# Possible determinants of consumers' adoption of electronic grocery shopping in the Netherlands

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**Abstract**

This study examines (1) the relationship between the (dis) advantages of electronic grocery shopping, in comparison to traditional in-store shopping, and consumers' perception of the innovation characteristics (i.e., relative advantage, compatibility and complexity) of electronic grocery shopping, and (2) the relationship between consumers' perception of these characteristics and their intention to adopt electronic grocery shopping. These relationships are examined using a sample of 415 households in the Netherlands. The results indicate that the advantages and disadvantages of physical efforts and time pressure related to traditional in-store shopping positively influence consumers' perception of the characteristics of electronic grocery shopping. The results further show that consumers' perception of the relative advantage and compatibility of electronic grocery shopping positively influence their intention to adopt electronic grocery shopping. Consumers' perception of the complexity of electronic grocery shopping negatively influences their intention to adopt electronic grocery shopping. It is also explored whether income, education and age moderate these relationships. © 2001 Elsevier Science Ltd. All rights reserved.

*Keywords:* Electronic retailing; Grocery shopping; Adoption

## 1. Introduction

Electronic grocery shopping refers to consumers' ability order groceries from home electronically (i.e., Internet, telephone and fax) and the subsequent delivery of those ordered groceries at home (Burke, 1997; Gillett, 1970, 1976; Peterson et al., 1998). In the late 1970s marketing academics considered electronic grocery shopping through phone and fax ordering to be an important new form of retailing (Berkowitz et al., 1979; Cunningham and Cunningham, 1973; Gillett, 1976; Peters and Ford, 1972). Academic attention declined in the 1980s because optimistic forecasts about the growing importance of electronic grocery shopping did not come true (Schneiderman, 1980). However, due to the upcoming of Internet the interest of marketing academics and practitioners in electronic grocery shopping was renewed in the

1990s (e.g., Alba et al., 1997; Burke, 1997; Hofman and Novak, 1996; Mulhern, 1997; Peterson et al., 1998). This interest was particularly stirred up because a number of US-based retailers, such as Peapod, Streamline, Netgrocer and American Stores introduced new electronic grocery shopping services on the Internet (Ernst and Young, 1998). In Europe the introduction of electronic grocery shopping services by leading retailers such as Tesco, Sainsbury and Albert Heijn also stimulated the interest of academics and practitioners (O'Connor, 1998).

With the introduction of electronic grocery shopping services on the Internet retailers are able to anticipate to changes in consumers' shopping behavior and socio-demographic profiles of consumers (Leeflang and Van Raaij, 1995). For instance, the mounting average age of consumers increases the need for more convenience in grocery shopping (Burke, 1997). Electronic grocery shopping services provide this convenience by enabling consumers to order groceries from home and having the groceries subsequently delivered at home. Furthermore, the expanding number of dual-income households and single-parent households results in a growing number of

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consumers experiencing time pressure. Electronic grocery shopping services provide consumers the opportunity to save time by making visits to a traditional retail store redundant. Keeping these changes in mind it is not surprising that Andersen consulting found that 42% of shoppers in the US and Europe expressed a willingness to order groceries from home (Narayanan, 1997).

In the (direct) marketing literature a number of studies have appeared that investigated home shopping. Researchers were specifically interested in the socio-demographic profile of home shoppers (Cunningham and Cunningham, 1973; Darian, 1987; Gillett, 1976; Peters and Ford, 1972; Reynolds, 1974). Darian (1987) is one of the few researchers who discussed the advantages and disadvantages of home shopping in comparison to traditional in-store shopping. However, home shopping using electronic channels, such as the Internet, is different from home shopping using conventional channels, such as catalogs and mail. These differences are related to the characteristics of the Internet, such as more and better accessible information, ordering convenience and enjoyment (Alba et al., 1997). Given these differences there is a need to assess whether Darian's (1987) advantages and disadvantages of traditional home shopping also hold for electronic shopping. Furthermore, most studies in the area of traditional home shopping have been conducted in a non-grocery environment. However, supermarkets differ from other retail formats, such as department stores and category specialists, on characteristics like consumers' involvement, consumers' perceived shopping enjoyment and purchase frequency (Alba et al., 1997). Given these differences the effect of the (dis) advantages of traditional home shopping in comparison to in-store shopping might be different in the context of electronic grocery shopping.

Electronic grocery shopping is a new form of home shopping that can be considered a service innovation (Alba et al., 1997). In the (marketing) literature on innovations a number of studies have focused on the key factors determining the success and failure of innovations (e.g., Tauber, 1960, 1973; Twedt, 1969). Despite these efforts many innovations remained unsuccessful, and consequently, a number of researchers tried to reveal innovation characteristics that differentiate between successful and unsuccessful innovations (e.g., Rogers, 1983; Tauber, 1973). Other researchers have tried to explain adoption behavior by focusing on the characteristics of consumer innovators (Green and Langeard, 1975), and on the communication behavior of opinion leaders (Mancuso, 1969). However, only a few consumer behavior researchers have studied the influence of personal characteristics and innovation characteristics on the adoption decision (e.g., Hirschman, 1980; Labay and Kinnear, 1981). To our knowledge no studies are available that study the adoption decision of an electronic grocery shopping service taking both the effect of innovation characteristics and the effect of personal characteristics on the adoption decision into account.

This study addresses the above-mentioned issues by; (1) relating shopping needs to the perceived (dis) advantages of electronic grocery shopping; (2) examining the influence of these perceived (dis) advantages on the perceived innovation characteristics of electronic grocery shopping, and; (3) studying the effect of the perceived innovation characteristics on consumers' behavioral intention to adopt electronic grocery shopping.

## 2. Theoretical background

A review of the literature on in-store shopping, traditional home shopping and electronic (grocery) shopping reveals a number of advantages and disadvantages of electronic grocery shopping. These (dis) advantages will be discussed henceforth.

### 2.1. Advantages of electronic grocery

Electronic grocery shopping has, in comparison to in-store shopping, two main advantages.

- Electronic grocery shopping offers consumers a higher level of convenience (Darian, 1987). This higher level of convenience stems from the fact that consumers do not face any transportation and physical problems, because they can order and receive their groceries from and at home.
- Electronic grocery shopping saves consumers time (Burke, 1997; Darian, 1987). Due to less transportation time, less waiting time and less planning time, the overall time required for electronic grocery shopping is lower then the time required for in-store shopping.

Another rather minor advantage of electronic shopping is the larger geographic coverage of shops that can be selected (Alba et al., 1997). Furthermore, it is believed that consumers can choose from a larger product assortment when they shop at home (Peterson et al., 1997).

### 2.2. Disadvantages of electronic grocery shopping

Darian (1987) and Tauber (1972) distinguish two shopping needs that, when aroused to a sufficient level of intensity, motivate consumers to visit retail stores rather than to shop from home.

- Personal needs encompass the need for sensory stimulation, physical activity and learning while shopping.
- Social needs comprise the need for social experiences, communication with other shoppers and the pleasure of bargaining while shopping.

Both needs are related to the hedonic function of shopping: shopping enjoyment (Dawson et al., 1990;

Faber and O'Guinn, 1992). Traditional home shopping limits the enjoyment of shopping, because consumers cannot communicate with other consumers, they cannot bargain, and they cannot smell and taste the products (Darian, 1987; Tauber, 1972). Consequently, the loss of shopping enjoyment is a major disadvantage of traditional home shopping. However, electronic shopping via the Internet allows consumers to communicate with other consumers using discussion groups and communities. Therefore, the Internet may (partly) offset the loss of shopping enjoyment that consumers encounter while not going to the shop. A minor disadvantage of electronic shopping might be higher search costs and waiting times.

## 2.3. The adoption process

Alba et al. (1997) explicitly state that electronic shopping is a new form of home shopping offering superior benefits compared to other non-store and store channels. Therefore, we consider electronic grocery shopping a service innovation that consumers perceive as new. Like any other innovation, electronic grocery shopping takes time to spread through the social system. The innovation diffusion process can be described as the spread of a new service from its source of invention to its ultimate adopters (Gatignon and Robertson, 1985). The consumer adoption process focuses on the mental process through which an individual consumer passes from first hearing about electronic grocery shopping to final adoption. Marketers recognize that consumers' perceptions of the characteristics of an innovation affect its rate of adoption (Mahajan et al., 1995). Rogers (1983) distinguishes five characteristics that influence the rate of adoption of an innovation: relative advantage, compatibility, complexity, divisibility and communicability. These characteristics can be considered in relation to electronic grocery shopping:

- Perceived relative advantage refers to the degree to which consumers perceive electronic grocery shopping to be superior to in-store shopping.
- Perceived compatibility refers to the degree to which consumers' perceive electronic grocery shopping to match their shopping needs.
- Perceived complexity refers to the degree to which consumers find electronic grocery shopping difficult to understand.
- Perceived divisibility refers to the degree to which electronic grocery shopping can be tried on a limited basis.
- Perceived communicability refers to the degree to which the benefits of use of electronic grocery shopping are observable or describable to others.

Three of these characteristics (i.e., relative advantage, compatibility, and complexity) relate to consumers' per-

ceptions prior to using an electronic grocery shopping service. Two characteristics (i.e., divisibility and communicability) refer to consumers' perceptions after using electronic grocery shopping. At the time of the study leading Dutch retailers were experimenting with electronic grocery shopping services. Therefore, the majority of the Dutch population did not have access to a Dutch electronic grocery shopping service. Keeping this in mind, this study had to focus on the three characteristics that consumers' were able to evaluate prior to using an electronic grocery shopping service. Furthermore, this study was limited to investigating consumers' (behavioral) intentions to adopt electronic grocery shopping instead of the actual adoption.

## 3. Model and hypotheses

The findings from the review of the literature were used to develop a conceptual framework, shown in Fig. 1, which explains consumers' behavioral intention to adopt electronic grocery shopping. This framework, which draws on the theory of reasoned action (Fishbein and Azjen, 1985), posits that the degree to which consumers perceive electronic grocery shopping to be superior, compatible and complex is determined by consumers' perceptions of the (dis) advantages of electronic grocery shopping, in comparison to traditional in-store shopping, in terms of convenience, time saving, and personal and social shopping needs (Ram and Jung, 1994). Likewise, the framework postulates that consumers' intention, which is viewed the immediate determinant of behavior, to adopt electronic grocery shopping is determined by their perception of its (innovation) characteristics (e.g., Miniard et al., 1983; Warshaw, 1980).

### 3.1. Physical effort

A large part of the convenience of an electronic shopping service originates from the fact that the physical effort required is much lower in comparison with the
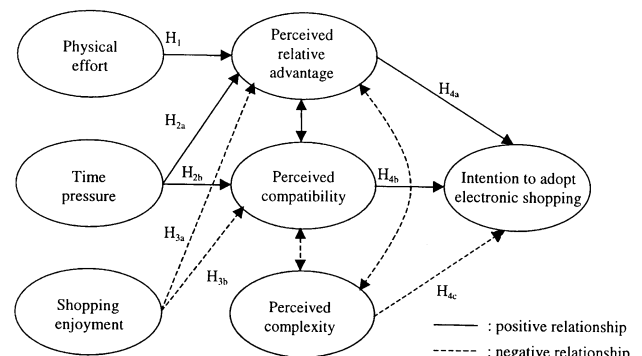


Fig. 1. Consumers' intention to adopt electronic grocery shopping.

physical effort necessary to visit a retail store to shop groceries (Darian, 1987). Therefore, we expect consumers who experience in-store shopping to be physically strenuous, to perceive a high relative advantage of electronic grocery shopping. Thus, we hypothesize that:

$H_1$: The larger the perceived physical effort of in store shopping, the larger the perceived relative advantage of electronic grocery shopping will be.

### 3.2. Time pressure

Srinivasan and Ratchford (1991) describe time pressure as the degree to which consumers consider themselves busy. Busy consumers will perceive the time consuming aspect of visiting retail stores to buy groceries as disadvantageous. Electronic grocery shopping offers busy consumers the opportunity to save time, because groceries can be ordered from home and can be delivered at home (Burke, 1997). Furthermore, consumers who experience time pressure generally do not satisfy their personal and social shopping needs through in-store shopping (McDonald, 1994). As a result busy consumers are more likely to consider electronic grocery shopping compatible with their shopping experiences (Dawson et al., 1990). Therefore, we expect consumers who experience more time pressure, to perceive the relative advantage and compatibility of electronic grocery shopping as higher. Thus, we hypothesize:

$H_{2a}$: The larger the perceived time pressure, the larger the perceived relative advantage of electronic grocery shopping will be.

$H_{2b}$: The larger the perceived time pressure, the larger the perceived compatibility of electronic grocery shopping will be.

### 3.3. Shopping enjoyment

Alba et al. (1997, p. 48) state that "for many consumers, shopping is an experience that transcends product purchase". Consumers who satisfy their personal and social shopping needs by means of visiting retail stores to buy groceries, are likely to consider the loss of shopping enjoyment an important disadvantage of electronic grocery shopping. Consumers who consider in-store shopping to be enjoyable derive personal and social values from visiting retail stores (Tauber, 1972). These consumers are not likely to find electronic grocery shopping compatible with their shopping behavior and experience. Although we acknowledge that the Internet may provide additional enjoyment, we adhere to the literature on traditional home shopping with the following hypotheses:

$H_{3a}$: The larger the perceived enjoyment of in store shopping, the smaller the perceived relative advantage of electronic grocery shopping will be.

$H_{3b}$: The larger the perceived enjoyment of in store shopping, the smaller the perceived compatibility of electronic grocery shopping will be.

### 3.4. Intention to adopt electronic grocery shopping

Research on the intention–behavior relationship suggests that behavioral intention measures are most appropriate when the objective is to maximize prediction (e.g., Miniard et al., 1980; Sheppard et al., 1988; Warshaw, 1980). The behavioral intention captures the perceived likelihood that consumers' adopt electronic grocery shopping. In this study the behavioral intention of consumers to adopt electronic grocery shopping is influenced by their perception of the characteristics of electronic grocery shopping. Therefore, we expect that consumers who perceive electronic grocery shopping to be superior, compatible and easy to understand, to be more willing to adopt electronic grocery shopping. Hence, we hypothesize:

$H_{4a}$: There is a positive relationship between the perceived relative advantage and the (behavioral) intention to adopt electronic grocery shopping.

$H_{4b}$: There is a positive relationship between the perceived compatibility and the (behavioral) intention to adopt electronic grocery shopping.

$H_{4c}$: There is a negative relationship between the perceived complexity and the (behavioral) intention to adopt electronic grocery shopping.

### 3.5. Moderating effects

The literature on the socio-demographic profiles of homeshoppers suggests that homeshoppers are likely to have higher incomes and to be better-educated (Cunningham and Cunningham, 1973; Darian, 1987). Likewise, the literature on adoption and diffusion suggests that consumer innovators tend to be older, are higher in social status and enjoy higher incomes (Rogers, 1983). Consumer innovators are also known to use personal and subjective criteria in their adoption decisions (Foxall and Bhate, 1993). Altogether these findings suggest that the consumer characteristics of age, income and education are likely to moderate the studied relationships in our model. To help marketers facilitate consumer movement through the adoption process this study explores the possible moderating effects of the consumer characteristics of age, income and education on the hypothesized relationships.[1]

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[1] The possibility of moderating effects was suggested by one of the anonymous reviewers.

# 4. Method

## 4.1. Sample and data collection

The sampling frame consisted of 2250 randomly selected households in a medium-sized Dutch town in which no electronic grocery shopping was available at the time of the study. The Dutch Central Bureau of Statistics (CBS) considers this town's population on socio-demographic variables to be representative for the Netherlands. Self-administered questionnaires were mailed to the selected households along with a cover letter on university stationary explaining the purpose of the study and the confidentiality of responses. Instructions included in the cover letter stipulated that the questionnaire be completed by the primary adult grocery shopper in the household. In order to increase the response rate a number of gift vouchers of dfl 25,- (approximately $13) were raffled among the respondents.

The mailing resulted in responses from 437 households, for a final *usable* response rate of 18.4% ($n = 415$) The majority (76.4%) of the survey respondents was female. The plurality (27.5%) of the respondents was between 30 and 39 years old. Overall, 81.9% of them resided in households with two or more persons. The majority of the respondents had either two (38.8%), or three, or four (35.9%) persons residing in the household. Most of the respondents held a college degree (38.8%), or reported having attended graduate school (29.2%). 46.5% of the respondents had a monthly net income of more than $1750.

To assess respondent bias the socio-demographics characteristics of the sample were compared to the national population. Chi-square tests indicated that respondents tended to be older, better educated women residing in more affluent households with two persons ($p < 0.05$). From previous research, it is known that these consumers are more prone to use home shopping services (Darian, 1987). This result might imply that there is a non-response bias towards consumers who are less prone to use electronic grocery shopping services. Armstrong and Overton's (1977) time trend extrapolation was used to test for non-response bias by comparing the results obtained from the first 70 respondents with those of the last 70 respondents with regard to the intention of respondents to adopt electronic grocery shopping. However, there were no significant differences between the two sets. This suggests that non-response bias was not problematic.

## 4.2. Measures

All responses were recorded on a seven point Likert scales anchored by 1 (strongly disagree) and 7 (strongly agree), with the exception of the intention of consumers to adopt electronic grocery shopping. The items are provided in the appendix. Two items were developed to measure the perceived physical effort of in-store shopping by drawing on the work of Eastlick (1993). To measure shopping enjoyment four items were adapted from Dawson et al. (1990). Three items adapted from Srinivasan and Ratchford (1991) study were used to measure the time pressure experienced by consumers. To measure the behavioral intention of consumers to adopt electronic grocery shopping this study utilizes a single-item measure adapted from Juster (1966). The responses were recorded on a 11-point scale anchored by 0 (absolutely not) and 10 (absolutely yes). To measure consumers' perceived relative advantage, perceived compatibility and perceived complexity of electronic grocery shopping 12 items adapted from Frambach's et al. (1998) study were used.

## 4.3. Pretesting

Pretesting was performed in three sequential stages. First, a draft of the questionnaire was pretested in personally administered interviews with a panel of three marketing academics. The second pretest involved administering the questionnaire to primary adult grocery shoppers in twenty households by telephone. The final pretest comprised of personally administering the questionnaire to primary adult grocery shoppers in five households. At each stage participants in the pretests were asked to identify items that were confusing or difficult to respond to, and any other problems they encountered. Items that were identified as problematic were either revised or eliminated, and new items were developed. By the end of the third stage of pretesting few concerns were reported and therefore the questionnaire was ready for final administration. To minimize concern about carry-over effects the scales in the final questionnaire were not marked and the order of the items belonging to the different constructs was changed (Bickart, 1993).

## 4.4. Item purification

A three-step item purification procedure was accomplished taking one multi-item scale at a time (Anderson et al., 1987). The following steps were applied: (1) inter-item and item-to total correlation's were computed for each of the items. The requirement for retaining an item was a significant correlation coefficient at the 0.01 level; (2) the Cronbach's α was computed and, in case of a low α, the item with the lowest item-to-total correlation was removed; and (3) an exploratory factor analysis was performed using an eigenvalue of 1.0 as the cut-off point. This procedure resulted in a reduced set of 19 items. Means, standard deviations, inter-item correlations and Cronbach's α's for each purified summed scale appear in Table 1. The deleted items are marked in the appendix.

Table 1
Means, standard deviations, construct inter-correlations and Cronbach's $\alpha$

|  | Mean | Standard deviation | PE | TP | SE | RA | CPA | CPE | No. items | Cronbach's $\alpha$ |
|---|---|---|---|---|---|---|---|---|---|---|
| Physical effort (PE) | 3.52 | 1.88 |  |  |  |  |  |  | 2 | 0.76 |
| Time pressure (TP) | 3.69 | 1.78 | 0.21 |  |  |  |  |  | 3 | 0.80 |
| Shopping enjoyment (SE) | 3.43 | 1.73 | 0.13 | 0.04 |  |  |  |  | 2 | 0.56 |
| Relative advantage (RA) | 4.20 | 1.84 | 0.24 | 0.30 | $-0.05$ |  |  |  | 3 | 0.79 |
| Compatibility (CPA) | 3.89 | 1.88 | 0.16 | 0.34 | $-0.04$ | 0.66 |  |  | 3 | 0.70 |
| Complexity (CPE) | 3.61 | 1.77 | 0.03 | $-0.17$ | 0.11 | $-0.31$ | $-0.46$ |  | 5 | 0.93 |
| Intention (I) | 3.23 | 2.74 | 0.20 | 0.17 | $-0.13$ | 0.54 | 0.42 | $-0.40$ | 1 |  |

Table 2
Results of the measurement model

| Construct/indicator | Standardized factor loading | SE | $t$-value | Composite reliability[a] | Proportion of extracted variance[b] |
|---|---|---|---|---|---|
| Intention to adopt electronic grocery shopping | 0.77[c] | — | — | — | — |
| Physical effort |  |  |  | 0.76 | 0.61 |
| $x_1$ | 0.77[d] | — | — | — |  |
| $x_2$ | 0.79 | 0.14 | 7.50[e] |  |  |
| Time pressure |  |  |  | 0.82 | 0.60 |
| $x_4$ | 0.79[d] | — | — | — |  |
| $x_5$ | 0.81 | 0.07 | 14.52[e] |  |  |
| $x_6$ | 0.72 | 0.07 | 13.70[e] |  |  |
| Shopping enjoyment |  |  |  | 0.60 | 0.44 |
| $x_7$ | 0.76[d] | — | — |  |  |
| $x_8$ | 0.54 | 0.28 | 2.56[f] |  |  |
| Complexity |  |  |  | 0.91 | 0.72 |
| $x_9$ | 0.88[d] | — | — | — |  |
| $x_{10}$ | 0.91 | 0.04 | 25.55[e] |  |  |
| $x_{11}$ | 0.71 | 0.04 | 16.97[e] |  |  |
| $x_{12}$ | 0.86 | 0.04 | 23.10[e] |  |  |
| Relative advantage |  |  |  | 0.82 | 0.61 |
| $Y_1$ | 0.75[d] | — | — | — |  |
| $Y_2$ | 0.83 | 0.06 | 15.69[e] |  |  |
| $Y_3$ | 0.75 | 0.07 | 14.43[e] |  |  |
| Compatibility |  |  |  | 0.82 | 0.60 |
| $Y_4$ | 0.65[d] | — | — | — |  |
| $Y_5$ | 0.83 | 0.10 | 13.51[e] |  |  |
| $Y_6$ | 0.83 | 0.09 | 13.57[e] |  |  |

Fit measurement model
$\chi^2 = 260.91$ (0.00); GFI = 0.93; AGFI = 0.90; CFI = 0.96; RMSEA = 0.05

[a] $\dfrac{\sum(\text{Std.Loadings})^2}{\sum(\text{Std.Loadings})^2 + \sum \xi_j}.$

[b] $\dfrac{\sum \text{Std.Loadings}^2}{\sum \text{Std.Loadings}^2 + \sum \xi_j}.$

[c] Single item indicator with error estimates adjusted: $\lambda = 0.95\sigma$ and $\xi = \sigma^2$ (Anderson and Gerbing, 1988).
[d] The first $\lambda$ for each construct was set to 1.
[e] $p < 0.01$.
[f] $p < 0.05$.

## 4.5. Measure reliability and validity

The two-step procedure recommended by Anderson and Gerbing (1988) was followed by separately estimating and respecifying the measurement model before simultaneous estimation of the measurement and structural model. A covariance sample matrix of the logarithmically transformed scale values was used as input to estimate the measurement model using LISREL 8 (Jöreskog and Sörbom, 1993). Initially a seven-factor model using all 19 items (e.g., 18 items pertaining to the multi-item scales and 1 item pertaining to the single-item

scale to measure the intention to adopt electronic grocery shopping) was estimated using maximum likelihood. As suggested by Anderson and Gerbing (1988) we have set the $\theta$, $\delta$ and $\lambda$ parameters of the single-item behavioral intention measure to respectively $\xi = \sigma^2$ and $\lambda = 0.95\sigma$. Although the fit of the model was acceptable one item pertaining to perceived complexity had high-standardized residuals. The modification index indicated that the fit of the model could be improved by eliminating this item and respecifying the measurement model (Anderson and Gerbing, 1988). The results indicate that the overall (GFI and AGFI) and comparative (CFI) fit indices are above the recommended cut-off level of 0.9 (Bagozzi and Yi, 1988). The fit measure based on the concept of non-centrality (RMSEA) is below the cut-off level of 0.08 recommended by Browne and Cudeck (1993). Together these results suggest that the respecified measurement model fits the data well.

The results in Table 2 further indicate that the composite reliability of all scales, with the exception of shopping enjoyment, exceeds the 0.70 threshold for acceptable reliability. The values for the extracted variance exceed, with the exception of shopping enjoyment, the recommended cut-off level of 0.5 as suggested by Bagozzi and Yi (1988). Convergent validity is indicated by the fact that all items load significantly (i.e., $t > 2.0$) on their corresponding latent construct, with the lowest $t$-value being 2.61 (Bagozzi et al., 1991). Discriminant validity is obtained because none of the 95% confidence intervals ($\pm 1.96 *$ standard errors) around all pairwise latent-trait correlations encompass 1.0 (Bagozzi and Phillips, 1982). Together the results of the tests for unidimensionality, reliability, convergent validity and discriminant validity provide evidence of internal and external validity of the scales used in this study.

Provided with this evidence the constructs were formed by averaging the responses to each item in a particular scale.

## 5. Results

### 5.1. Estimation structural model

Following Anderson and Gerbing (1988) the remaining 18 items were used to simultaneously estimate the measurement and structural model. In estimating the structural model the three characteristics of electronic grocery shopping (i.e., relative advantage, compatibility and complexity) were allowed to covary, because prior research reveals that relative advantage, compatibility and complexity are likely to be interrelated (Eastlick, 1993; Frambach et al., 1998). The structural model, as shown in Table 3, has a good fit as judged from the goodness of fit indices (GFI = 0.93; AGFI = 0.90; CFI = 0.96; RMSEA = 0.05), even though the Chi-square index is significant ($\chi^2 = 274.8$; df = 119; $p < 0.01$) (Bagozzi and Yi, 1988).

### 5.2. Testing the hypotheses

The findings reported in Table 3 support $H_1$ as the physical effort of in-store shopping is positively related to the perceived relative advantage of electronic grocery shopping ($\gamma = 0.20$, $p < 0.05$). The results also support $H_{2a}$, as time pressure positively influences perceived relative advantage ($\gamma = 0.29$, $p < 0.05$). However, no support is found for $H_{3a}$, as shopping enjoyment is not related to relative advantage ($\gamma = -0.04$, $p > 0.05$). The results support $H_{2b}$ as time pressure is positively related to

Table 3
Results of estimation structural model

| Path to | Path from | Hypothesis | Standardized structural coefficients | $t$-value |
|---|---|---|---|---|
| Relative advantage | Physical effort | 1 | 0.20 | 3.68[a] |
| | Time | 2a | 0.29 | 4.85[a] |
| | Enjoyment | 3a | − 0.04 | − 0.59 |
| Compatibility | Time | 2b | 0.24 | 5.36[a] |
| | Enjoyment | 3b | 0.01 | 0.20 |
| Intention to adopt electronic grocery shopping | Relative advantage | 4a | 0.47 | 3.06[a] |
| | Compatibility | 4b | 0.60 | 2.73[a] |
| | Complexity | 4c | − 0.23 | − 2.28[a] |
| Relative advantage | Compatibility | | 0.12 | 8.01[a] |
| Relative advantage | Complexity | | − 0.20 | − 3.62[a] |
| Compatibility | Complexity | | − 0.37 | − 7.99[a] |

[a]$p < 0.05$.

perceived compatibility ($\gamma = 0.24$, $p < 0.05$). No support is provided for $H_{3b}$, because shopping enjoyment is not related to perceived compatibility ($\gamma = 0.01$, $p > 0.05$). The results further show that perceived relative advantage ($\beta = 0.47$, $p < 0.05$) and perceived compatibility ($\beta = 0.60$, $p < 0.05$) are related positively to the intention to adopt electronic grocery shopping, providing support for $H_{4a}$ and $H_{4b}$. The results also reveal that perceived complexity is related negatively to the intention of consumers to adopt electronic grocery shopping ($\beta = -0.23$, $p < 0.05$), providing support for $H_{4c}$. Together the three innovation characteristics explain 36% of the variance of the behavioral intention measure. Finally, the results show that perceived relative advantage covaries with perceived compatibility ($\varphi = 0.12$, $p < 0.05$) and perceived complexity ($\varphi = -0.20$, $p < 0.05$), and that perceived compatibility covaries with perceived complexity ($\varphi = -0.37$, $p < 0.05$).

### 5.3. Testing for moderator effects

In order to test for possible moderating effects of the consumer characteristics the following procedure was used. For each moderating variable (i.e., age, income and education) the sample was median split in two subgroups. For examining the equality (or invariance) of the structural paths constrained and unconstrained models were estimated with the multi-group procedure as suggested by Jöreskog and Sörbom (1993). With this procedure individual paths are separately examined across subsamples and it is tested whether the estimated coefficients for each subgroup are equal using a Chi-square difference test.

The results indicate that the fit indices for the constrained and unconstrained models were above the threshold value of 0.90, and that the RMSEA's were below the recommended threshold of 0.08. The estimation results of the unconstrained models, shown in Table 4 to reveal size effects, show that income has no significant effect on any of the path coefficients in the unconstrained models. With regard to education a num-

ber of significant moderator effort are found. The findings reveal that physical effort has a significant positive impact on relative advantage in the well-educated group ($\beta = 0.17$, $p < 0.05$) but not in the low educated group. The results further show that time pressure has a significant positive effect on relative advantage in the low-educated subgroup ($\beta = 0.72$, $p < 0.05$) but not in the high educated group. The findings also reveal that the estimates for the path between time pressure and perceived compatibility are unlike for higher ($\beta = 0.17$, $p < 0.05$) and lower educated ($\beta = 0.43$, $p < 0.05$) consumers. The perceived relative advantage is found to significantly affect consumers' behavioral intention to adopt electronic grocery shopping positively in the well-educated subgroup ($\beta = 1.20$, $p < 0.05$), while no effect is found in the lower educated subgroup. The perceived compatibility is found to significantly affect consumers' intention to adopt electronic grocery shopping positively in the subgroup of lower educated consumers ($\beta = 1.31$, $p < 0.05$), but not in the subgroup of higher educated consumers. With regard to age two paths are found to be different among the two subgroups. The findings reveal that physical effort affects relative advantage positively in the younger subgroup of consumers ($\beta = 0.25$, $p < 0.05$), but not in the subgroup of older consumers. The results also show that time pressure significantly influences relative advantage for the subgroup of older consumers ($\beta = 0.43$, $p < 0.05$), while it does not influence relative advantage in the subgroup of younger consumers.

### 6. Discussion

This study examined the relationship between the (dis)advantages of electronic grocery shopping and consumers' perceptions of the characteristics of electronic grocery shopping. We first discuss the results of the testing of the main effects in our conceptual model and next we will discuss the results of the studied moderating variables.

Table 4
Multi-group analysis results for unconstrained model[a]

| Path to | Path from | Income | | Education | | Age | |
|---|---|---|---|---|---|---|---|
| | | Low | High | Low | High | Young | Old |
| Relative advantage | Physical effort | $0.29^b$ | $0.31^b$ | **0.00** | **$0.17^b$** | **$0.25^c$** | **0.01** |
| | Time | $0.27^b$ | 0.08 | **$0.72^c$** | **0.16** | **0.12** | **$0.43^b$** |
| | Enjoyment | $-0.13$ | $-0.02$ | $-0.13$ | $-0.02$ | $-0.06$ | 0.08 |
| Compatibility | Time | $0.24^b$ | 0.14b | **$0.43^c$** | **$0.17^b$** | 0.20 | $0.27^b$ |
| | Enjoyment | 0.07 | 0.05 | $-0.10$ | 0.03 | 0.00 | 0.00 |
| Intention to adopt electronic grocery shopping | Relative advantage | $0.68^b$ | $0.69^b$ | **$-0.11$** | **$1.20^b$** | $0.66^b$ | 0.34 |
| | Compatibility | $0.44^c$ | $0.54^c$ | **$1.31^c$** | **$-0.41$** | $0.64^b$ | 0.64 |
| | Complexity | $-0.28$ | $-0.17$ | $-0.25$ | **$-0.41^b$** | **$-0.29^b$** | $-0.11$ |

[a]Bold implies that the chi-square difference test shows that the coefficients in the two groups are unequal.
[b]$p < 0.05$.
[c]$p < 0.01$.

## 6.1. Main effects

The findings show that consumers perceive the reduction in the physical efforts of grocery shopping an important advantage of electronic grocery shopping. The results further indicate that consumers who regard themselves as busy perceive electronic grocery shopping as compatible with their shopping experiences. These results suggest that busy consumers consider electronic grocery shopping as a means to reduce the time pressure associated with traditional in-store shopping. Physical effort and time pressure are closely related to shopping convenience. This suggests that convenience is a decisive factor in shaping consumers' perceptions of the characteristics of electronic grocery shopping, and hence their intention to adopt it. Thus, the advantages of traditional home shopping in comparison to in-store shopping also appear to hold for electronic grocery shopping.

In contrast with the literature on traditional home shopping, we find that shopping enjoyment is unrelated to consumers' perception of the characteristics of electronic grocery shopping. This result might be caused by the fact that electronic grocery shopping is considered more enjoyable than traditional shopping, because the Internet provides consumers opportunities to communicate and discuss with other consumers (Peterson et al., 1997). These results might also be explained by the fact that groceries are low involvement products, which are bought through routine shopping behavior, from which consumers derive less enjoyment.

This study also investigated the relationship between consumers' perception of the characteristics and their behavioral intention to adopt electronic grocery shopping. The findings reveal that consumers who consider electronic shopping to be superior, compatible and uncomplicated, express a high willingness to order groceries at home. This result confirms that consumers consider electronic shopping as a service innovation that is different from traditional home shopping services.

## 6.2. Moderating effects

This study also explored the moderating effect of the consumer characteristics of age, income and education on the relationships between the (dis) advantages of electronic grocery shopping, consumers' perception of the innovation characteristics of electronic grocery shopping and consumer's behavioral intention to adopt electronic grocery shopping. The results reveal that physical effort is the most important determinant shaping better-educated consumers' perception of the perceived innovation characteristics. Within this group perceived relative advantage is the most important determinant of the behavioral intention to adopt electronic grocery shopping. For less-educated consumers time pressure is the most important factor influencing their perception of the innovation characteristics of electronic grocery shopping. Within this less-educated group perceived compatibility is the most important determinant of their intention to adopt electronic grocery shopping. These results might be explained by the fact that well-educated and less-educated consumers have different shopping needs and hence consider the (dis) advantages differently in their decision to adopt electronic grocery shopping. For example, better-educated consumers already perceive more time pressure then less-educated consumers do and hence they are likely to consider electronic grocery shopping to be time-saving. Consequently, only for well-educated consumers, who consider in-store shopping to be physically strenuous, the perceived relative advantage of electronic grocery shopping will be higher. The results further reveal that physical effort is the most important determinant of young consumers' perception of the relative advantage of electronic grocery shopping, while time pressure is the most important determinant of the perceived relative advantage of electronic grocery shopping for old consumers.

## 7. Management implications

The results of this study have important implications for the content of a electronic grocery shopping service and the segmentation and targeting strategy of providers of such services.

## 7.1. Content of service

The finding that convenience is a decisive factor in determining consumers' perceived relative advantage and compatibility of electronic grocery shopping, means that retailers providing electronic grocery shopping services should emphasize this benefit in order to facilitate the movement of consumers through the adoption process. Convenience is closely related to time saving and physical efforts. Electronic grocery shopping makes retail store visits and grocery hauling redundant. However, providers of electronic grocery shopping services should be aware of the fact that inconveniences (e.g., waiting time) related to the characteristics of the Internet may arise. These inconveniences may offset the advantages that electronic grocery shopping has in comparison to traditional in-store shopping. Therefore, retailers providing electronic grocery shopping services should design simple ordering and fulfillment procedures that are convenient to consumers. Simple procedures also help shaping consumers' perceptions that electronic grocery shopping is rather user friendly. These perceptions of electronic grocery shopping aids in speeding up the adoption process.

## 7.2. Segmentation and targeting

The results show that consumers who perceive shopping to be physically strenuous and/or perceive much time pressure are important market segments. In that respect older consumers, as well as, better-educated consumers with time consuming jobs, are important socio-demographic market segments. The knowledge that education and age influence the relationship between consumers' perceptions of the characteristics (i.e., relative advantage and compatibility) of electronic grocery shopping and consumers' intention to adopt electronic grocery shopping, can be used to fine-tune marketing programs within the targeted market segments. For example, providers should treat better- and less-educated consumers differently. In the communication to better-educated consumers the provider should stress the reduction of the physical problems related to in-store shopping. The provider should stress the time saving aspects of electronic shopping and focus on the compatibility of electronic shopping with their life-style in the less-educated group. As such the provider can facilitate the consumer movement within the targeted market segments through the adoption process.

## 8. Limitations and suggestions for further research

This study is limited by several factors that should be addressed in further research. First, the sample was drawn from the population of a city in the Netherlands where no electronic grocery services were available. The model should be tested further with other independent samples drawn from populations where electronic grocery shopping services are already available. Since these consumers would be more knowledgeable with regard to characteristics of electronic shopping, this would provide a more robust test of the hypotheses. Second, this study used the single-respondent technique that precludes a rigorous assessment of the validity of the informant's reports. It would be interesting to verify the model using multi-respondents from the same household. Third, although the scales used for measuring physical efforts and shopping enjoyment share similarities with existing scales, further research might consider developing more elaborate measures to allow for a richer coverage of these (dis) advantages of electronic grocery shopping. Fourth, this study focused on consumers' behavioral intention to adopt electronic grocery shopping. Research shows that discrepancies are likely to occur between consumers' intentions and actual behavior (Miniard et al., 1983; Morwitz et al., 1997). Therefore, it would be interesting to include measures with regard to actual electronic shopping behavior in further research. This would also allow consumers to evaluate the divisibility and communicability of electronic grocery shop-

ping. Fifth, our exploratory findings of moderating effects of age and education suggest that in further research consumer characteristics should receive more attention. Finally, this study was limited to grocery retailing. It would be interesting to verify the model using high involvement products like clothing.

## Acknowledgements

## Appendix

Table 5
Description of scale items used[a]

*Physical effort*
    I think the transportation of my bought grocery products is hard
    The transportation of my bought groceries is exhausting
*Time pressure*
    I usually find myself pressed for time
    I am often in a hurry
    Usually there is so much to do that I wish I had more time

*Shopping enjoyment*
    I like to shop in shops that I do not know
    I really like to visit different supermarkets
    I like to meet other people in the supermarket[b]
    I consider shopping a big hassle (reversed)[b]

*Perceived relative advantage*
    Electronic shopping is less exciting
    Using electronic shopping saves much time
    Using electronic shopping makes me less dependent
      of opening hours

*Perceived compatibility*
    Electronic shopping suits my person
    Electronic shopping requires few adaptations in my personal life
    Electronic shopping yields little problems for me

*Perceived complexity*
    Electronic shopping is complex, because I cannot feel
      and see the products[c]
    With electronic shopping it is hard to find the needed products
    With electronic shopping it is difficult to order products
    With electronic shopping it is problematic to compare products
    Electronic shopping is complex

*Intention to adopt electronic grocery shopping*
    Please indicate on the response scale from 0 to 10 to which extent
      you intent to use electronic shopping to obtain your groceries
      in the near future

[a] Items originally stated in Dutch.
[b] Item deleted based on purification procedure.
[c] Item deleted based on specification measurement model.

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