

Pre-publication draft of:

Krasnikolakis, I., Vrechopoulos, A. and Pouloudi, A. (2014). Store selection criteria and sales prediction in Virtual Worlds. *Information & Management*, 51 (6), pp. 641-652.

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The final publication is available at
<http://www.sciencedirect.com/science/article/pii/S0378720614000779>

Store Selection Preferences and Sales in Virtual Worlds

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Abstract

Virtual worlds (VWs) have emerged as a new context for gaming, collaboration, social networking but also commercial activity. This paper focuses on the latter, and investigates how consumers behave in this virtual context when selecting stores they visit or buy from. The paper explores store selection criteria in virtual world stores and extends earlier research in both offline and online commercial environments, taking into account the novel IT capabilities that VWs exploit. Theoretical insights drawn from the marketing and information systems literature have been used to guide the design of a survey conducted in the virtual world Second Life. In addition to identifying the factors influencing store selection, the paper investigates how these differ between shoppers and non-shoppers, and identifies the factors that affect the amount of money spent in virtual world shopping environments. The findings suggest that “Core Store Features” and “Security and Privacy” constitute the most important store selection factors in virtual environments and that sales in VWs are predicted by the frequency of visiting and the time spent within VWs’ stores.

1. Virtual world dynamics and motivation for the study

A Virtual World (VW) is defined as a “*computer-simulated three-dimensional (3D) environment*” [11, p.525]. Virtual Worlds have been developed since the last decade, exploiting the available information and Internet technology capabilities, attracting increasing numbers of users. Some of these worlds can be accessed through a web browser, while others require downloading and using specialized software. The origin of VWs is considered to be both social networking and gaming [52]. Some VWs started as games and consequently adopted new services, capabilities and even their own virtual currency. The variety of activities and possibilities depends on each VW’s orientation (e.g., education, socialization, entertainment, commerce, etc). Several VWs develop and grow dynamically through their inhabitants’ (i.e., users’) actions. Users in a VW interact [45] with others through their “avatar”, “a representation of the user as an animated character in virtual worlds” [47, p.17], and engage in numerous activities such as information sharing, talking with friends or finding new friends, playing games, creating new services, building virtual objects, buying and selling goods, and so on. They can communicate with others through synchronous text messages, voice chat, e-mails, or videoconferencing.

Retailing activity also gained momentum in VWs, with users buying and selling virtual or real products [34]. Recent studies suggest that Virtual Commerce (V-Commerce) should be considered as a totally new and well promising retailing channel [27, 28, 78]. According to Kzero [41], the revenues in VWs reached \$6 billion in 2012 and by 2018, VWs will have been one of the most important business platforms [35]. The overall consumer virtual reality market over the five year period of 2014 to 2018 will worth \$16.2 bn, with an average compound annual growth rate of 125% [43].

Virtual worlds present businesses and individuals with a variety of profit-making opportunities [36]. Apart from buying and selling products and services, businesses use VWs for various commercial purposes, e.g., to learn about their inhabitants' opinion about specific brands and products [68], or for promotional activities. For example, Hugo Boss, and Superdry have incorporated 3D applications and features in their online stores [57]. Pontiac, in order to promote its car models, allows users to modify and drive specific cars within Second Life [7], whereas Dell provides a virtual simulation of its real products in Second Life [7], a function that is not available in its 2D web store [22]. Other companies engage VW inhabitants in the production or customization phase of a product (e.g., Toyota [18]) or launch idea competitions for innovative business ideas (e.g., OSRAM [40]). In the same vein, citizens of Paris recently participated in the designing phase of a park that will be created at Les Halles [39]. Thus, VWs offer the possibility to pre-test new products with specific target groups or to simulate activities that are high risk or high cost in the real world. Furthermore, different branches of multinational companies can work together in a collaborative 3D environment. For instance, Kohler et al. [40] investigated the design principles of co-creation within Second Life, presenting KTM and Philips among the companies engaged in such projects.

Wasko et al. [79] suggest that the adoption of VWs will be growing in the following years as the prevalent set of registered users in the first quarter of 2011 are between 10 and 15 years old. Consequently, it is expected that the maturity of VWs will be following the maturity of users, creating a need for further research in marketing, economics, international business and other fields in this novel empirical setting [79]. Indicative directions for such research given in the extant literature include: security, privacy and virtual currency, in order to understand the users'

behavior [4]; factors that influence the shopping process within this context [24]; and consumer behavior in this new retail channel [78]. Thus, social, behavioral, and economic topics in VWs are recognized as quite complex, needing further investigation [1]. These calls for further research motivate our work in this paper.

Specifically, this paper aims to explore consumer behavioral preferences and patterns in the context of VWs, adopting an interdisciplinary research approach that draws theoretical insights from information systems and marketing. While business activity in VWs takes many different forms [60], as discussed earlier, the present study focuses on virtual worlds where *retailing* activity is taking place, while other VWs (e.g., pure gaming 3D environments) remain beyond the scope of this paper. The paper studies the criteria that VW users adopt as consumers (both shoppers and non-shoppers) – hence the term user/consumer – when they opt to visit a virtual reality retail store and measures the importance they attach to each of these criteria. The term *non-shoppers* refers to users that are not engaged in commercial activities within VWs, but visit VWs for other purposes (e.g., socialization, information search, education or entertainment). Non-shoppers may also visit VWs retail stores to search and evaluate product and service information in order to “decide online but buy offline” (as is the case in the 2D Internet retailing environment for a large proportion of Internet non-shoppers). Thus, studying the behavior of non-shoppers that use VWs towards VWs retail stores, along with that of VWs shoppers, is highly relevant for understanding store selection criteria in this environment. The study also explores potential differences between shoppers and non-shoppers in terms of the importance each group attaches to specific store selection criteria. Finally, as an initial research effort to predict sales in VWs, a list of relevant independent variables shown in the

literature to affect sales in alternative electronic retailing channels are tested in this new VW context.

The paper is structured as follows. Section 2 discusses store selection criteria and related literature concerning user/consumer behaviour in the context of brick-and-mortar, online and virtual environments. Section 3 describes the research methodology, whereby the research questions are addressed using a two-stages research approach. The stage #1 of the study is presented in section 4. Then, the formulation of research hypotheses, as well as the analysis of findings and discussion (stage #2) are presented in section 5. Finally, section 6 discusses the implications and limitations of this research offering directions for further research.

2. Literature review

2.1. Brick-and-mortar and online store selection criteria

Earlier studies indicate that both utilitarian and hedonic cues influence user/consumer decisions when selecting a brick-and-mortar or a Web store to visit or buy from, [17, 59, 76]. The criteria identified in these studies are likely to play a role in consumer behavior in VWs as well, and are therefore worth investigating.

Store image has been identified as a potential predictor of online purchasing behavior [70]. There are multiple definitions in the literature about store image and store cues in general; all concur that store image is “a total feeling” of physical and psychological factors [73]. Several studies show that online services, online atmosphere and online web appearance positively affect consumers’ perception of the store and their consuming behavior [12, 49, 73]. Atmospheric factors such as music

and color influence emotional responses and purchase intentions, accordingly, in online stores [3, 81]. Prices, products and promotion activities also constitute part of the store image [16]. Consequently, store image appears as an important factor in the shopping process.

Furthermore, there is great interest among researchers in investigating the influence of an offline store image to the corresponding online and vice versa [74]. Consumers may be aware of both offline and online stores and be influenced by various characteristics of each store in the overall shopping process. For example, Verhagen and Dolen [73] confirmed that offline store impressions influence purchase intention for the corresponding online store. However, van der Heijden and Verhagen [70] consider that some constructs used to measure store image in an online environment should be different from those used to measure store image in an offline environment, as some constructs describing offline stores do not exist online and vice versa.

Insights from psychology suggest that *emotions* play a mediating role in the decision making process [63]. An emotion is “a mental state of readiness that arises from cognitive appraisals of events or thoughts and among others, is often expressed physically” [2, p. 184]. Schwarz [61] states that the emotions of everyday life affect the decision making process and vice versa. In a business context, interactivity and social interaction are, among others, key characteristics causing special emotions [37]. VWs may support highly interactive capabilities that online sites do not [33]. For example, entertaining experiences [72] such as festivals can be hosted in VWs stores, causing specific emotions to participants.

Two other important factors that consumers are concerned about when selecting an online store are *security* and *privacy* [65]. There are several studies

addressing the circumstances under which consumers provide personal or payment information online. Indicatively, Belanger et al. [5] confirmed that users are willing to provide information if they consider the retailer trustworthy, regardless of whether the retailer maintains a traditional store apart from the online one. Similarly, Chang and Chen [10] showed that perceived security positively influence customer satisfaction with an online store. The importance of security and privacy in online shopping behavior suggests that their role in VWs should be studied as well.

Finally, *web site design* and *navigational characteristics* of an online web site have been shown to influence visitors (e.g., perceived ease of use, perceived usefulness, stimulation of emotions, attractiveness) [54, 58]. Multidisciplinary studies drawing from the fields of information systems and marketing draw attention to the importance of navigational characteristics and provide guidelines on how practitioners should design their online stores in order to generate pleasant feelings to visitors, help them to easily find the products they are looking for and, in general, affect consuming behavior [9, 38, 53, 58].

Overall, the work discussed in this section indicates that the criteria influencing consumers' store selection process in the offline and 2D online worlds are likely to be relevant also in virtual worlds. Therefore, they have been used to guide our study, described in detail in the methodology section further on.

2.2. Virtual reality store emerging characteristics and trends

All the services offered in a 2D online web store can be adopted by a virtual reality store, as all web technology capabilities are available in VWs too. Moreover, by exploiting the virtual reality capabilities (e.g., moving in a 3D 'space'), a store developed in a VW can also adopt several of the attributes of a brick-and-mortar store

that are not necessarily amenable to representation in a 2D online store. For example, the external and internal decoration, storefront, layout, and product display techniques of brick-and-mortar stores can be adopted in stores in virtual worlds. Also, consumers benefit more from the interactive capabilities that VWs offer, compared to 2D online stores [22]. Interestingly, it has also been argued that the attempt to simulate real world activities and conditions in the VWs environment may in fact hinder the tremendous growth potential of the latter [8].

In addition to accommodating the capabilities of brick-and-mortar and web stores in VWs, the navigational and layout cues can be enriched or formed along new dimensions in this environment. This can be achieved by exploiting two unique main features of these environments, namely flying and teleporting [55]. Specifically, the ability to fly gives an avatar the opportunity to have a greater view of the interior and exterior of a store, or move faster to a specific place within the store. Similarly, the ability to teleport provides an avatar with the opportunity to directly visit a specific place in the store by just clicking on a link designating the destination. This is a sophisticated tool allowing retailers to manipulate customization or lug in a store (e.g., in cases where when there are more avatars in a region than the system can accommodate). It also means that a retailer could choose to develop more than one virtual store, identical or different, so as to control crowding or even customization, by guiding an avatar to a virtual store that meets its preferences.

Another key characteristic of virtual communities and worlds is the social aspect [46, 56]. According to Lin [46], the motivation to be part of a community satisfies peoples' sense of belonging. The social relations developed among people lead to the formation of communities (groups) with particular interests and may affect their shopping behavior [13]. Chiou et al. [14] showed that interactive

communications had been used as one of the criteria or factors affecting web site evaluation in 37 research studies, and member community was similarly used in 19 studies in the years 1995-2006.

Taking into account these characteristics of VWs, as well as the relevant theoretical work outlined in the previous section, the research gaps that the present study aims to address are summarized in the following research questions:

- Which are the potential criteria users/consumers use for selecting and visiting a virtual retail store?
- How can these criteria be grouped to a set of underlying factors?
- How do these criteria influence the choice of users/consumers for visiting a virtual retail store?
- Which are the differences per type of user/consumer (i.e., shopper vs. non-shopper) in terms of these criteria?
- How are the specific capabilities provided by VWs' platforms perceived by users?
- Which factors seem to influence sales of virtual retail stores?

3. Research methodology

The following table (Table 1) depicts the research framework of this study. The research questions are presented alongside the respective stage of the study in which they were investigated and the relevant methodological approach employed in each stage.

Table 1 - Framework of the Study

Research Questions	Stage of the Research	Methodological Approach
Which are the potential criteria users/consumers use for selecting and visiting a virtual retail store? How can these criteria be grouped to a set of underlying factors?	#1	Preliminary qualitative study and literature review guided the development of a set of potential store selection criteria. Using the results of a VW user survey, factor analysis was used to group the criteria to a set of underlying factors according to the importance consumers attach to each one.
How do these criteria influence the choice of users/consumers for visiting a virtual retail store? Which are the differences per type of user/consumer (i.e., shoppers vs. non-shoppers) in terms of these criteria?	#2(a)	Hypotheses development (H1(a), H1(b), H1(c), H2). ANOVA was used to illustrate both the importance that VW users attach to store selection criteria and the potential differences between shoppers and non-shoppers in terms of the importance they attach to these criteria.
How are the specific capabilities provided by VWs' platforms perceived by users?	#2(b)	Hypothesis development (H3). t-Tests were conducted in order to provide evidence about the perceived difficulty of different types of users (shoppers vs. non-shoppers), in terms of interacting with specific VWs' characteristics (i.e., creating an avatar, and walking around and visiting places in a VW).
Which factors seem to influence sales of virtual retail stores?	#2(c)	Hypothesis development (H4). Stepwise Regression was used to measure the predicting power of a series of factors that seem to affect sales in VWs retail stores.

Building on earlier work on store selection criteria in the traditional and online environments, as outlined in the previous section, the present research gathers and groups the criteria that seem to affect users' selection process of a virtual store in the context of VWs. This phase of the study is presented in detail in section 4 and employs factor analysis.

The results of stage #1 of the study are then used in order to investigate the importance consumers attach to each of the set of criteria and examine (using ANOVA) potential corresponding differences for shoppers and non-shoppers (separately) for each of the resulting factors (stage #2a). Potential statistical significant differences between these two groups of users in terms of the importance they attach to specific VWs' characteristics were also measured using t-Tests (stage #2b). Finally, multiple regression analysis served towards measuring the predicting

power of a series of factors that, according to theoretical evidence, seem to affect the amount of money shoppers spend in a virtual environment (stage #2c). The hypotheses testing results (stage #2) are presented in section 5. SPSS (v.16) was used to analyze the results in both stages of the research.

Data collection

Given the distinctiveness of the VWs' environment, before embarking on the main data collection phase, a qualitative study through in-depth personal interviews was conducted with eight shop owners operating exclusively in VWs. These shop owners sell virtual reality goods, such as those associated with avatars' appearance needs (e.g., clothes, skins, hair, shoes, make-up, movements and dancing scripts). They served as experts, providing input on any special and unique characteristic of virtual stores they consider important and common in VWs' store selection process. Their responses complemented the store selection criteria list derived from the extant literature.

Using this consolidated list (presented in the next section in Table 3), an electronic questionnaire was developed and served as the data collection instrument for this research. The use of this type of instrument was considered appropriate for studying the opinions and beliefs of a large group of people at low cost. The function of the questionnaire was to collect data about the respondents' use of the internet (i.e., frequency, consuming activity, etc.), the respondents' use of VWs (i.e., frequency, habits, consuming activity, etc.) as well as demographic data of the respondents.

Pre-tests were conducted in order to test the questionnaire's reliability and to modify any unclear questions. An electronic text message, explaining the purpose of the research and containing the web link that the questionnaire was hosted, was sent

to 400 users that are fans of Second life on Facebook (sampling frame #1). Also, questionnaire kiosks were developed and placed in two regions in Second Life (sampling frame #2), where avatars crossing by were invited to take part in the research by filling in the questionnaire. In order to increase the response rate, an award of 20 Linden Dollars (currency of the specific VW that corresponds approximately to 8 cents of US Dollars) was given as a participation motive to each avatar that had filled in a usable questionnaire. Since a large part of the questionnaire referred to perceptions and habits in VWs, only users who had experienced at least one visit in VWs were considered appropriate respondents (i.e., these users constitute the population from which the sample was drawn).

After distributing the questionnaires, a total of 104 usable responses were collected, 61 through the invitation through the Facebook group and 43 through the Second Life questionnaire kiosks. The gender distribution was about equal (53.8% male respondents). The majority (81.8%) of the sample was below 36 years old; approximately 40% were aged between 18 and 25 years old and 38.5% between 26 and 35 years old. In terms of nationality, the sample has a large proportion of Greek participants. This is because the virtual questionnaire kiosks were sited in two regions of Second Life owned by Greeks, which increased the probability of Greek users passing by and filling in the questionnaires. This is a limitation in the present study that is also discussed further on in the paper. All demographic characteristics of the respondents are presented in Table 2 and show the heterogeneity of profiles of Second Life visitors.

Table 2 - Demographics of the sample

Demographics		N=104 (%)
Age	<18	2.9
	18-25	40.4

	26-35	38.5
	36-50	16.3
	>50	1.9
Gender	Male	53.8
	Female	46.2
Education	High School	19.2
	Undergraduate	26.9
	Graduate	31.8
	Postgraduate	13.5
	PhD	7.7
Nationality	Greek	87.5
	European	10.6
	Australian	1
	American	1
Average income in Euros	0-700	17.3
	701-1100	21.2
	1101-1500	27
	1501-3000	16,3
	>3000	1
	N/A	17.3

4. Stage #1 of the study

The store selection criteria (i.e. store attributes) identified through the literature and discussed in section 2, were complemented by the responses of experts in the preliminary qualitative study, leading to the list of variables presented in the first column of Table 3. This constitutes a concise, rather than an exhaustive, list of store selection criteria in VWs. The selection of a concise list of criteria is a deliberate choice in the research design, because shopping through VWs is an emerging phenomenon [23, 36]. Therefore, current or potential consumers may not be experienced enough to provide reliable answers when evaluating complicated and advanced VW store features. We used factor analysis to examine the structure of interrelationships among variables, leading to a smaller set of underlying factors [26]. The variables of Table 3 were thus grouped into four underlying factors for store selection in VWs.

The appropriateness of the model for factor analysis was thoroughly tested. First, the sample of 104 respondents exceeds the requirement of a minimum of five

subjects per variable for factor analysis [48]. Furthermore, several variables were sufficiently correlated with each other. Also, multicollinearity and singularity were conducted to check if any of the squared multiple correlations are near or equal to one. Additionally, Bartlett's test of sphericity (Approx. Chi- Square 215.389, df 66.000, Sig 0.000) and Kaiser-Mayer-Olkin measure (0.636) suggest that the data structure was adequate for factor analysis [15]. Principal components analysis and principal axis factoring are among the most commonly used methods for factor analysis, leading in most cases to the same results [15]. Principal axis factoring was adopted in the present study and the factors that extracted are based on the eigenvalue criterion (eigenvalues greater than 1 should be included in the model). After retrieving the number of factors, the varimax rotation procedure was adopted, that is an orthogonal procedure enabling the enhanced interpretability of the factors [48]. The results of the factor analysis are presented in Table 3.

Factor #1 had positive loadings on Variety of the Products, Quick Access and Easy Walking through the virtual store, Prices of the Products and Store Atmosphere. We label this factor "*Core Store Features*". Specifically, Variety of the Products enables "one-stop-shopping" and is preferred by consumers both offline and online, mainly due to time constraints. Quick Access and Easy Walking through the virtual store also constitutes a core store feature since it is related to ease of use and convenience. Prices of the Products constitute a critical success factor for e-tailing due to the tremendous information search and evaluation of alternatives capabilities offered to the online users today. The importance of price is also strengthened by the current global economic climate. In sum, these three variables constitute core store features of a retail store in VWs, as they did in offline and online retail stores [77].

Table 3 - Results of factor analysis (Rotated Factor Matrix)

Store Selection Criteria	Factors			
	<i>Core Store Features (1)</i>	<i>Peripheral Store Features (2)</i>	<i>Security and Privacy (3)</i>	<i>Social and Promotional Impulsion (4)</i>
Variety of the Products	.574			
Quick Access and Easy Walking through the virtual store	.562			
Prices of the Products	.549			
Store Atmosphere	.418			
Quality of the Products	.410	.595		
Store Reputation		.570		
Value Added Services and Customer Support	.345	.450		
Security			.676	
Privacy Protection			.664	
My Friends Visit the particular store				.536
Quality of Advertising	.313	.412		.497
Exhibitions and Entertaining Activities within the store				.427

Note: Extraction method: Principal axis factoring; Rotation method: Varimax with Kaiser normalization, rotation covered in six iterations.

Conversely, Store Atmosphere, which constitutes a distinct factor in offline and 2D online retail stores [77] (i.e., usually, it is perceived differently by consumers), is identified in this research as one of the core store features for VW stores. This finding could be explained by the advanced graphic capabilities (i.e., 3D) that may be available in a VW retail store. This implies that VWs consumers hold high expectations for Store Atmosphere (perhaps due to their familiarity with online gaming 3D interfaces), similar to their expectations for reasonable prices, convenience and “one-stop-shop” capabilities. Therefore, consumers that select the virtual retailing shopping channel to conduct their purchases perceive Store Atmosphere in a similar fashion to the other three variables (Variety of the Products,

Quick Access and Easy Walking through the virtual store and Prices of the Products). This finding is also supported by the fact that the average score of this factor was the highest one observed (the average score of responses was 4, in the five-point Likert scale used) compared to the remaining three factor scores.

Factor #2 has positive loadings on Quality of the Products, Store Reputation and Value Added Services and Customer Support. We label this factor “*Peripheral Store Features*”. Specifically, while Quality of the Products is usually (in studies similar to the present one) grouped with product variety and price attributes, this was not the case in the present study. Also the average score of responses for this factor (3.44 in the five-point Likert scale) is lower than the corresponding scores of factors #1 and #3 in the total ranking. Probably, consumers believe that nowadays most of the products have reasonable quality and, therefore, price and variety are more important than quality. Also, the experience of shopping through Web 1.0 (i.e. the early stage of web stores with static pages where interactive or social features were lacking) contributed towards confronting any concerns regarding quality of products and services bought “from distance” (i.e., not through the physical store where consumers have more options than online for testing product quality). The same may stand for Store Reputation. Finally, Value Added Services and Customer Support could be also characterized as “peripheral” services because consumers are aware that such type of services may be offered online due to the combination of technological capabilities with low cost.

Factor #3 has positive loadings on Security and Privacy Protection, thus it has been labeled “*Security and Privacy*”. This label highlights users’ concerns about issues such as security in transactions and privacy, as these first arose with the advent of the internet. Thus, this grouping was expected. However, while these attributes

usually obtain the highest scores (see [78]), in the case of the present study they were ranked as the second most important store dimension (i.e., average score of responses was 3.9 in the five-point Likert scale). This finding could be probably explained by the fact that VWs users are usually experienced Internet users and, therefore, are not as concerned about security issues or privacy protection as early shoppers in the Web 1.0 environment were.

Factor #4 has positive loadings on My Friends Visit the particular store, Quality of Advertising and Exhibitions and Entertaining Activities within the store. This factor, labeled “*Social and Promotional Impulsion*”, characterizes people that enjoy socializing online and are influenced by their friends or are looking for amusement and entertainment. Specifically, advertising, exhibitions and entertaining activities within the store constitute elements of the promotional mix. Also, the effects of friends constitute a promotional tool in the sense that these friends may operate as reference groups (e.g., opinion leaders) and, thus, companies invest in formulating their opinions and use them as promoters of their VW stores. This grouping implies that consumers perceive their friends’ influence (e.g. through online “word-of-mouth/mouse”) as comparable to promotional effects. In other words, it appears that consumers perceive any type of promotional effect similarly. However, this factor obtained the lowest score compared to the other factors (the average score of responses was 3.37 in the five-point Likert scale). This is consistent with the findings of earlier studies exploring the influence of advertising and promotion on online or offline store selection criteria (see [77]).

5. Stage #2 of the study

5.1. Research hypotheses formulation

There are several studies in the context of brick-and-mortar and web retailing addressing the different characteristics and behavioral patterns of shoppers (multichannel or not) and non-shoppers. Indicatively, in the context of web retailing, Vijayasathy [75] reported that users' general acceptance of the internet affected their shopping behavior accordingly. Similarly, Farag et al. [21] and Sorce et al. [66] showed that demographics play an important role in the shopping adoption process, while Vrechopoulos et al. [78] found significant differences between VWs' retail store selection criteria in terms of the importance consumers attach to them.

Thus, it is hypothesized on the one hand that the store selection factors derived through the stage #1 of the study discussed in the previous section significantly differ in terms of the importance both shoppers and non-shoppers (i.e., the total sample of the study) attach to them. On the other hand, it is hypothesized that VW shoppers perceive the importance of store selection factors differently to VW users who are non-shoppers (hereafter called VW non-shoppers). Therefore, in order to investigate whether the differences observed between the four factors' average scores have any statistical significant difference, as well as to investigate whether such potential differences (and/or ranking of importance) apply to both shoppers and non-shoppers, we formulate the following hypotheses:

***Hypothesis 1(a):** There are statistically significant differences in the importance that all VW users (shoppers and non-shoppers) attach to store selection factors (i.e., Factors 1, 2, 3 and 4).*

Hypothesis 1(b): *There are statistically significant differences in the importance that VW shoppers attach to store selection factors (i.e., Factors 1, 2, 3 and 4).*

Hypothesis 1(c): *There are statistically significant differences in the importance that VW non-shoppers attach to store selection factors (i.e., Factors 1, 2, 3 and 4).*

In the same vein, in order to investigate whether and why these groups exhibit different behavioral patterns and attitudes towards each of these factors, it is necessary to compare shoppers and non-shoppers in terms of the importance they attach to each of the four factors separately. The results of such comparison can contribute to the design of targeted promotional and communication campaigns in the sense that a company could differently approach shoppers and non-shoppers, according to the importance they attach to different store selection criteria. Melancon [51], based on the study of Yee [82] who investigated the typology of users' motivations in virtual environments, argues that information on the motivations of different groups of users is valuable for marketers wishing to enhance users' experiences through branded policies. Jin [33] argues that the majority of consumers are "inexperienced" shoppers in the context of VWs. Thus, investigating their attitudes towards VWs store selection criteria is important, especially because non-shoppers may visit VWs stores, search for and evaluate information, decide online and buy offline (or even buy online but through Web 1.0 online retail stores). Based on this discussion, the following research hypotheses are formulated in order to investigate the perceptions of different types of users (shoppers vs. non-shoppers):

Hypothesis 2: *There are statistically significant differences in each store selection factor between VW shoppers and non-shoppers:*

- *Hypothesis 2.1: There are statistical significant differences in Core Store Features between VW shoppers and non-shoppers*
- *Hypothesis 2.2: There are statistical significant differences in Peripheral Store Features between VW shoppers and non-shoppers*
- *Hypothesis 2.3: There are statistical significant differences in Security and Privacy between VW shoppers and non-shoppers*
- *Hypothesis 2.4: There are statistical significant differences in Social and Promotional Impulsion between VW shoppers and non-shoppers*

Since, as we have argued in Section 2, VWs constitute a distinctive commercial channel, it is interesting to investigate whether the novel features of VWs account for differences in perception between shoppers and non-shoppers. According to Hackbarth et al. [25], shoppers are more likely to adopt and use a system than non-shoppers, as they spend more time exploring its capabilities. Also, computer anxiety is likely to create negative feelings in the direction of use [71]. Computer anxiety is the notion or even the worry of an individual as far as the use of computers is concerned [62]. Webster et al. [80] claim that if a computer task is too difficult, it will probably cause a negative effect on anxiety. In the same vein, Hoffman and Novak [30] state that in a very demanding environment (e.g., with many options and buttons) users will consider that their capabilities are not enough to cope with the environmental complexity. Based on this claim, Shen and Eder [62] investigated the factors that influence users to visit VWs for business purposes and concluded that computer anxiety does not influence the users' perceived ease of use (PEOU) of the Second Life VW. However the results of their study imply that the difficulty or ease an individual faces with technology use, influence the use of Second Life respectively

[62]. Specifically, in Second Life, the process of creating an avatar may not be a one-step process. Inexperienced users have to face issues such as creating (or buying) skin, clothes, body, face and shoes. Also, the directional buttons that can be used to direct an avatar in a virtual place can be time consuming, when visiting a virtual mall, for users not familiar with teleporting and flying capabilities. In sum, creating an avatar and navigating through VWs are considered difficult in-world activities [39]. Therefore, it is anticipated that non-shoppers consider the processes of creating an avatar and walking around and visiting places in a virtual reality world more difficult than shoppers do. Thus, we hypothesize that:

Hypothesis 3: There are statistically significant differences between VW shoppers and non-shoppers in terms of their perceived difficulty in:

- *Hypothesis 3.1: Creating an avatar*
- *Hypothesis 3.2: Walking around and visiting places in a virtual world.*

Users that visit VWs frequently are expected to be more experienced than those who are not frequent visitors and, in accordance with the findings of computer anxiety studies aforementioned, more likely to engage in shopping activities. At the same time, there are some economic, political, virtual experiences and regulatory issues in VWs that are similar to the physical world [52]. Indicatively, naturalness of virtual in-world activities may generate a familiar environment for visitors, creating or strengthening consumption of virtual or real products [78]. Herrington and Capella [29] state that store design decisions relate to the time that customers spend shopping, while Eroglu et al. [20] found that virtual store design influences the time that customers spend within a Web site. Similarly, van der Heijden [69] and Li et al. [44]

state that Web site characteristics determine the duration of a Website visit. Moreover, the time spent shopping in a virtual store has proved to be an important factor that positively affects the amount of money spent in virtual environments [64]. The display of products around the walls, the models/avatars, and screens is likely to increase unplanned shopping [32]. In sum, several studies in the past (both offline and online) attempted to predict shopping behavior employing “sales” (or money spent) as the dependent variable in any given research design.

Bellman et al. [6] note that “the most important information for predicting online shopping habits are measures of past behavior.” Furthermore, they state that “looking for product information on the Internet is the most important predictor of online buying behavior” (p.35-38). As far as the context of VWs is concerned, Vrechopoulos et al. [78] sought to measure the predicting power of online activity related determinants (e.g., perceived usefulness, perceived ease of use and entertainment, time spent within the store, promotional sales and impulse purchases) on the overall evaluation of a virtual reality store layout, but did not find any significant relationships. However, according to Huang [31] perceived ease of use is the strongest predictor of e-consumer attitudes followed by perceived usefulness, irritation and entertainment. In light of this earlier work and in order to investigate the determinants of shopping behavior in the Virtual Reality Retailing (VRR) environment further, we posit the following hypothesis:

Hypothesis 4: The amount of money spent in to the VRR environment is predicted by the:

- *Hypothesis 4.1: Frequency of visiting Virtual Worlds*
- *Hypothesis 4.2: Perceived difficulty (vs. ease of use) of creating an avatar*

- *Hypothesis 4.3: Perceived difficulty (vs. ease of use) of walking around and visiting places in a virtual world*
- *Hypothesis 4.4: Perceived similarity between virtual and physical worlds*
- *Hypothesis 4.5: Time spent in virtual worlds*
- *Hypothesis 4.6: Average time spent in a store*

Before moving to the presentation of the hypotheses testing results, it should be noted that all the research hypotheses articulated in the stage #2 of the study are primarily supported by relevant literature regarding electronic retailing channels other than virtual reality retailing. This is justified by the great similarities that exist among these channels, but is mainly due to the fact that relevant literature in the context of VWs is still limited. Furthermore, supporting research hypotheses referring to new retail channels (e.g. VWs) by employing literature from other channels (e.g. Web 1.0) constitutes a common research practice, especially when research on the new channel is in its infancy. For example, Web 1.0 electronic retailing initial research attempts employed literature from conventional retailing to support the investigated research hypotheses.

5.2. Analysis of the stage#2 results

Hypotheses H1(a), H1(b) and H1(c) were tested through ANOVA with Post-Hoc comparisons. The results are presented in Tables 4, 5, and 6, respectively. The necessary assumptions of population normality and homogeneity of variance are met in all three cases.

Table 4 - Importance that VR users (the total sample of the study: both shoppers and non-shoppers) attach to store selection criteria (Multiple Comparisons)

	(I) Factor	(J) Factor	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Tukey HSD	1	2	.39894*	.10152	.001	.1371	.6608
		3	-.05769	.10152	.941	-.3196	.2042
		4	.47615*	.10152	.000	.2143	.7380
	2	1	-.39894*	.10152	.001	-.6608	.1371
		3	-.45663*	.10152	.000	-.7185	.1948
		4	.07721	.10152	.872	-.1847	.3391
	3	1	.05769	.10152	.941	-.2042	.3196
		2	.45663*	.10152	.000	.1948	.7185
		4	.53385*	.10152	.000	.2720	.7957
	4	1	-.47615*	.10152	.000	-.7380	.2143
		2	-.07721	.10152	.872	-.3391	.1847
		3	-.53385*	.10152	.000	-.7957	.2720

*The mean difference is significant at the 0.05 level

The results of the importance that shoppers and non-shoppers of VWs (i.e., the total sample) attach to store selection criteria, as depicted in Table 4, indicate that there are statistically significant differences observed among the factor means (marked by the asterisk in the fourth column of the Table). The means of each factor depict that the whole sample attaches more importance to factor#1 (“*Core Store Features*”, mean=4), and secondly to factor#3 (“*Security and Privacy*”, mean=3.9), without, however, any significant difference observed between them. Also, both factors significantly differ from the other two (factor #2: “*Peripheral Store Features*”, mean = 3.44, and factor #4: “*Social and Promotional Impulsion*”, mean = 3.37), whereas no significant differences are observed between factors #2 and #4. These results imply that all respondents perceive “*Core Store Features*” and “*Security and Privacy*” as the most important selection criteria, of equal importance, when selecting a store within this virtual world. Thus, Hypothesis 1(a) is confirmed. However, it should be noted that all factors scored greater than 3.3, indicating that all factors are perceived as important by VW users.

Similarly, ANOVA was used to test whether there are statistically significant differences between VRR store selection criteria (i.e., Factors 1, 2, 3 and 4) in terms of the importance that VRR shoppers attach to them (Hypothesis 1(b) – see Table 5). The significant differences derived among factors are the same as in the whole sample (Hypothesis 1(a)) with slightly different scores observed in factors’ means (Factor#1= 3.9, Factor#3= 3.87, Factor#2= 3.54, Factor#4= 3.39). However, the ranking remains the same. Thus, hypothesis 1(b) is also confirmed.

Table 5 - Importance that VR shoppers attach to store selection criteria
(Multiple Comparisons)

	(I) Factor	(J) Factor	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Tukey HSD	1	2	.36254*	.12231	.017	.0464	.6787
		3	.02465	.12231	.997	-.2915	.3408
		4	.50352*	.12231	.000	.1874	.8196
	2	1	-.36254*	.12231	.017	-.6787	-.0464
		3	-.33789*	.12231	.031	-.6540	-.0218
		4	.14099	.12231	.657	-.1751	.4571
	3	1	-.02465	.12231	.997	-.3408	.2915
		2	.33789*	.12231	.031	.0218	.6540
		4	.47887*	.12231	.001	.1627	.7950
	4	1	-.50352*	.12231	.000	-.8196	-.1874
		2	-.14099	.12231	.657	-.4571	.1751
		3	-.47887*	.12231	.001	-.7950	-.1627

*The mean difference is significant at the 0.05 level

The testing of Hypotheses 1(a) and 1(b) confirm the available knowledge as discussed in section 4, especially as far as price, product variety, ease of use, security and privacy issues are concerned.

Testing Hypothesis 1(c) showed that results for VW non-shoppers are slightly different from those of VW shoppers. Specifically (Table 6), non-shoppers attach the highest importance on “*Security and Privacy*” (mean = 3.95) and then to “*Core Store Features*” (mean = 3.72). However, also in this case, there was no statistically

significant difference observed between these factors, suggesting that these two factors are perceived similarly for non-shoppers and shoppers. The higher score of “*Security and Privacy*” compared to “*Core Store Features*” could be explained by the fact that non-shoppers do not shop online (at least until now) because they may have some reservations about the security standards employed online and about the fair use of their data. One could also claim that non-shoppers are not experienced in buying through VWs (as shoppers are), and, therefore, they are more concerned about an activity that they have not undertaken before. Furthermore, it should be noted that “*Core Store Features*” (i.e. prices, product variety, ease of use, etc.) do not significantly differ from “*Social and Promotional Impulsion*” (Factor #4 mean = 3.3). This finding could be explained by the fact that VWs’ non-shoppers spend their time in this world primarily for social communication, entertainment and similar purposes rather than shopping. Therefore, they are used to enjoying such services and attach significance to them when selecting a virtual reality store. Finally, “*Peripheral Store Features*” (mean = 3.24) was found to be the least important factor. In sum, Hypothesis 1(c) is confirmed.

As discussed earlier, non-shoppers visit virtual reality stores in VWs in order to search for information, evaluate the alternatives, use customer services, etc. So, part of the non-shoppers’ decision making process may be conducted online while they purchase products and services offline (this is a common consumer behavioral practice in Web 1.0 retailing too). Thus, non-shoppers are aware of VWs’ store features and use these to select which VWs’ stores to visit. This decision making process of non-shoppers makes them relevant for our research and this is why they are included in our sample and compared to VWs shoppers.

Table 6 - Importance that VW non-shoppers attach to store selection criteria
(Multiple Comparisons)

	(I) Factor	(J) Factor	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Tukey HSD	1	2	.47727*	.18086	.046	.0065	.9481
		3	-.23485	.18086	.566	-.7057	.2360
		4	.41727	.18086	.102	-.0535	.8881
	2	1	-.47727*	.18086	.046	-.9481	-.0065
		3	-.71212*	.18086	.001	-1.1829	-.2413
		4	-.06000	.18086	.987	-.5308	.4108
	3	1	.23485	.18086	.566	-.2360	.7057
		2	.71212*	.18086	.001	.2413	1.1829
		4	.65212*	.18086	.002	.1813	1.1229
	4	1	-.41727	.18086	.102	-.8881	.0535
		2	.06000	.18086	.987	-.4108	.5308
		3	-.65212*	.18086	.002	-1.1229	-.1813

*The mean difference is significant at the 0.05 level

In order to test whether there are statistical significant differences between VRR shoppers and non-shoppers in terms of the importance they attach to each factor separately (Hypothesis 2) and in terms of their perceived difficulty regarding the processes of creating an avatar and walking around and visiting places in a virtual world (Hypothesis 3), t-Tests were conducted. The output indicates that there are no significant differences observed among the mean values ($p > 0.05$) in both cases. Therefore, hypotheses 2 and 3 are not confirmed. Specifically, the findings concerning hypothesis 2 imply that shoppers and non-shoppers attach the same importance to each factor, confirming indirectly the results of hypotheses 1(b) and 1(c) testing. As far as the results of hypothesis 3 testing are concerned, it is observed that non-shoppers are experienced enough to use VWs' tools and services. Therefore, the fact that they do not shop online cannot be attributed to the difficulties they face in using and navigating through a VW.

Finally, in order to test H4, stepwise regression was adopted (Table 7). In this stepwise approach, each predictor variable enters or is excluded from the regression

equation at a time [50]. This procedure is used where the variables that explain most of the variation of the dependent variable need to be drawn from a large set of predictor variables [48]. In this research, this procedure was considered appropriate due to the exploratory nature of the independent variables that frame H4 (whereby not all variables are likely to be significant – see [48]). The amount of money spent in a VW was used as the dependent variable, and the independent variables inserted in the model were: frequency of visiting VWs, perceived difficulty of creating an avatar, perceived difficulty of walking around and visiting places in a virtual world, perceived similarity between virtual and physical worlds, the time spent in virtual worlds and the average time spent in a store.

The outcome (Table 7) shows that only the average time spent in the store and the frequency of visiting VWs have been entered into the regression equation. These two variables explain 34.7% (R^2) of the variability in the money spent in the store ($F(2.68) = 18.042, p < 0.5$). The other variables failed to meet the selection criteria.

While the average time spent within the store is positively related to sales, it is surprising, and conflicting to earlier findings (as discussed in the formulation of the research hypotheses section), that frequency of visits is negatively related to money spent in VWs. This finding may result from shoppers that spend high amounts of money in VWs being mainly goal-oriented. Therefore, do not visit virtual reality stores often, but only when they want to accomplish a specific objective (e.g., find and directly buy a product or service). So, when they visit VWs' stores they spend a considerable amount of money and time within the store in order to browse, compare, evaluate and buy their desired products or services. On the other hand, those shoppers that visit VW stores frequently seem to do so mainly for market research or entertaining purposes rather than shopping. However, this finding needs to be

interpreted with caution since it is not in line with established knowledge (e.g., the Customer Relationship Management “Recency-Frequency-Monetary” metric) in the sense that frequency of visits, usually, is positively related to cross and up-sell [67]. Thus, future research on this topic is needed.

Table 7 - Results of stepwise multiple regression

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
2 (Constant)	3.775	.817		4.620	.000
The average time spent in a store	.553	.159	.362	3.480	.001
Frequency of visiting Virtual Worlds	-.736	.214	-.358	-3.440	.001

Note: Dependent Variable: Moneyspent coefficients

Therefore, Hypothesis 4 is confirmed as far as 4.1 (i.e. Frequency of visiting Virtual Worlds) and 4.6 (i.e. Average time spent in a store) are concerned. The findings regarding hypotheses 4.2 (i.e. Perceived difficulty (vs. ease of use) of creating an avatar) and 4.3 (i.e. Perceived difficulty (vs. ease of use) of walking around and visiting places in a virtual world) indirectly confirm the findings of hypothesis 3 testing results, since difficulties of using and navigating through a VW did not appear to affect sales. Finally, as far as hypothesis 4.4 is concerned, it is clear that the variable Perceived similarity between virtual and physical worlds does not have predicting power on sales since both shoppers and non-shoppers are experienced online users and, therefore, the amount of money they spend online is not determined by whether they perceive a VW as similar to the real world, but by other factors.

6. Conclusions, implications and further research

This paper explored store selection criteria in virtual world stores. The empirical research led to the identification of four factors influencing store selection: Core Store Features, Peripheral Store Features, Security and Privacy, Social and Promotional Impulsion. The paper presented the importance of these factors for all respondents, and subsequently looked separately into the responses of shoppers in VWs and users of VWs who are non-shoppers.

The empirical results show that the “*Core Store Features*” factor, comprising of Variety of the Products, Quick Access and Easy Walking through the store, Prices of the Products and Store Atmosphere plays a major role for both shoppers and non-shoppers selecting to visit a virtual reality retail store. Other studies, as discussed in earlier sections, have shown that all these attributes are considered important in determining behavior both in traditional and web retailing. This study confirmed the presence and influence of these attributes in determining store selection criteria in the virtual reality retailing channel as well.

Second, the study demonstrated that users that have never conducted purchases through virtual reality environments are mostly concerned about security and privacy issues. This conclusion is in line with the extant related literature. A probable explanation is that VWs non-shoppers do not shop in online retailing (i.e., in Web 1.0) either. These users are, therefore, likely to exhibit a similar behavior in VWs, as most of security and privacy issues are similar to those of the Web 1.0 environment.

This study also showed that both the frequency of visiting VWs and the average time spent in a store directly predict the amount of money spent in virtual environments. Surprisingly however, as discussed in the previous section, the

frequency of visits is negatively associated with sales. Another interesting finding is that perceived similarity between virtual and physical worlds does not seem to predict the amount of money spent; this is in line with the argument that traditional and virtual retailing channels are perceived quite differently by consumers despite the analogies between the two worlds.

No significant differences between shoppers and non-shoppers were observed in terms of their perceived difficulty regarding the process of creating an avatar. Contrary to our expectations, the lack of significant differences also stands for the process of walking around and visiting places in a virtual world. One possible explanation for the finding regarding the creation of an avatar is that the individuals in our sample do not have significant differences in terms of their internet experience (heavy-medium-light), and, thus, face similar difficulties in “using software tools”. A possible explanation for the finding regarding navigation in a VW could be the fact that flying and teleporting offer an easier and quicker view of the stores, thus creating an enjoyable experience for all VWs’ visitors.

6.1 Managerial implications

Several managerial implications emerge from the findings of this study. Critical factors affecting consumers’ choice to visit a virtual reality store were identified. The empirical findings can be exploited by practitioners so as to enhance consumers’ willingness to shop in VWs. This study also suggests that “*Core Store Features*” (Variety of the Products, Quick Access and Easy Walking through the store, Prices of the Products and Store Atmosphere) and “*Security and Privacy*” issues are key aspects that practitioners should invest in, in order to create positive attitudes towards their businesses. Also, managers should focus on increasing the time customers spend

at their virtual reality stores since this was found to positively affect the money that customers spend online. This could be implemented through the appropriate manipulation of variables that according to the available literature seem to affect this consumer behavioral dimension. Indicatively, Vrechopoulos et al. [76] and Vrechopoulos et al. [78] have studied the role of store layout as a critical dimension that affect the time customers spend in Web 1.0 (i.e., 2D Web retail stores) and Web 2.0 (3D retail stores), respectively.

Managers of virtual reality stores should also invest in designing stores that offer a wide variety of entertaining and innovative store atmosphere related features. It is clear that the “culture” of VWs’ users increases their expectations for high quality graphical user interfaces. Both shoppers and non-shoppers visiting VWs are experienced enough (e.g., have been playing online games through a virtual reality interface) to use advanced software tools and applications.

Another important managerial implication refers to the need to invest in information management initiatives (i.e., consumer behavior research). Specifically, a challenging research and business opportunity is to create “segments of one customer” and adjust accordingly the business offering at the individual level. In other words, managers, assisted by technology and following permission marketing guidelines, can easily and at low cost collect, process and exploit consumer information in order to customize the virtual reality retail mix at the individual level (i.e., the essence of “mass customization” – see [67]). Indicatively, they could allocate resources towards obtaining a 360 degrees view of each customer’s relationships and profile. Thus, managers will be aware of the most important store selection criteria for each customer individually. Similarly, managers will be able to predict sales at the individual level through the appropriate manipulation of user generated content (e.g.,

POS data, navigational data, etc). However, as also discussed above, some store image variables (e.g., layout) may not be available in a customized manner due to the social presence dimension that seems to dominate VWs. This implies that since many consumers prefer to conduct shopping through their avatars in a “social” VW retail environment (i.e., in the presence of others at the same store at the same time - similarly to conventional retailing) managers should invest in selecting the most effective layout for their store in a one-to-many basis (as is the case in physical stores). This suggests that future research should also consider classifying store layouts available in the context of VWs or design new ones to test cause-and-effect relationships and explore how alternative store layout types affect consumer behavior.

6.2 Limitations

The present study has several limitations. The main limitation refers to the large proportion of Greek users participating in the sample as noted in the methodology section. Thus, generalizations of the results should be made with caution. However, a recent research of B2C E-Commerce in Greece for 2011 conducted by the ELTRUN E-Business Research Center [19] indicated that the number and the amount of sales of Greek online users in 2011, has reached the typical European numbers. This is an indication that Greek users are likely to exhibit a similar profile of the average European user.

In terms of age distribution, our sample is limited to adults and appears to have a high proportion (43.3%) of people under 25 years of age. However, this is consistent with the profile of VWs users, where people over 25 years old are a minority, whereas minors are the majority [42]. While we excluded minors from our research, we believe that the high proportion of young people is relevant to our

research. While they may presently have low purchasing power, they do care about store related features. They could be current or potential customers and, in this respect, it is important to investigate their preferences as they constitute the emerging target group of such environments. Furthermore, younger people are usually more technology savvy, since this age group is usually more familiar with advanced IT systems and applications (e.g., navigating in a 3D environment), often as a consequence of their online gaming experience in such settings. Thus, they can evaluate VWs more reliably than older customers that usually are less familiar with these environments.

Another limitation of the research is the relatively small R^2 value of the stepwise regression model. This suggests that future research should consider more independent variables that are likely to influence shopping decisions and behavior. For example, more attention could be drawn to the social aspect of VWs, including such metrics as the effect of the presence of others on shopping.

6.3 Further research directions

Several of the present study's findings confirm prior knowledge regarding consumer behavior in the "traditional" web environment. However, there are findings in this study that suggest that consumer behavior in virtual worlds may differ to that of conventional or electronic retailing. In this respect, the present study could well serve as motivation for further interdisciplinary research, bringing together insights from the marketing and information systems literature, to explore user and consumer behavior in this fast evolving and promising retail channel.

An interesting future research direction deals with the fact that social presence is applicable in VWs, whereby more than one avatar could navigate within the same

store at the same time. Thus, it may not be possible to customize some virtual store interface features (e.g., layout). In other words, similar to conventional retailing and unlike 2D online environments, it is not possible to offer personalized store layouts when more than one customers (avatars) are visiting and navigating within the same store at the same time.

Future studies can further investigate how each store selection criterion affects consumers' behavior towards virtual shopping. Such studies could employ causal research designs (experiments). Also, it is important to investigate which kind of products (virtual or real) people are willing to buy through VWs and which are the research mechanisms that should be employed by businesses in order to support the shopping process. As aforementioned, VWs are considered by many as a new and unique retailing channel [27]. Thus, further research should also investigate what kind of products could be 'experienced' virtually by users using technology capabilities supporting the five human senses, and how such features as well as product display techniques and store layouts may enhance consumer experience.

Finally, further studies can enrich the list of store selection criteria employed by the present study. This could be implemented through both desk-research and empirical (quantitative and qualitative) research initiatives. Using such an exhaustive list of store selection criteria, researchers could adopt and apply the methodology followed by the present study to conduct confirmatory research on this topic.

7. References

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