*Transport and Telecommunication, 2013, Volume 14, No 1, 45–56*
*Transport and Telecommunication Institute, Lomonosova 1, Riga, LV-1019, Latvia*
*DOI 10.2478/ttj-2013-0006*

# INDIVIDUAL ATTITUDES AND SHOPPING MODE CHARACTERISTICS AFFECTING THE USE OF E-SHOPPING AND RELATED TRAVEL

***[1]Federica Crocco, [2]Laura Eboli, [3]Gabriella Mazzulla***

*University of Calabria – Faculty of Engineering, Department of Land Use Planning*
*P. Bucci, cubo 46/B, 87036 Rende (CS), Italy*

*[1]Ph. +39.984.496754. Fax +39.984.496784. E-mail: federica.crocco@unical.it*

*[2]Ph. +39.984.496784. Fax +39.984.496784. E-mail: laura.eboli@unical.it*

*[3]Ph. +39.984.496782. Fax +39.984.496784. E-mail: g.mazzulla@unical.it*

New telecommunication technologies and services have caused important challenges on travel behaviour and trip characteristics. Existing literature studies show many different outcomes regarding the effects of the new technologies on the participation of people to their personal activities and related travel; specifically, e-shopping may produce the reduction of shopping trips (substitution effect), but also an increase of trips thanks to the reuse of the travel time saved for other activities and trips (complementarity's effect). The focus of this study is to analyse the aspects mostly affecting consumer choices of purchasing goods by web or in-store, with the aim of understanding how to operate so that e-shopping can positively modify consumers' travel behaviour. Our research findings show that individual social and economic factors, consumer attitudes, and shopping mode characteristics influence the usage of online shopping. An experimental survey addressed to a sample of Italian consumers is used in the study.

**Keywords:** e-commerce; travel behaviour; logistic regression models

## 1. Introduction and Motivation

Demand for travelling is a derivative of the demand for performing activities. Everyday people move for conducting various activities, like working, studying, shopping, and so on. Therefore, people participation to the activities produces an amount of trips.

The penetration of Information and Communication Technologies (ICT) into human life has influenced personal activities and related travel [1, 2, 3, 4, 5, 6]. The Internet, in fact, allows activities such as working and shopping to be conducted without travelling to the activity places. The impacts of ICT may involve also some changes in land use, residential and work location, and possible transformations of social norms and values [7].

Many different activities can be made by ICT. As an example, Mokhtarian [8] classified eight teleactivities: commuting, conferencing, shopping, banking, entertainment, education, medicine, and justice. However, the main personal activities that can be conducted by ICT are telecommuting, teleshopping, and teleleisure. Andreev et al. [9] showed that substitution was found as the most prevalent impact for telecommuting, while complementarity is a major impact for teleshopping and teleleisure.

In the scientific literature, telecommuting has already received considerable attention, while e-shopping and its relationship with personal travel behaviour has received far less attention. Most of the empirical studies consider e-shopping as part of home-shopping (shopping by catalogue, television, fax, or telephone). However, e-shopping can be more properly defined as an activity to buy or to get information about consumer goods via the Internet; e-shopping also enables a spatial and temporal fragmentation and recombination of several stages in the shopping process. As an example, one can obtain information about a certain product by in-store shopping and purchase the product via the Internet; vice versa, it is also possible to use the Internet to obtain information about a product and then buy it in a store [10]. As the popularity of shopping via the Internet increases, it could fundamentally change people's travel behaviour, their use of transport systems and the spatial configuration of the shops.

The expected benefit of e-shopping on transportation demand is the reduction of shopping trips (substitution effect) and consequently the possible reuse of the saved travel time for other purposes/activities and trips (complementarity's effect) [11]. On the other hand, the combination of the increased access to product information with variety via e-shopping, together with the pleasure experienced by some individuals while physically shopping, may result in excess travel [12]. The findings of Casas et al. [13] had already shown that online shoppers do not travel less and in some cases travel more than in-store shoppers. The study of Circella and Mokhtarian [14] confirms a hint of complementarity of online shopping with store shopping, consistently with other studies. Hjorthol [15]

found that there is no indication of substitution of travel by shopping online and e-shopping seems to be a complementary activity to traditional shopping.

Also, electronic commerce has a relevant influence on logistics; in fact, it is fundamentally changing the nature of supply chains, and redefining how consumers learn about, select, purchase, and use products and services. In a conventional retailing, supply chain customers are responsible to purchase their goods and services at the retailer's location. Given that location is an important dimension of retailing, significant costs are assumed by the retailer to consider a location as accessible; the costs linked to the location are reflected in the final costs of a good. The introduction of e-commerce has significantly changed the relationship between customers and retailers (e-retailers). The result has been the emergence of new business-to business supply chains that are consumer-focused rather than product-focused. Customers are directly linked to the supply chain since their action of ordering a product reaches directly the distribution centre. In addition, customers want to know their landed cost of the products, when and where the products can be delivered, and this challenge the distribution industry to implement information systems to track parcels as well as vehicles. Definitively, e-commerce impacts supply chain management in a variety of keyways, such as: cost efficiency (in terms of reduction of costs, improvement of data accuracy, enhancement of customer service); distribution system (more flexibility in managing the movement of products and information between businesses, suppliers and customers); customer orientation (in terms of delivering better services to their customers); shipment tracking (e.g. providing to users an account for obtaining real-time information about cargo shipments); shipping notice (e.g. receiving process by electronically transmitting a packing list ahead of the shipment); shipping documentation (automatic production allows reduction of manual intervention); online shipping inquiry (in terms of instant shipping information access to anyone in the company, from any location).

From a transportation perspective, we can highlight that in the traditional system, the shopper was bearing the costs of moving the goods from the store to home, but with e-commerce, this segment of the supply chain has to be integrated in the freight distribution process. The result potentially involves more packaging and more tons-km of freight transported, especially in urban areas. Traditional distribution systems are thus ill fitted to answer the logistical needs of e-commerce. We can anticipate less use of private cars, but more employment of delivery vans, as well as smaller orders to be shipped longer distances.

The contradicting results of the various research studies regarding the impact of e-shopping on travel imply the need of more research on this topic.

There have not been many empirical studies attempting to establish the relationship between some factors and the intention to use or actually use online shopping. In the period after the downturn of the dot-com businesses, it became even more important to analyse these factors [16] in order to understand consumers' behaviour and perceptions about the opportunity of shopping online, which could conduct to a reduction of the trips made to physically reach the stores or at least to a more efficient organization of the trips.

In this study, the aspects mostly affecting user choices to use the Internet for purchasing goods or to buy in-store have been analysed, with the aim of understanding how to operate so that e-shopping can positively modify travel behaviour of the consumers. The study is supported by a survey, which provided experimental data collected from a sample of online and in-store consumers living in the South of Italy. The next section provides a literature review highlighting the influences of several factors on the shopping mode choice. In section 3 the experimental survey is depicted, while section 4 reports the results of a statistical analysis of the data collected from the survey. Specifically, consumer and product characteristics, and shopping mode features have been analysed; the statistical analyses have been carried out in order to define the profiles of the typical online and in-store consumer by analysing separately all the characteristics of the two categories of consumers. A logistic regression model, reported in section 5, has been proposed in order to determine the variables explaining the propensity of people to online shopping. Finally, in a conclusive section the main considerations emerged from the research have been discussed.

## 2. Factors Affecting E-Shopping: a Literature Review

Shopping is a process composed of a set of distinct components linked together in a particular sequence [17]. Mokhtarian [10] stated that typical elements of the process include desire, information gathering/receiving, trial/experience, evaluation, selection, transaction, delivery/possession, display/use, and return, e.g. [18, 19]. The choice of shopping mode can play a role in each element of the shopping process [20]. There are various elements affecting choice between online and in-store shopping mode. Some literature studies analyse these elements. Chang et al. [16] proposed a review arisen from the analysis of 45 articles, with the aim of classifying the factors affecting the intention to use or actually use online shopping. Some factors were classified into three main categories: perceived characteristics of the web as a sale channel, characteristics of the consumers, and characteristics of the website or products. Each category includes subcategories. The first category includes variables concerning the risk of online shopping perceived by consumers, relative advantages of online shopping, aspects regarding online

shopping experience, service quality factors, and trust of online transactions. The category concerning the characteristics of the customers includes consumer shopping orientations, demographic variables, computer/Internet knowledge and usage, consumer innovativeness, psychological variables. The website and product characteristics include risk reduction measures, website features like design, product characteristics like cost and tangibility. The factors analysed in the various studies showed significant (positive or negative) or no significant impacts on the use of online shopping. Some studies verified that the perceived risks concerning system security, credit card, and product have a negative impact on the intention and usage of online shopping, while variables representing relative advantages, like time saving, convenience, ease of use, utility as communication and distribution channel, have a positive impact on online shopping, as well as the variables of service quality, like customer service and perceived quality of e-vendors. Consumer characteristics have generally positive impacts on the online shopping. Examples of variables with positive impacts are: convenience oriented, recreational oriented, impulsiveness, education level, age, income level, access to credit card. In addition, variables concerning computer/Internet knowledge and usage have a positive impact. Psychological factors such as attitude, subjective norm, perceived behavioural control positively affect the intention and usage of online shopping.

Also Farag et al. [21] proposed a literature review of factors affecting e-shopping. They describe the classification of Salomon and Koppelman [19, 22] who identify four categories of characteristics affecting the behavioural choices in the shopping process: shopping motive; product characteristics; shopping mode characteristics; individual characteristics. Shopping activities have several functions: economic functions, such as buying a product; social functions (meeting people, conversation); recreational functions (physical exercise, entertainment); psychological needs (exposure to information or to fresh stimuli). Also product characteristics can affect shopping mode choice. As an example, the products popularly purchased via e-shopping are computer hardware and software, CDs, books, travel tickets, cinema and concert tickets [23, 24, 25]; on the other hand, the products usually bought in-store are clothes, furniture, and cosmetics. Concerning shopping mode characteristics, e-shopping is rated relatively low in comparison with in-store shopping on product information, product sales, security of transactions, and ease of returning merchandise [24, 26, 27]. In addition, e-shopping is rated relatively high on timesaving and flexibility in shopping hours. Individual characteristics also affect shopping mode; as an example, e-shopping is mainly done by young male graduates in professional occupations and with high incomes [23, 28, 29].

Dijst et al. [30] found that people with more Internet experience have a stronger inclination to buy online; moreover, having a credit card positively affects the volition to buy a media product online. On the other hand, with respect to the in-store shopping, people who own one or two cars have a relatively weak volition to buy a media product. Earlier research has found that owners of one or two cars make fewer shopping trips than people who do not own a car [31, 32].

Hsiao [20] proposed a literature review on the attributes of shopping mode classified into three main categories: information gathering/shopping, purchase/transaction, delivery. According to Salomon and Koppelman [19], some of the attributes may serve economic function, and some psychological function. The category of information gathering/shopping includes characteristics concerning travel; specifically, in-store shopping involves travel cost and time. Other characteristics regard psychological factors linked to shopping fun and information uncertainty; specifically, online shopping involves less shopping fun and more information uncertainty than in-store shopping. The category of purchase/transaction includes characteristics concerning purchase price and distrust feelings caused by transaction. The category of delivery includes waiting time for delivery and other inconveniences caused by delivery.

## 3. Survey

The study area is the single built-up area made up of the towns of Cosenza and Rende, sited in the South of Italy. The urban area has grown over the years also thanks to the presence of the University of Calabria, which expanded in the North of Rende at the beginning of the seventies. Cosenza and Rende represent a centre of attraction for all the towns of the whole province, because of the administrative functions, job opportunities and supply of services. The urban area has about 120,000 inhabitants. In addition, a fair proportion of university students from other places of Calabria lives in Rende or Cosenza; the students attending the University of Calabria are approximately 35,000. The total number of employees in the urban area is about 37,000. About 47% of the employees work in the public sector, about 37% in the business or the other private services, only 14% in the industry and 2% in the agriculture.

A web survey was conducted in order to investigate the factors affecting the inclination of people to the usage of e-shopping compared to in-store shopping. The survey was realized at the end of 2008 by the website of an online magazine published by the University of Calabria. About 3,400 frequent readers of the magazine were reached by e-mail, and 1,216 individuals voluntarily took part in the survey;

therefore, the response rate is 35.8%. Each respondent was asked for describing his/her last purchase by indicating the category of product purchased and the adopted shopping mode (in-store or online). On the basis of this last statement the sample was divided into two groups, by assuming that who adopted online shopping mode is an online consumer, while who purchased in a store is an in-store consumer. Therefore, the sample is divided in by 562 online consumers and 654 in-store shoppers.

The questionnaire was divided into three sections. Section 1 aimed to collect information about some socio-economic characteristics of the sample (gender, age, employment, education, income, and so on). Section 2 aimed to collect information about the purchase (category of the product, price of the product, shopping mode). Some information about consumer attitudes for shopping are collected through section 3. Specifically, consumers were asked for giving a judgement according to a five-point verbal scale ("irrelevant", "little important", "quite important", "very important", "fundamental") to their following attitudes: need of handling and having a close look at products; need of interacting with shop assistants; propensity to negotiate; inclination to make recreational activities for shopping; propensity to purchase without travelling to shopping places; perceived risk concerning credit card; perceived problems concerning prepayment. Section 3 contains also some questions in which consumers were asked for giving a judgement according to the same verbal scale to factors concerning three peculiarities of in-store shopping and fifteen characteristics of online shopping: presence of a physical structure; opportunity of immediately having products; easiness to change products; slowness of the Internet connection; large variety of offered products; opportunity of acquiring more in detail information about products; opportunity of comparing prices and saving; opportunity of gaining information from other people netsurfing; opportunity of purchasing at any time; opportunity of safely purchasing by avoiding robberies; opportunity of purchasing articles unobtainable on traditional channels; opportunity of having online assistance in real time; opportunity of using digital cash; opportunity of using wallet; problems concerning dispatching; problems concerning delivery; opportunity of taking advantage of discount.

Out of 1,216 respondents, there are 666 males (55%) (Table 1). Most of the sample is between 41 and 65 years old (45.8%); relevant percentages are reported for people between 18 and 24 (29.9%) and between 25 and 40 (19.5%). Half of the respondents are employees and 34% are students. Over half of the employed people are clerks and 23% are freelancer. Most of the employees work in the sector of public administration (56.7%). Over half of the sample has a degree. Half of the sample belongs to an upper-middle class of income, and 33.3% of the respondents belong to a lower-middle class. The classes of income refer to the net monthly income of the family unit, expressed in Euros. The number of members in a family unit is 3.6 on average. Each family has 2.6 members with car driving licence and 1.9 cars on average.

The z-test for a proportion was conducted to compare the proportions created by the random sample to the proportions in the population in order to determine the representativeness of the sample. Since the test statistic has an absolute value higher than the critical value of 1.96 (level of significance of 5%), or 1.645 (level of significance of 10%), the researcher rejects the null hypothesis that there is a statistically significant difference between the population proportion and the sample proportion. The obtained test values suggest that the sample can be considered as representative of the population.

## 4. Sample Statistical Analysis

### 4.1. Consumer Characteristics

A more useful descriptive statistical analysis was carried out in order to define the profiles of the online and in-store consumer by analysing separately the socio-economic characteristics of the two categories of consumers (Table 1). As above mentioned, the sample is made up of 562 online consumers (46.2%) and 654 in-store shoppers (53.8%). Little more than half of in-store consumers are females, while 55.2% of online consumers are males. From the responses given by the sample, the following profile of the online consumer emerges: online consumer is a university or secondary school student (55.0%), with an age between 18 and 24 years (47.7%), and a higher-middle level of family income (48.6%). Therefore, this statistical analysis suggests that being male and young, being student and having a high family income positively increase the propensity to buy online. A profile of in-store consumer can be described according to the same criteria: in-store consumer is an employee (65.1%), belonging to a higher-middle class of income (44.0%) and having an age between 41 and 65 years (76.3%).

As expected, in-store consumer has more possibility to use the private car, given that 8.7% of these consumers belong to families having 3 or more cars (against 4.3% of the online consumers), and 65.4% of them belong to families with 3 o more members having car driving licence (against 50.4% of the online consumers).

The two-proportion z-test was conducted to determine whether the difference between the percentages of the two samples (or the two categories of consumers) is significant. The z-test verifies

from the observed sample difference whether the hypothesized difference between population proportions differs significantly. If the sample findings are unlikely, given the null hypothesis that the two proportions are equal, the researcher rejects the null hypothesis. Specifically, the null hypothesis is rejected if the absolute value of the statistics is higher than 1.96 (level of significance of 5%), or than 1.645 (level of significance of 10%). By observing the obtained values of the z-test reported in table 1, we can say that the two populations differ significantly, except for belonging to the category of workers, compulsory education, upper and lower-middle income classes. The test is not satisfactory also for some characteristics regarding the family size, driving licence and car ownership.

**Table 1.** Frequency of the responses about consumer socio-economic characteristics (n = 1,216)

| Characteristics | | In-store consumers (654) | Online consumers (562) | Two proportion z-test | Total sample (1216) |
|---|---|---|---|---|---|
| Gender | male | 356 (54.4%) | 310 (55.2%) | -2.44 | 666 (55.0%) |
| | female | 298 (45.6%) | 252 (44.8%) | 2.44 | 550 (45.0%) |
| Age | < 18 | 8 (1.2%) | 45 (8.0%) | -5.78 | 53 (4.4%) |
| | 18-24 | 96 (14.7%) | 268 (47.7%) | -12.53 | 364 (29.9%) |
| | 25-40 | 46 (7.0%) | 191 (34.0%) | -11.83 | 237 (19.5%) |
| | 41-65 | 499 (76.3%) | 58 (10.3%) | 23.02 | 557 (45.8%) |
| | > 65 | 5 (0.8%) | 0 (0.0%) | 2.08 | 5 (0.4%) |
| Employment | employed | 426 (65.1%) | 190 (33.8%) | 10.89 | 616 (50.7%) |
| | unemployed | 31 (4.7%) | 44 (7.8%) | -2.23 | 75 (6.2%) |
| | searching for a first emp. | 7 (1.1%) | 13 (2.3%) | -1.70* | 20 (1.6%) |
| | housewife | 56 (8.6%) | 6 (1.1%) | 5.92 | 62 (5.1%) |
| | high school student | 8 (1.2%) | 45 (8.0%) | -5.78 | 53 (4.4%) |
| | university student | 98 (15.0%) | 264 (47.0%) | -12.16 | 362 (29.8%) |
| | pensioner | 28 (4.3%) | 0 (0.0%) | 4.96 | 28(2.3%) |
| Career | clerk | 226 (53.1%) | 125 (65.8%) | -2.95* | 351 (57.0%) |
| | manager | 20 (4.7%) | 8 (4.2%) | n.s. | 28 (4.5%) |
| | entrepreneur | 65 (15.3%) | 10 (5.3%) | 3.50* | 75 (12.2%) |
| | freelancer | 105 (24.6%) | 37 (19.5%) | n.s. | 142 (23.1%) |
| | artisan | 6 (1.4%) | 0 (0.0%) | 1.65* | 6 (1.0%) |
| | worker | 3 (0.7%) | 4 (2.1%) | n.s. | 7 (1.1%) |
| | other | 1 (0.2%) | 6 (3.2%) | -3.16* | 7 (1.1%) |
| Education | compulsory education | 51 (7.8%) | 50 (8.9%) | n.s. | 101 (8.3%) |
| | high school leaving qualifications | 148 (22.6%) | 267 (47.5%) | -9.12 | 415 (34.1%) |
| | degree | 422 (64.5%) | 231 (41.1%) | 8.17 | 653 (53.7%) |
| | post degree qualification | 33 (5.0%) | 14 (2.5%) | 2.30 | 47 (3.9%) |
| Family income level | < 20,000 euros | 120 (18.3%) | 29 (4.4%) | 6.99 | 149 (12.3%) |
| | 20,000-40,000 euros | 216 (33.0%) | 189 (28.9%) | n.s. | 405 (33.3%) |
| | 40,000-60,000 euros | 288 (44.0%) | 318 (48.6%) | -4.36 | 606 (49.8%) |
| | >60.000 euros | 30 (4.6%) | 26 (4.6%) | n.s. | 56 (4.6%) |
| Family members | 1 member | 2 (0.3%) | 0 (0.0%) | n.s. | 2 (0.2%) |
| | 2 members | 33 (5.0%) | 35 (6.3%) | n.s. | 68 (1.8%) |
| | 3 members | 236 (36.0%) | 225 (40.0%) | n.s. | 461 (37.9%) |
| | 4 or more members | 383 (58.6%) | 302 (53.7%) | 1.69* | 685 (56.3%) |
| Family members with | 1 member | 16 (2.5%) | 6 (1.1%) | n.s. | 0 (0.0%) |
| car driving licence | 2 members | 210 (32.1%) | 273 (48.5%) | 1.80* | 22 (1.8%) |
| | 3 or more members | 428 (65.4%) | 283 (50.4%) | 5.32 | 711 (58.5%) |
| Family car ownership | 0 | 3 (0.5%) | 0 (0.0%) | n.s. | 3 (0.2%) |
| | 1 | 74 (11.3%) | 99 (17.6%) | -3.14 | 173 (14.2%) |
| | 2 | 520 (79.5%) | 439 (78.1%) | n.s. | 959 (78.9%) |
| | 3 or more cars | 57 (8.7%) | 24 (4.3%) | 3.09 | 81 (6.7%) |

*significant at a level of 10%

Also concerning consumer attitudes, a first analysis can be conducted by observing for each question the frequency of response (Table 2). Considerations that are more useful can be made if the data are analysed by distinguishing the responses of people who chose in-store shopping from the responses of people who purchased online. This type of analysis helps to better and more immediately understand factors influencing shopping mode choice.

For most of online consumers (68%) the need of handling and having a close look at goods is irrelevant or little important; vice versa, 64% of in-store consumers considers as fundamental this kind of need. For almost all in-store consumers (88%) the inclination to make recreational activities for shopping is fundamental; while online consumers have conflicting opinions, given that a relevant percentage of them (42%) retains this aspect as little important and a percentage as relevant (44%) considers the aspect

as fundamental. Concerning the propensity to interact with shop assistants, most of people who purchased online (61%) give little or no importance to this aspect, while 65% of in-store consumers consider as important this aspect. An unexpected outcome is obtained for the factor regarding the propensity to negotiate; specifically, most of people who purchased in-store (68%) retains this aspect as irrelevant or little important (even if in this last case the z-test is not satisfactory), while over half of online consumers consider this aspect as important. In this case, the propensity to negotiate reflects a need of the online consumers to competitively priced purchase and to choose the shopping mode, which generally guarantees lower prices. The opportunity to purchase without travelling to shopping places is considered as very important or fundamental by almost 60% of both the categories of interviewed consumers. An expected outcome was obtained for the aspect linked to the perceived risk concerning credit card; specifically, 91% of online consumers considers this risk as little or no important, while only 3.5% of in-store consumers does not give importance to this risk. The aspect linked to the perceived problems concerning prepayment does not show particular differences by comparing responses expressed by people who purchased online with the responses of consumers who purchased in-store.

**Table 2.** Frequency of the responses about consumer attitudes

| | | irrelevant | little important | quite important | very important | fundamental |
|---|---|---|---|---|---|---|
| handling and having a close look | in-store consumer (%) | 0.0 | 0.0 | 21.4 | 14.4 | 64.2 |
| | online consumer (%) | 39.7 | 28.1 | 2.3 | 10.0 | 19.9 |
| | two proportion z-test | -17.83 | -14.54 | 10.01 | 2.33 | 15.52 |
| interacting with shop assistants | in-store consumer (%) | 12.2 | 22.5 | 21.7 | 26.3 | 17.3 |
| | online consumer (%) | 25.8 | 35.4 | 25.8 | 8.7 | 4.3 |
| | two proportion z-test | -6.07 | -4.98 | -1.67* | 7.93 | 7.15 |
| negotiate | in-store consumer (%) | 37.6 | 30.4 | 22.2 | 9.0 | 0.8 |
| | online consumer (%) | 17.4 | 26.7 | 18.5 | 22.8 | 14.6 |
| | two proportion z-test | 7.79 | n.s. | n.s. | -6.63 | -9.33 |
| recreational activity | in-store consumer (%) | 0.0 | 0.0 | 7.6 | 3.8 | 88.5 |
| | online consumer (%) | 2.3 | 42.2 | 2.5 | 8.7 | 44.3 |
| | two proportion z-test | -3.91 | -18.51 | 4.01 | -3.56 | 16.50 |
| purchasing without travelling | in-store consumer (%) | 9.6 | 13.9 | 18.7 | 17.9 | 39.9 |
| | online consumer (%) | 3.6 | 16.2 | 22.1 | 39.5 | 18.7 |
| | two proportion z-test | 4.19 | n.s. | n.s. | -8.38 | 8.04 |
| risk concerning credit card | in-store consumer (%) | 0.0 | 3.5 | 37.9 | 40.8 | 17.7 |
| | online consumer (%) | 3.6 | 87.2 | 0.0 | 7.3 | 2.0 |
| | two proportion z-test | -4.86 | -29.46 | 16.36 | 13.40 | 8.97 |
| problems concerning prepayment | in-store consumer (%) | 13.9 | 18.5 | 28.0 | 28.3 | 11.3 |
| | online consumer (%) | 26.0 | 16.2 | 31.0 | 20.5 | 6.4 |
| | two proportion z-test | -5.29 | n.s. | n.s. | 3.16 | 2.98 |

*significant at a level of 10%

In addition, a question about consumer experience with the new technologies was addressed to all the users. Specifically, 97% of online consumers state to have experience with online shopping. In-store consumers, instead, are less expert with new technologies; in fact, over half of them (54%) states to have not experience with online shopping.

Finally, additional questions were addressed to the in-store consumers about their potential usage of the Internet before purchasing. Specifically, 73.4% of the consumers used the Internet for collecting information about the products before purchasing in-store; almost 60% of the consumers used the Internet for searching for the different articles or brands of the desired product and controlling the product prices; about 30% of users used the Internet for searching for the most convenient point of sale nearest to home or more convenient in terms of assortment and promotion, and only 19% for searching for information from people experienced at buying the desired products.

### 4.2. Product Characteristics

Each respondent specified the category and the level of price of the product that he/she purchased (Table 3). The products were preliminary classified according to sixteen categories, while nine categories of price were predefined.

Although about 30% of both online and in-store consumers purchase products of electronics and telephony, online consumers purchase more products of computer hardware and notebook (31.5%), while in-store consumers purchase a certain quantity of articles of clothing (28.9%). There are many categories

of products purchased by scant percentages of consumers; for these categories, the values of the two-proportion z-test are not satisfactory. Over half of the products purchased online have a price between 300 and 500 Euros (55.9%), while the majority of the products purchased in-store has a price between 50 and 100 Euros (40.7%).

We can say that online consumers tend to purchase products with higher levels of price and which can be easily chosen on the web, being products which less need to be handled or had a close look. Concerning the levels of price, we can say that people purchase more online expensive products because they can generally purchase on the cheap by web. On the other hand, in-store consumers tend to purchase larger quantities of product of clothing than online consumers do, because these kinds of products need more to be handled or had a close look.

**Table 3.** Frequency of the responses about product characteristics

| | | In-store consumers (654) | Online consumers (562) | Two proportion z-test | Total sample (1216) |
|---|---|---|---|---|---|
| Product category | publishing/books | 21 (3.2%) | 0 (0.0%) | 4.29 | 21 (1.7%) |
| | dvd/music | 47 (7.2%) | 40 (7.1%) | n.s. | 87 (7.2%) |
| | computer hardware/notebook | 74 (11.3%) | 177 (31.5%) | -8.67 | 251 (20.6%) |
| | electronics and telephony | 221 (33.8%) | 160 (28.5%) | 1.99 | 381 (31.3%) |
| | computer software | 10 (1.5%) | 0 (0.0%) | 2.94 | 10 (0.8%) |
| | domestic appliances | 40 (6.1%) | 78 (13.9%) | -4.56 | 118 (9.7%) |
| | clothing | 189 (28.9%) | 31 (5.5%) | 10.56 | 220 (18.1%) |
| | shoes | 19 (2.9%) | 19 (3.4%) | n.s. | 38 (3.1%) |
| | personal accessories | 16 (2.4%) | 23 (4.1%) | n.s. | 39 (3.2%) |
| | health | 5 (0.8%) | 19 (3.4%) | -3.27 | 24 (2.0%) |
| | sport | 9 (1.4%) | 6 (1.1%) | n.s. | 15 (1.2%) |
| | perfumery | 2 (0.3%) | 7 (1.2%) | -1.91* | 9 (0.7%) |
| | toys | 0 (0.0%) | 0 (0.0%) | n.s. | 0 (0.0%) |
| | jewellery | 1 (0.2%) | 2 (0.4%) | n.s. | 3 (0.2%) |
| | ironmongery | 0 (0.0%) | 0 (0.0%) | n.s. | 0 (0.0%) |
| | electrical materials | 0 (0.0%) | 0 (0.0%) | n.s. | 0 (0.0%) |
| Product price (Euro) | lower than or equal to 20 | 1 (0.2%) | 35 (6.2%) | -6.23 | 36 (3.0%) |
| | between 21 and 50 | 157 (24.0%) | 99 (17.6%) | 2.73 | 256 (21.1%) |
| | between 51 and 100 | 266 (40.7%) | 11 (2.0%) | 16.05 | 277 (22.8%) |
| | between 101 and 300 | 137 (20.9%) | 48 (8.5%) | 6.01 | 185 (15.2%) |
| | between 301 and 500 | 14 (2.1%) | 314 (55.9%) | -21.05 | 328 (27.0%) |
| | between 501 and 700 | 31 (4.7%) | 24 (4.3%) | n.s. | 55 (4.5%) |
| | between 701 and 900 | 19 (2.9%) | 7 (1.2%) | 1.99 | 26 (2.1%) |
| | between 901 and 2000 | 29 (4.4%) | 24 (4.3%) | n.s. | 53 (4.4%) |
| | higher than 2000 | 0 (0.0%) | 0 (0.0%) | n.s. | 0 (0.0%) |

*significant at a level of 10%

### 4.3. Shopping mode Characteristics

All the consumers interviewed gave information about factors characterizing in-store and online shopping, independently of their choice about shopping mode. Therefore, 1,216 observations were collected for each factor.

Also for these factors, the data are analysed by distinguishing the responses of people who chose in-store shopping from the responses of people who purchased online (Table 4).

Concerning the characteristics of in-store shopping, there are relevant differences in responses between people who chose in-store shopping and people who chose online shopping. Specifically, most of people who purchased online (62%) give little or no importance to the opportunity of immediately having products, while most of people who purchased in-store (86%) consider as fundamental, very or quite important this kind of opportunity. As expected, the easiness to change products is considered more important for people who purchased in-store; in fact, a relevant percentage of online consumers (51%) consider this aspect as little or no important. Finally, the presence of the physical structure is judged roughly in the same way by both the categories of consumers.

By analysing the characteristics of online shopping, not relevant differences in responses between people who chose in-store shopping and people who purchased online can be observed for many aspects. Specifically, the factors regarding the large variety of offered products and the opportunity of acquiring more in detail information about products are considered as fundamental by almost all people who purchased online (84% and 76%, respectively), while relevant percentages of people who purchased in-store consider these two aspects as little or no important (24% and 27%, respectively). Concerning the slowness of the Internet connection, the sample of people who purchased online is divided between consumers considering this aspect as irrelevant (57%) and consumers retaining it as a very important aspect (36%); on the other hand, 85% of people who purchased in-store give little or no importance to this

aspect. A series of aspects shows very similar percentages of response from the comparison between the rates expressed by the consumers belonging to the two different categories: opportunity of comparing prices and saving; opportunity of gaining information from other people netsurfing; opportunity of purchasing at any time; opportunity of purchasing articles unobtainable on traditional channels; opportunity of using digital cash; opportunity of using wallet; problems concerning delivery. Specifically, most of the online consumers (about 80%) give importance to the opportunity of comparing prices and saving; over 60% of the online sample considers the opportunity of purchasing at any time as a very important or fundamental aspect. However, the values of the z-test regarding these two aspects do not allow to state that these differences are significant in the populations.

**Table 4.** Statistical analysis of shopping mode characteristics

| | | | irrelevant | little important | quite important | very important | fundamental |
|---|---|---|---|---|---|---|---|
| In-store characteristics | presence of a physical structure | in-store consumer (%) | 16.2 | 29.8 | 23.1 | 18.0 | 12.8 |
| | | online consumer (%) | 4.3 | 42.7 | 19.0 | 24.0 | 10.0 |
| | | two proportion z-test | 6.72 | -4.67 | 1.72* | -2.56 | n.s. |
| | immediately having products | in-store consumer (%) | 0.0 | 13.8 | 23.5 | 43.0 | 19.7 |
| | | online consumer (%) | 25.8 | 36.1 | 20.1 | 2.7 | 15.3 |
| | | two proportion z-test | -13.84 | -9.09 | n.s. | 16.33 | 2.02 |
| | easiness to replace products | in-store consumer (%) | 10.1 | 15.1 | 25.2 | 28.9 | 20.6 |
| | | online consumer (%) | 6.4 | 44.8 | 18.3 | 13.5 | 16.9 |
| | | two proportion z-test | 2.31 | -11.40 | 2.89 | 6.48 | 1.66* |
| | slowness of the Internet connection | in-store consumer (%) | 31.3 | 54.3 | 5.5 | 8.9 | 0.0 |
| | | online consumer (%) | 57.3 | 1.2 | 5.0 | 36.5 | 0.0 |
| | | two proportion z-test | -9.10 | 20.17 | n.s. | -11.66 | n.s. |
| | large variety of offered products | in-store consumer (%) | 3.4 | 20.9 | 15.7 | 13.8 | 46.2 |
| | | online consumer (%) | 0.9 | 6.4 | 4.6 | 4.1 | 84.0 |
| | | two proportion z-test | 2.92 | 7.24 | 6.28 | 5.79 | -13.67 |
| | acquiring more information | in-store consumer (%) | 4.3 | 22.8 | 16.4 | 11.5 | 45.1 |
| | | online consumer (%) | 2.0 | 1.6 | 8.5 | 11.7 | 76.2 |
| | | two proportion z-test | 2.29 | 10.95 | 4.08 | n.s. | -10.99 |
| | comparing prices and saving | in-store consumer (%) | 8.4 | 13.1 | 17.9 | 24.5 | 36.1 |
| | | online consumer (%) | 4.8 | 10.5 | 15.7 | 30.2 | 38.8 |
| | | two proportion z-test | 2.50 | n.s. | n.s. | -2.26 | n.s. |
| | gaining information from other people | in-store consumer (%) | 20.8 | 34.3 | 17.3 | 14.4 | 13.3 |
| | | online consumer (%) | 10.9 | 31.3 | 17.6 | 18.7 | 21.5 |
| | | two proportion z-test | 4.69 | n.s. | n.s. | -2.03 | -3.80 |
| | purchasing at any time | in-store consumer (%) | 8.9 | 11.6 | 19.1 | 26.5 | 33.9 |
| | | online consumer (%) | 5.3 | 12.1 | 18.9 | 26.3 | 37.4 |
| | | two proportion z-test | 2.37 | n.s. | n.s. | n.s. | n.s. |
| | safely purchasing | in-store consumer (%) | 12.4 | 34.3 | 24.6 | 14.7 | 14.1 |
| Online characteristics | | online consumer (%) | 10.9 | 20.1 | 26.5 | 26.9 | 15.7 |
| | | two proportion z-test | n.s. | 5.49 | n.s. | -5.27 | n.s. |
| | purchasing articles unobtainable on | in-store consumer (%) | 13.1 | 15.1 | 15.3 | 39.3 | 17.1 |
| | traditional channel | online consumer (%) | 6.0 | 18.0 | 19.4 | 45.9 | 10.7 |
| | | two proportion z-test | 4.14 | n.s. | -1.89* | -2.33 | 3.22 |
| | having online assistance in real time | in-store consumer (%) | 8.6 | 26.1 | 33.2 | 19.0 | 13.1 |
| | | online consumer (%) | 5.7 | 19.0 | 26.2 | 21.4 | 27.8 |
| | | two proportion z-test | 1.92* | 2.94 | 2.67 | n.s. | -6.36 |
| | taking advantage of discount | in-store consumer (%) | 5.0 | 3.8 | 34.1 | 3.7 | 53.4 |
| | | online consumer (%) | 0.0 | 0.0 | 13.5 | 16.9 | 69.6 |
| | | two proportion z-test | 5.40 | 4.68 | 8.31 | -7.74 | -5.77 |
| | using digital cash | in-store consumer (%) | 6.4 | 22.3 | 25.2 | 29.5 | 16.5 |
| | | online consumer (%) | 5.9 | 18.5 | 30.1 | 35.2 | 10.3 |
| | | two proportion z-test | n.s. | 1.64* | -1.89* | -2.13 | 3.14 |
| | using wallet | in-store consumer (%) | 10.9 | 23.7 | 35.3 | 16.1 | 14.1 |
| | | online consumer (%) | 11.6 | 22.2 | 26.3 | 20.8 | 19.0 |
| | | two proportion z-test | n.s. | n.s. | 3.37 | -2.14 | -2.34 |
| | problems concerning dispatching | in-store consumer (%) | 22.8 | 23.7 | 17.3 | 25.7 | 10.6 |
| | | online consumer (%) | 15.1 | 13.5 | 32.9 | 30.4 | 8.0 |
| | | two proportion z-test | 3.38 | 4.51 | -6.32 | -1.84* | n.s. |
| | problems concerning delivery | in-store consumer (%) | 10.7 | 27.1 | 27.4 | 22.0 | 12.8 |
| | | online consumer (%) | 10.0 | 26.0 | 35.8 | 19.2 | 9.1 |
| | | two proportion z-test | n.s. | n.s. | -3.15 | n.s. | 2.09 |

*significant at a level of 10%

The following factors do not show particular differences by comparing responses expressed by people who purchased online with the responses of consumers who purchased in-store: opportunity of safely purchasing by avoiding robberies; opportunity of having online assistance in real time; opportunity of taking advantage of discount. As expected, the aspect linked to the problems concerning dispatching is considered as more important for people who purchased online.

From the analysis of the frequency of responses, it emerges that the in-store consumer has more inclination to make recreational activities for shopping, more need of handling and having a close look at products, and of interacting with shop assistants; at the same time, he/she retains important the opportunity of immediately having products and the easiness to change products.

Instead, the online consumer retains that the large variety of offered products, the opportunity of acquiring more in detail information about products, together with the opportunity of taking advantage of discount are fundamental aspects of the online shopping; he/she also has more propensity to purchase without travelling to shopping places, and considers as important the aspects linked to the opportunity of comparing prices and saving, and of purchasing articles unobtainable on traditional channels.

## 5. Logistic Regression Models

The logistic regression technique has been adopted in order to determine the variables explaining the propensity of people to online shopping. Some consumer attitudes and shopping mode characteristics have been used as independent variables affecting shopping mode choice (Table 5).

We introduced a binary logistic regression model for explaining online buying by the Internet users to control for the multivariate effects of the independent variables. Binary logistic regression predicts the probability to shop online compared to shop non-online. The dependent variable of the model is the choice of online or in-store shopping. The variable has a value of "1" if the consumer purchased by web, and a value of "0" if the consumer purchased in a store; the value of "0" is the reference level representing the non-online shopping mode. Each independent variable has a value of "1" if the respondent judged the attitude or shopping mode characteristic as "fundamental", or "very important", or "quite important"; on the other hand, the "0" value corresponds to the "little important" or "irrelevant" judgement.

A backward Wald procedure was used to determine significant predictor variables by using SPSS software. Backward selection starts with all variables and removes one at a time, in the order they are worst according to the Wald test. The values of the statistics on the goodness of fit are reasonable. Specifically, R-square of Nagelkerke is 0.887, chi-square test is significant with a value of 1330.789, and the Hosmer-Lemeshow test shows a chi-square value of 5.590 with a significance level of 0.693. By observing the classification tables, the percentage of correct responses is 95.9% against 46.2%, which is the percentage when there are no variables in the model. The results partly confirm the findings of the descriptive analysis. The significant un-standardized logit coefficient for each predictor in the model is shown in table 5, together with its standard error, the Wald statistic, the p significance level, and the odds ratio.

**Table 5**. Logistic regression analysis of online purchasing accounting for consumer attitudes and shopping mode characteristics (n = 1,216)

| | Coeff. β | E.S. | Wald | Sig. | Exp(β) |
|---|---|---|---|---|---|
| interacting with shop assistants (1 = imp; 0 = not imp) | -1.246 | 0.321 | 15.104 | 0.000 | 0.288 |
| negotiate (1 = imp; 0 = not imp) | 2.573 | 0.420 | 37.498 | 0.000 | 13.104 |
| risk concerning credit card (1 = imp; 0 = not imp) | -6.665 | 0.470 | 201.159 | 0.000 | 0.001 |
| immediately having products (1 = imp; 0 = not imp) | -2.455 | 0.350 | 49.063 | 0.000 | 0.086 |
| large variety of offered products (1 = imp; 0 = not imp) | 0.833 | 0.450 | 3.418 | 0.064 | 2.299 |
| acquiring more information (1 = imp; 0 = not imp) | 1.287 | 0.508 | 6.428 | 0.011 | 3.622 |
| purchasing articles unobtainable on traditional channels (1 = imp; 0 = not imp) | 1.042 | 0.379 | 7.541 | 0.006 | 2.834 |
| having online assistance in real time (1 = imp; 0 = not imp) | 0.544 | 0.325 | 2.803 | 0.094 | 1.723 |
| taking advantage of discount (1 = imp; 0 = not imp) | 1.726 | 0.691 | 6.234 | 0.013 | 5.619 |

Among the consumer attitudes, the need of interacting with shop assistants and the perceived risk concerning credit card negatively affect the propensity to purchase online; while the propensity to negotiate has a positive impact to the choice of online shopping. Among the characteristics of the shopping modes, only the opportunity of immediately having products has a negative impact on online shopping. All the other shopping mode characteristics introduced in the model positively affect the propensity to choose online shopping; specifically, the opportunity of taking advantage of discount has

the highest positive weight on the choice of shopping online. From these results we can conclude that online consumer has more propensity to negotiate, he/she retains important having discount by buying online, acquiring more information than in a store, purchasing articles unobtainable on traditional channels, having a large variety of products in the Internet, and having online assistance in real time. On the other hand, the in-store consumer perceives more the risk in the use of credit card concerning privacy when he/she buys in the Internet, he/she has more need to interact with shop assistants; in addition, in-store consumer considers as important the opportunity to immediately have products in-store. Odds ratios may be more usefully adopted to compare the relative strength of the independents.

By analysing the odds concerning the variables of the consumer attitudes, we can say that the odds of online shopping compared to in-store shopping are decreased by a factor of 0.228 by needing interactions with shop assistants; in addition, we could say that the odds a consumer needing to negotiate purchases online are 13.104 the odds a consumer who does not need to negotiate purchases online; finally, the probability of purchasing online, given that consumers have a high perceived risk concerning credit card, is 0.001 the probability of purchasing online given that this risk is not considered by the consumers. The effects of the variables concerning shopping mode characteristics can be analogously explained. For the characteristics concerning immediately having products, the odds a consumer giving importance to this aspect purchases online are 0.086 the odds a consumer who does not give relevance to this aspect purchases online. In addition, we can say that the odds of online shopping compared to in-store shopping are increased by a factor of 5.619 by considering as important the advantage of discount by web, 3.622 by giving importance to the possibility of acquiring more information by the Internet, 2.834 by retaining important the opportunity to purchase articles unobtainable on traditional channels, 2.299 by giving importance to the large variety of products offered by web, and 1.723 by retaining important the online assistance in real time.

## 6. Conclusions

Although many studies have analysed the impacts of ICT on travel behaviour, different and contrasting outcomes were found. There is still vagueness regarding the effects linked to the interactions between ICT and travel behaviour, in terms of reduction of shopping trips (substitution effect) and the possible reuse of the saved travel time for other purposes/activities and trips (complementarity effect). Researchers have probably overestimated the importance of technologies and underestimated the importance of social factors, and the expected travel decrease has not been realized yet. The proposed research has tried to analyse the aspects mostly affecting user choices to purchase goods by the Internet or to buy in-store just for understanding how e-shopping can positively modify the travel behaviour of the consumers.

We have analysed both individual (socio-economic and attitudinal) and shopping mode characteristics, through statistical analyses of experimental data.

Individual socio-economic characteristics such as being male and young, having a high family income affect positively the usage of online shopping. In addition, some online shopping mode characteristics influence positively the use of the Internet for purchasing goods, such as the large variety of offered products, opportunity of acquiring more in detail information about products, taking advantage of discount, comparing prices and saving, and purchasing articles unobtainable on traditional channels. Online consumers tend to purchase products with higher levels of price and which can be easily chosen on the web being products which less need to be handled or had a close look. Logistic regression analysis largely confirms the above-mentioned outcomes. In addition, it emerges that the attitude of the consumers to negotiate and the opportunity of having online assistance in real time affect positively the usage of e-shopping.

On the other hand, the typical in-store consumer is an employee, between 41 and 65 years old, working in the sector of public administration and belonging to a higher-middle class of family income. In-store consumer is recreational oriented, he/she needs to handle and have a close look at goods, to interact with shop assistants, and he/she perceives more the risk of the use of credit card concerning privacy when he/she buys in the Internet. At the same time, he/she retains important the opportunity of immediately having products and the easiness to replace goods. In-store consumers tend to purchase larger quantities of product of clothing. Logistic regression analysis confirms these outcomes.

Some outcomes of the proposed study are in line with the findings of other literature studies. As highlighted from the literature review proposed by Chang et al. [16], we verified that variables regarding perceived risk concerning credit card have a negative impact on the usage of online shopping, while variables representing relative advantages, like convenience, utility as communication and distribution

channel, have a positive impact on e-shopping. According to the same literature review, consumer characteristics in general have positive impacts on the online shopping, such as education level, age, income level. In line with the studies of Vrechopoulos et al. [23], Hjorthol [28], Zmud and Arce [29], we found that being young and having a high family income affects positively the usage of online shopping. Like Vrechopoulos et al. [23], Lee [24], and Szymanski and Hise [25], we found that online consumers tend to purchase computer hardware and software, while clothes are more purchased in-store. In line with the study of Dijst et al. [30], we found that people with more Internet experience have a stronger inclination to buy online. From the proposed studies, many other factors concerning shopping mode characteristics have shown different effects on the usage of online shopping.

The outcomes of the proposed research could be used for identifying the most convenient strategies to positively modify travel behaviour of the consumers. Some suggestions arise from the analysis of the characteristics of both online and in-store shopping mode characteristics. As an example, a useful strategy could be adopted to encourage in-store shoppers to acquire product information such as prices or brands before purchasing in-store and to identify the most convenient points of sale. For this aim, shopkeepers could provide online information regarding saleable products and store location to the consumers. The achievements of shopping centres could be further stimulated in order to satisfy user needs in doing both shopping and other recreational activities (cinema, sport, etc.). These strategies could help to optimise the trips made by consumers to reach the shops.

In addition, strategies for improving online shopping may be usefully adopted. As an example, one of the most relevant problems of the online shopping is caused by the door-to-door delivery of the products increasing the traffic of the delivery vans. In order to solving this problem, specific delivery centres for the online consumers could be realized.

## References


1. Salomon, I. (1986). Telecommunications and travel relations: a review. *Transportation Research Part A,* 20(3), 223–238.
2. Salomon, I. (1998). Technological change and social forecasting: the case of telecommuting as a travel substitute. *Transportation Research Part C*, 6, 17–45.
3. Handy, S. L. & Yantis, T. (1997). *The impacts of telecommunications technologies on nonwork travel behaviour*. Texas: University of Texas at Austin; Center for Transportation Research.
4. Golob, T. F. & Regan, A. C. (2001). Impacts of information technology on personal travel and commercial vehicle operations: research challenges and opportunities. *Transportation Research Part C*, 9, 87–121.
5. Mokhtarian, P. L., Salomon, I. & Handy, S. (2004). *A taxonomy of leisure activities: the role of ICT*. California: University of California, Davis; Institute of Transportation Studies.
6. Weltevreden, J. W. J. & Rotem-Mindali, O. (2009). Mobility effects of b2c and c2c e-commerce in the Netherlands: a quantitative assessment. *Journal of Transport Geography*, 17, 83–92.
7. Salomon, I. (2000). Can telecommunications help solve transportation problems. In D. A. Hensher & J. B. Kenneth (Eds.), *Handbook of Transport Modelling* (pp. 449–462). Oxford: Pergamon.
8. Mokhtarian, P. L. (1990). A typology of relationships between telecommunications and transportation. *Transportation Research Part A*, 24, 231–242.
9. Andreev, P., Salomon, I. & Pliskin, N. (2010). Review: State of teleactivities. *Transportation Research Part C*, 18, 3–20.
10. Mokhtarian, P. L. (2004). A conceptual analysis of the transportation impacts of B2C e-commerce. *Transportation*, 31, 25–284.
11. Ferrell, C. E. (2005). Home-based Teleshopping and Shopping Travel: Where do we find the Time? *Transportation Research Record*, 1926, 211–223.
12. Papola, A. & Polydoropoulou, A. (2006). Shopping-Related Travel in a Rich ICT Era. A Case study on the Impact of e-shopping on Travel Demand. In Proceedings of the 85th Annual Meeting of the Transportation Research Board, January 22–26, 2006. Washington DC.
13. Casas, J., Zmud, J. & Bricka, S. (2001). Impact of Shopping Via Internet on Travel for Shopping Purposes. In Proceedings of the 80th Annual Meeting of the Transportation Research Board, January 7–11, 2001. Washington DC.
14. Circella, G. & Mokhtarian, P. (2010). Complementarity or Substitution of Online and In-Store Shopping: an Empirical Analysis from Northern California. In Proceedings of the 89th Annual Meeting of the Transportation Research Board, January 10–14, 2010, Washington, D. C.

15. Hjorthol, R. (2009). Information searching and buying on the Internet: travel-related activities? *Environment and Planning Part B*, 36, 229–244.
16. Chang, M. K., Cheung, W. & Lai, V. S. (2005). Literature Derived Reference Models for the Adoption of Online Shopping. *Information & Management*, 42, 543–559.
17. Peterson, R. A., Balasubramanian, S. & Bronnenberg, B. J. (1997). Exploring the implications of the internet for consumer marketing. *Journal of the Academy of Marketing Science*, 25 (4), 329–346.
18. Schiffman, L. G. & Kanuk, L. L. (1987). *Consumer Behavior, 3rd edition*. Englewood Cliffs, NJ: Prentice-Hall, Inc.
19. Salomon, I. & Koppelman, F. (1988). A framework for studying teleshopping versus store shopping. *Transportation Research Part A*, 22(4), 247–255.
20. Hsiao, M. H. (2009). Shopping mode choice: Physical store shopping versus e-shopping. *Transportation Research Part E*, 45, 86–95.
21. Farag, S., Dijst, M. & Lanzendorf, M. (2003). Exploring the use of e-shopping and its impact on personal travel behaviour in the Netherlands In Proceedings of the 82nd Annual Meeting of the Transportation Research Board, January 12–16, 2003, Washington, D.C.
22. Salomon, I. & Koppelman, F. (1992). Teleshopping or Going Shopping: An Information Acquisition Perspective. *Behaviour and Information Technology*, 11, 189–198.
23. Vrechopoulos, A. P., Siomkos, G. J. & Doukidis , G. I. (2001). Internet Shopping Adoption by Greek Consumers. *European Journal of Innovation Management*, 3, 142–152.
24. Lee, P. (2002). Behavioral Model of Online Purchasers in E-commerce Environment. *Electronic Commerce Research*, 2, 75–85.
25. Szymanski, D. M. & Hise, R. T. (2000). E-Satisfaction: An Initial Examination. *Journal of Retailing*, 76, 309–322.
26. Koppelman, F., Salomon, I. & Proussalogou, K. (1991). Teleshopping or Store Shopping? A Choice Model for Forecasting the Use of New Telecommunications-Based Services. *Environment and Planning B*, 18, 473–489.
27. Raijas, A. (2002). The Consumer Benefits and Problems in the Electronic Grocery Store. *Journal of Retailing and Consumer Services*, 9, 107–113.
28. Hjorthol, R. J. (2002). The Relation between Daily Travel and Use of the Home Computer. *Transportation Research Part A*, 36, 437–452.
29. Zmud, J. & Arce, C. (July 2000). E-Mobility (Electronic Travel): Measuring New and Evolving Behaviour. In Proceedings of the 9th Conference of the International Association for Travel Behaviour Research. Australia, Queensland.
30. Dijst, M., Farag, S. & Schwanen, T. (2008). A comparative study of attitude theory and other theoretical models for understanding travel behaviour. *Environment and Planning A*, 40, 831–847.
31. Farag, S., Schwanen, T. & Dijst, M. (2007). Shopping online and/or in-store? A structural equation model of the relationships between e-shopping and in-store shopping. *Transportation Research Part A*, 41, 125–141.
32. Van, U. P. & Senior, M. (2000). The contribution of mixed land uses to sustainable travel in cities. In K. Williams, E. Burton and M. Jenks (Eds.), *Achieving Sustainable Urban Form* (pp. 139–148). London: E & F N Spon.