Prof. dr. H.W. Volberda & Prof. dr. H.R. Commandeur, EPS-2004-042-STR, ISBN 90-5892-067-4, http://hdl.handle.net/1765/130

43. Kippers, J., *Empirical Studies on Cash Payments*, Promotor: Prof. dr. Ph.H.B.F. Franses, EPS-2004-043-F&A, ISBN 90-5892-069-0, http://hdl.handle.net/1765/152

44. Daniševská, P., *Empirical Studies on Financial Intermediation and Corporate Policies*, Promotor: Prof. dr. C.G. Koedijk, EPS-2004-044-F&A, ISBN 90-5892-070-4, http://hdl.handle.net/1765/151

45. Mulder, A., *Government Dilemmas in the Private Provision of Public Goods*, Promotor: Prof. dr. R.J.M. van Tulder, EPS-2004-045-ORG, ISBN: 90-5892-071-2, http://hdl.handle.net/1765/179

46. Hermans., J.M., *ICT in Information Services, Use and deployment of the Dutch securities trade, 1860-1970*, Promotor: Prof. dr. drs. F.H.A. Janszen, EPS-2004-046-ORG, ISBN 90-5892-072-0, http://hdl.handle.net/1765/179

47. Liang, G., *New Competition: Foreign Direct Investment And Industrial Development In China*, Promotor: Prof. dr. R.J.M. van Tulder, EPS-2004-047-ORG, ISBN 90-5892-073-9, http://hdl.handle.net/1765/179

48. Schweizer, T.S., *An Individual Psychology of Novelty-Seeking, Creativity and Innovation*, Promotor: Prof. dr. R.J.M. van Tulder., EPS-2004-048-ORG, ISBN: 90-5892-07-71, http://hdl.handle.net/1765/181

49. Vliet, P., van, *Downside Risk and Empirical Asset Pricing*, Promotor: Prof. dr. G.T. Post, EPS-2004-049-F&A, ISBN 90-5892-07-55, http://hdl.handle.net/1765/181

50. Valck, K., de, *Virtual Communities of Consumption: Networks of Consumer Knowledge and Companionship, Promotors: Prof. dr. ir. G.H. van Bruggen*, & Prof. dr. ir. B. Wierenga, EPS-2005-050-MKT, ISBN 90-5892-078-X, http://hdl.handle.net/1765/666

51. Le Anh, T., *Intelligent Control of Vehicle-Based Internal Transport Systems*, Promotors: Prof. dr. M.B.M. de Koster & Prof. dr. ir. R. Dekker, EPS-2005-051-LIS, ISBN 90-5892-079-8, http://hdl.handle.net/1765/655

52. Pouchkarev, I., *Performance Evaluation of Constrained Portfolios*, Promotors: Prof. dr. J. Spronk & Dr. W.G.P.M. Hallerbach, EPS-2005-052-F&A, ISBN 90-5892-083-6, http://hdl.handle.net/1765/673

53. Maeseneire, W., de, *Essays on Firm Valuation and Value Appropriation*, Promotor: Prof. dr. J.T.J. Smit, EPS-2005-053-F&A, ISBN 90-5892-082-8, http://hdl.handle.net/1765/676

54. Verheul, I., *Is there a (fe)male approach? Understanding gender differences in entrepreneurship*, Promotor: Prof. dr. A.R. Thurik, EPS-2005-054-ORG, ISBN 90-5892-080-1, http://hdl.handle.net/1765/200

55. Jansen, J.J.P., *Ambidextrous Organizations*, Promotors: Prof. dr. ir. F.A.J. Van den Bosch & Prof. dr. H.W. Volberda, EPS-2005-055-STR, ISBN 90-5892-081-X, http://hdl.handle.net/1765/677

57. Keizer, A.B., *The Changing Logic of Japanese Employment Practices: A Firm-Level Analysis of Four Industries*, Promotors: Prof. dr. J.A. Stam & Prof. dr. J.P.M. Groenewegen, EPS-2005-057-ORG, ISBN: 90-5892-087-9, http://hdl.handle.net/1765/666

58. Moerman, G.A., *Empirical Studies on Asset Pricing and Banking in the Euro Area*, Promotors: Prof. dr. C.G. Koedijk, EPS-2005-058-F&A, ISBN: 90-5892-090-9, http://hdl.handle.net/1765/666

59. Kotlarsky, J., *Management of Globally Distributed Component-Based Software Development Projects*, Promotor: Prof. dr. K. Kumar, EPS-2005-059-LIS, ISBN: 90-5892-088-7, http://hdl.handle.net/1765/677

60. Boer, N.I., *Knowledge Sharing within Organizations: A situated and relational Perspective*, Promotor: Prof. dr. K. Kumar, EPS-2005-060-LIS, ISBN: 90-5892-086-0, http://hdl.handle.net/1765/677

61. Pak, K., *Revenue Management: New Features and Models*, Promotor: Prof. dr. ir. R. Dekker, EPS-2005-061-LIS, ISBN: 90-5892-092-5, http://hdl.handle.net/1765/362/677

62. Vromans, M.J.C.M., *Reliability of Railway Systems*, Promotors: Prof. dr. L.G. Kroon, Prof. dr. ir. R. Dekker & Prof. dr. ir. J.A.E.E. van Nunen, EPS-2005-062-LIS, ISBN: 90-5892-089-5, http://hdl.handle.net/1765/677

63. Brohm, R., *Polycentric Order in Organizations: a dialogue between Michael Polanyi and IT-consultants on knowledge, morality, and organization*, Promotors: Prof. dr. G. W. J. Hendrikse & Prof. dr. H. K. Letiche, EPS-2005-063-ORG, ISBN: 90-5892-095-X, http://hdl.handle.net/1765/691

64. Le-Duc, T., *Design and control of efficient order picking processes*, Promotor: Prof. dr. M.B.M. de Koster, EPS-2005-064-LIS, ISBN 90-5892-094-1, http://hdl.handle.net/1765/691

65. Boer, C.A., *Distributed Simulation in Industry*, Promotors: Prof. dr. A. de Bruin & Prof. dr. ir. A. Verbraeck, EPS-2005-065-LIS, ISBN: 90-5892-093-3, http://hdl.handle.net/1765/692

66. Kuilman, J., *The re-emergence of foreign banks in Shanghai: An ecological analysis*, Promotor: Prof. dr. B. Krug, EPS-2005-066-ORG, ISBN: 90-5892-096-8, http://hdl.handle.net/1765/692

67. Hartigh, E., den, *Increasing Returns and Firm Performance: An Empirical Study*, Promotor: Prof. dr. H.R. Commandeur, EPS-2005-067-STR, ISBN: 90-5892-098-4, http://hdl.handle.net/1765/693

68. Hagemeijer, R.E., *The Unmasking of the Other, Promotors: Prof. dr. S.J. Magala*, Prof. dr. H.K. Letiche, EPS-2005-068-ORG, ISBN: 90-5892-097-6, http://hdl.handle.net/1765/696

69. Govers, R., *Virtual Tourism Destination Image: Glocal identities constructed, perceived and experienced*, Promotors: Prof. dr. F.M. Go & Prof. dr. K. Kumar, EPS-2005-069-MKT, ISBN 90-5892-107-7, http://hdl.handle.net/1765/698

70. Mentink, A., *Essays on Corporate Bonds*, Promotor: Prof. dr. A.C.F. Vorst, EPS-2005-070-F&A, ISBN: 90-5892-100-X, http://hdl.handle.net/1765/712

71. Pietersz, R., *Pricing Models for Bermudan-style Interest Rate Derivatives*, Promotors: Prof. dr. A.A.J. Pelsser & Prof. dr. A.C.F. Vorst, EPS-2005-071-F&A, ISBN 90-5892-099-2, http://hdl.handle.net/1765/712

72. Vries-van Ketel, E., de, *How Assortment Variety Affects Assortment Attractiveness: A Consumer Perspective*, Promotors: Prof. dr. G.H. van Bruggen & Prof.dr.ir. A.Smidts, EPS-2006-072-MKT, ISBN 90-5892-101-8, http://hdl.handle.net/1765/719

73. Lentink, R.M., *Algorithmic Decision Support for Shunt Planning*, Promotors: Prof. dr. L.G. Kroon & Prof. dr. ir. J.A.E.E. van Nunen, EPS-2006-073-LIS, ISBN 90-5892-104-2, http://hdl.handle.net/1765/732

74. Sloot, L., *Understanding Consumer Reactions to Assortment Unavailability, Promotors: Prof. dr. H.R. Commandeur*, Prof. dr. E. Peelen & Prof. dr. P.C. Verhoef, EPS-2006-074-MKT, ISBN 90-5892-102-6, http://hdl.handle.net/1765/743

75. Vlaar, P.W.L., *Making Sense of Formalization in Interorganizational Relationships: Beyond Coordination and Control*, Promotors: Prof. dr. ir. F.A.J. Van den Bosch & Prof. dr. H.W. Volberda, EPS-2006-075-STR, ISBN 90-5892-103-4, http://hdl.handle.net/1765/732

76. Smit, W., *Market Information Sharing in Channel Relationships: Its Nature, Antecedents and Consequences, Promotors: Prof. dr. H.R. Commandeur*, Prof. dr. ir. G.H. van Bruggen & Prof. dr. ir. B. Wierenga, EPS-2006-076-MKT, ISBN 90-5892-106-9, http://hdl.handle.net/1765/732

77. Iastrebova, K, *Manager's Information Overload: The Impact of Coping Strategies on Decision-Making Performance*, Promotor: Prof. dr. H.G. van Dissel, EPS-2006-077-LIS, ISBN 90-5892-111-5, http://hdl.handle.net/1765/732

78. Londoño, M., del Pilar, *Institutional Arrangements that Affect Free Trade Agreements: Economic Rationality Versus Interest Groups*, Promotors: Prof. dr. H.E. Haralambides & Prof. dr. J.F. Francois, EPS-2006-078-LIS, ISBN: 90-5892-108-5, http://hdl.handle.net/1765/757

80. Alvarez, H.L., *Distributed Collaborative Learning Communities Enabled by Information Communication Technology*, Promotor: Prof. dr. K. Kumar, EPS-2006-080-LIS, ISBN 90-5892-112-3, http://hdl.handle.net/1765/783

82. Blindenbach-Driessen, F., *Innovation Management in Project-Based Firms*, Promotor: Prof. dr. S.L. van de Velde, EPS-2006-082-LIS, ISBN: 90-5892-110-7, http://hdl.handle.net/1765/782

83. Kole, E., *On Crises, Crashes and Comovements*, Promotors: Prof. dr. C.G. Koedijk & Prof. dr. M.J.C.M. Verbeek, EPS-2006-083-F&A, ISBN 90-5892-114-X, http://hdl.handle.net/1765/782

84. Iwaarden, J.D., van, *Changing Quality Controls: The Effects of Increasing Product Variety and Shortening Product Life Cycles*, Promotors: Prof. dr. B.G. Dale & Prof. dr. A.R.T. Williams, EPS-2006-084-ORG, ISBN 90-5892-117-4, http://hdl.handle.net/176

## The Effects of the Internet, Recommendation Quality and Decision Strategies on Consumer Choice

The Internet conquered the world at a very rapid pace. Moreover, it is an ideal communication and transaction channel for both firms and consumers. An aspect of the Internet is that recorded visits to a web site create a valuable source of information on online consumer behavior. This information can subsequently be used to support firms and consumers in their decision-making processes. Several aspects of consumer decision making in relation to the Internet are, however, still rather unclear. In this thesis we firstly investigate what determines that the Internet or other channels like the brick-and-mortar store are used for information search or purchase. In addition, we investigate whether a firm can select mortgage-loan applicants on the likelihood of a purchase, which is based on recorded online consumer behavior. This type of information may also be used to provide consumers with recommendations on products and services. Differences in the quality of these recommendations may affect consumer decision making. Moreover, this effect on consumer behavior is likely to be related to a change in decision-srategy usage. Both aspects of decision-making in an online environment are discussed in this thesis.

## ERIM

The Erasmus Research Institute of Management (ERIM) is the Research School (Onderzoekschool) in the field of management of the Erasmus University Rotterdam. The founding participants of ERIM are RSM Erasmus University and the Erasmus School of Economics. ERIM was founded in 1999 and is officially accredited by the Royal Netherlands Academy of Arts and Sciences (KNAW). The research undertaken by ERIM is focussed on the management of the firm in its environment, its intra- and inter-firm relations, and its business processes in their interdependent connections.

The objective of ERIM is to carry out first rate research in management, and to offer an advanced graduate program in Research in Management. Within ERIM, over two hundred senior researchers and Ph.D. candidates are active in the different research programs. From a variety of academic backgrounds and expertises, the ERIM community is united in striving for excellence and working at the forefront of creating new business knowledge.

ERASMUS RESEARCH INSTITUTE OF MANAGEMENT

**www.erim.eur.nl**

**ISBN 90-5892-122-0**

Design: B&T Ontwerp en advies www.b-en-t.nl Print: Haveka www.haveka.nl