Store layout effects on consumer behavior in 3D online stores

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Abstract

Purpose – Positioned in the e-retailing field, this study aims to investigate the effect of the retail store's atmosphere on consumer behavior in 3D online shopping environments, focusing on store layout as a critical influential factor.

Design/methodology/approach – The research uses a mixed research method approach that includes two complementary studies. First, a three-round Delphi study with domain experts is used to develop a store layout classification scheme (Study 1), resulting in five distinct types of store layout. Subsequently, 3D online retail stores that use the five layouts are designed and developed. These serve as treatments of a laboratory experimental design, which is used to assess layout impact on a number of attitudinal and behavioral variables (Study 2).

Findings – Five distinct types of store layout have been identified in Study 1, and their distinctive features are presented. The findings of Study 2 indicate that online shopping enjoyment, entertainment and ease of navigation are influenced by the store layout types of 3D online environments. Specifically, the "avant-garde" layout type facilitates the ease of navigation of customers in the store and provides a superior online customer experience. The "warehouse"' adopts long aisles for the display of products, which simplifies the comparison of products, whereas the "boutique" layout was found to be the best in terms of shopping enjoyment and entertainment. The "department" layout shares many common characteristics with traditional department stores, providing an entertaining and enjoyable store, whereas the "pragmatic" layout emphasizes low system requirements.

Practical implications – The paper presents characteristics that make store layouts effective for different aspects of online customers' experience and identifies opportunities that 3D online store designers and retailers can explore for the provision of enhanced, customized services to online customers.

Originality/value – This paper examines recent technological developments in store design and visual merchandising. It identifies five layout types of 3D online stores, which are different from those of brick–and–mortar and 2D online stores, and investigates their impact on consumer behavior. Further, the paper examines how each layout type influences online shopping enjoyment, entertainment, ease of navigation, online customer experience and, in turn, purchase and word-of-mouth intentions. Finally, the paper examines the moderating role of telepresence. Individuals with high sense of telepresence conceive 3D environments as "real" and are more concerned about the attributes that trigger the sense of enjoyment they experience while browsing.

Keywords Store layout, 3D online stores, Store atmospherics

Paper type Research paper

Consumers expect stores to offer an integrated shopping experience across multiple, online and offline, retail channels. The link between offline and online experiences is crucial because of the advent of new sophisticated technologies that have made the distinction between the real and the virtual increasingly challenging (McLeod *et al.*, 2014) and blurry (Schumpeter, 2014). Not surprisingly, an integrated multichannel strategy for category assortments and product prices has important positive effects for retail chains (Melis

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et al., 2016). Thus, the success of retailing does not only lie in physical stores and traditional e-commerce environments but also in virtual stores and environments as well (Yoo *et al.*, 2015).

Virtual environments such as virtual worlds and virtual marketplaces are considered the next major step of e-commerce (Jung and Pawlowski, 2014). Although they originate in the gaming and entertainment industries, Mims (2015) suggests that they will grow massively and will become compelling in the near future. Indicatively, Bird (2016) estimated that the virtual reality market will reach $6.7bn within the year, and is expected to reach $70bn in 2020; that is, there are opportunities for significant entrepreneurial benefits. Virtual environments offer sophisticated technologies and characteristics such as stereoscopic 3D visualization and scanning, biometrics, virtual kiosks and immersive and synchronously interactive systems that enhance the customer experience, all of which make these environments more realistic and closer to the real world context (Fang *et al.*, 2014). For example, John Lewis is testing virtual reality equipment to create virtual shopping catalogues (Benady, 2015), while Tommy Hilfiger has become the first retailer to introduce virtual reality headsets for immersing its customers in a 3D virtual trip (Tabuchi, 2015).

The prominence of store design and store atmosphere and their implications for customer experience in the era of the Omni-channel and technology-driven shopping environments has been acknowledged in the marketing literature (Poncin and Mimoun, 2014; Seckler *et al.*, 2015). Brocato *et al.* (2015, p. 200) report that "in atmosphere dominant service firms, sense of place leads to place attachment, which in turn plays a critical role in driving desirable customer behaviors". Retailers adopt the use of innovative and immersive technologies in physical stores to improve their atmosphere and increase the number of visitors at brick–and–mortar points of sale (Pantano and Viassone, 2014). The augmented reality technologies along with the traditional store atmosphere variables can be carefully manipulated by retailers to positively influence store atmosphere perceptions. To provide answers on how these cues influence store impressions, Bigné *et al.* (2015) used virtual reality tools to simulate a store to investigate the influence of atmospherics on traffic paths, and Poncin and Mimoun (2014) showed that the in-store use of magic mirrors and interactive game terminals limits the barriers between traditional and online atmospherics.

Store layout has been shown to have a significant impact on consumer behavior both in traditional and online environments (Griffith, 2005; Diehl *et al.*, 2015; Mallapragada *et al.*, 2016). As new and embedded forms of e-retailing emerge, the innovative technologies, the in-store signage and the store layout are used by retailers to guide customers through the store and increase sales (Levy and Weitz, 2012). In physical environments, Titus and Everett (1995) showed that store layout is a critical influencing factor of search efficiency within a traditional retail store. In 2D e-retailing, Vrechopoulos *et al.* (2004) transformed the layout types of physical retailing in the online context and found significant influence on customers' attitudes. However, research exploring the alternative store design patterns and the impact on shopping behavior in 3D online environments is scarce. Visinescu *et al.* (2015) investigated the storefront of 3D websites and found a significant effect on absorption, perceived ease of use and usefulness, and Liu (2014) emphasized the importance of ease of navigation in 3D online environments, particularly for the elderly. Recent research calls for further studies in the area of 3D shopping, to examine the influence of the technology acceptance model (TAM) constructs in these environments (Visinescu *et al.*, 2015), the role of atmospheric and design elements (Poncin and Mimoun, 2014) and product locations and display techniques (Bigné *et al.*, 2015).

Following a review of theoretical and empirical work on the role of layout on shopping behavior, this paper addresses a gap in the extant literature on 3D online environments by

investigating whether layouts affect consumers' shopping behavior. The study aims to identify distinct store layout types in 3D online environments, and investigate the impact of the alternative layouts on customers' attitudes and behavior. We followed a mixed method design to address this gap. A Delphi study (Study 1) was used to investigate whether there are distinct layout types in commercial virtual worlds. Findings showed that there are five different layout types, each with distinct characteristics. A laboratory experiment (Study 2) was then conducted to investigate how each of those layout types influences enjoyment, entertainment, ease of navigation, customer experience, purchase and word-of-mouth intentions and the moderating role of telepresence.

Theoretical background

Store design in brick–and–mortar and online retailing

In traditional retailing, there have been various attempts to classify retail stores in terms of merchandise, business sectors, geographic region and store atmosphere, among others. The main purpose of some of these studies is to provide classification schemes, while others use classification schemes as a means to set up experimental study designs and examine the characteristics of these classifications.

Store design as a classification dimension is a critical factor that drives sales in the traditional retailing. Levy and Weitz (2012) have described the three established layout types of traditional retail stores. The "grid" layout type facilitates planned shopping, and is mainly used by grocery stores. The design of retail stores that adopt this layout type is based on repetitive long aisles and rectangular arrangement and display of products. The department stores or smaller specialty stores adopt the "free-form" layout that facilitates a superior view of the products. There is a main aisle in a ring form that connects all the entrances of the store. Retailers adopt this store layout to encourage customers to view an existing or a new product that they had not intended to buy (i.e. unplanned purchases); that is why this layout serves impulse buying. The third type, the "racetrack-boutique" is mainly used by large department stores. The aisles and display of the products are arranged irregularly within the store. This layout does not guide the customers through the store, and sacrifices enough space to create a pleasant and tempting atmosphere. This layout is also adopted by boutique stores that wish to create a unique atmosphere in terms of the quality of the products and the shopping experience.

In their study of online environments, Vrechopoulos *et al.* (2004) developed virtual store layouts that simulate traditional states. The researchers confirmed that the layout of online stores affects consumer behavior. Indicatively, it has been shown that the hierarchical structure of the transformed grid layout positively influences ease of navigation within the online store. The free-form layout better facilitates ease of use, perceptions and entertainment, while a mixed grid/free-form layout appears promising for consumer experience in the context of online retailing. Finally, both the racetrack and the free-form layouts increase the time that consumers spend in the online stores.

Similarly, based on information processing theory, Griffith (2005) investigated how two different types of layout (i.e. tree and tunnel) affect consumers in terms of elaboration and response. Among others, Griffith (2005) considered layout as a viable design factor in the decision-making process. Manganari *et al.* (2009) provided a conceptual framework of the online store environment including virtual layout and design as a major component of the online store's interface. Then, Manganari *et al.* (2011) investigated the influence of grid and free-form layout in the online travel industry and confirmed the established knowledge in terms of the influence of store layout effects on consumers' responses.

In 3D online environments, Vrechopoulos *et al.* (2009) used a fourth store layout format labeled "boxes" in their classification scheme, which served as one of their treatments in their quasi-experimental design conducted in the context of 3D online retailing; however, the influence of store layout remains understudied in 3D online environments. In this respect, Messinger *et al.* (2009) proposed an open research question on whether store layout in virtual 3D stores should be customizable, and Vrechopoulos *et al.* (2009) and Krasonikolakis *et al.* (2014) have called for further research on the effect of 3D store layout on consumer behavior by using experimental designs in the context of causal conclusive research initiatives that will study the specific attributes that characterize such environments.

Store layout and consumer behavior

Store layout is considered a main component of store atmosphere. Academic research recognized the influential role of store layout on consumer behavior (Griffith, 2005; Manganari *et al.*, 2011; Visinescu *et al.*, 2015) and described the classification schemes of retail stores based on the store layout (Griffith, 2005; Vrechopoulos *et al.*, 2009). This section demonstrates the importance of store layout with reference to several research studies by investigating store layout effects on a range of consumers' cognitive and experiential states.

Baker *et al.* (2002) considered store layout as a design factor of the brick–and–mortar store environment and investigated, among other factors, its influence on merchandise quality perceptions and, in turn, on store image. Their study followed a between-subjects factorial experimental design, and while they did not find any significant effects of design factors on quality perceptions, they encouraged further research on that topic, as their results are influenced by their experimental design decisions. With an emphasis on the definition of flow and its influence on critical consumer behavior variables, Novak *et al.* (2000) developed a conceptual model, and a structural equation modeling approach was used to test these variables. They suggested that website design should follow specific guidelines regarding ease of navigation to arouse customers, but it should not be too sophisticated as it is likely that this would confuse online visitors.

Ease of navigation has been studied both in traditional (Weisman, 1981; Levy and Weitz, 2012) and 2D online retail settings (Childers *et al.*, 2001). While the traditional retail store layout in some cases is considered easier to understand and to navigate than the 2D online layout, the 3D online environments share more common characteristics with traditional retail stores regarding navigation than they do with the 2D online stores. For example, the avatar, which is the consumer's representative within the 3D online store, has to navigate and explore the store mimicking real-world patterns. Digital in-store technologies and innovative services have reduced the boundaries between the offline and online environments (Poncin and Mimoun, 2014).

The direct influence of store layout on perceived ease of use and perceived usefulness has been acknowledged in both physical and online stores (Vrechopoulos *et al.*, 2004). Harris and Goode (2010) adopted a cross-sectional online survey approach to investigate the influence of e-servicescape on trust in the websites and, in turn, on online purchase intentions. The layout and functionality of the website was considered one of the three e-servicescape determinants of their conceptual model, and their results strongly supported their conceptual framework. The influence of store layout on perceived ease of use and usefulness in the 2D online retail context was also confirmed by Vrechopoulos *et al.* (2004).

Kim *et al.* (2007) incorporated the principles of the consciousness–emotion–value model and cognition–affect–behavior model in the stimuli–organism–response (S–O–R) model from environmental psychology and investigated, among other factors, the influence of store layout as a stimulus design factor on cognitive states (e.g. beliefs, perceptions and others).

They considered that the direct interaction between the customers and stores affects their preferences for and perceptions of the store (e.g. store image, store perceptions).

Hui and Bateson (1991) studied the importance of perceived control in retail settings, and showed the mediating effects of perceived control on consumers' behavioral responses in traditional environments. In the same vein, van Rompay *et al.* (2012) examined the effects of store design along with shoppers' motivations, and they confirmed the link between environmental factors and consumers' orientation. Consumers strive for control to some extent; however, this is more important for some than for others (Van Rompay *et al.*, 2008).

Verhoef *et al.* (2009) developed a holistic model regarding all the features and characteristics that create the customer experience. Along with customer experience in other retailing channels, past customer experience, assortment and brand, among others, the store layout is considered a retail store atmosphere determinant, which influences customer experience. Similarly, Kaltcheva and Weitz (2006) studied the effects of environmental characteristics on arousal and, in turn, on pleasantness; on the basis of their findings, they advised retailers of grocery stores to create a simple layout to positively affect the customer experience, and advised retailers of the sporting/athletic sector to create more complex layouts as their customers are likely to be less task-oriented.

The review of past studies reveals the importance of store layout as a component of store atmosphere on consumer behavior. To research its role in 3D environments, the first step is to investigate whether there are different store layout types in 3D environments and what the characteristics of those designs are. This is the aim of the first study, which is presented below.

Study 1

To identify and classify store layout types in 3D environments, which are innovative and at an early stage of development, the Delphi method is considered appropriate. The method does not rely on statistical power; therefore, the selection of the most-qualified experts is a critical factor for its success (Taylor and Judd, 1994). To form the expert panel in this study, a list of distinguished academics was compiled from the marketing, e-retailing, information systems and human computer interaction domains, that is, academics active in research in the context of 3D online environments. Concerning practitioners, CEOs or entrepreneurs of companies in 3D online environments were invited. Thirty per cent of the participants in all rounds of the Delphi study were practitioners, two of which were employees of multinational companies with more than 5,000 employees.

The communication with panelists was undertaken in three stages and conducted via email. The first-round questionnaire included the scope of the study, a brief description of store layouts in traditional, 2D online and 3D online retail environments, and two open-ended questions. First, respondents were asked to provide a list of the characteristics that they considered important for the layout of the virtual 3D retail store. Second, they were asked to describe the specific layouts that they believed have been formed in 3D environments.

In the second, narrowing-down phase of the Delphi, each participant was encouraged to provide comments or refine their first-round answers, in view of the feedback from other respondents. Panelists were provided with an exhaustive list of the virtual 3D retail stores' characteristics that were identified as important for the layout of the store in the first round. Then, we asked them to consider whether each layout frequently appears in 3D environments or not. In addition, given that some of the proposed layouts could be grouped to provide a distinct layout, participants were asked to indicate any such groupings.

Statistics about the Delphi panel composition and participation rates across the three rounds are provided in Table I.

Delphi study results

In the first round of the Delphi study, panelists identified 62 characteristics that constitute components of store layout. The second open-ended question on layouts in use in 3D environments, after careful review and evaluation of raw data and following the same instructions as in the first question, led to the identification of 15 store layout types. The store layout types with their distinctive characteristics were drafted for circulation to participants to verify that raw data have been successfully grouped and analyzed. Data analysis and results of first-round Delphi were used as input for the development of the second-round questionnaire. In the second round, panelists were asked to consider whether each layout frequently appears in 3D environments, indicating their agreement or disagreement in a seven-point Likert scale. Respondents were also asked to recommend how the layouts proposed in the first round could be grouped together, resulting in a consolidated list of distinct layouts. Table II presents the five refined and validated distinct layout types along with their distinct characteristics that resulted from the second round of the Delphi study, taking into consideration both qualitative and quantitative data.

The purpose of the third round was to reach consensus on whether each layout could provide a distinct layout type. The final set of responses was used to compile a consolidated list of store layout types. At least nine participants for each layout indicated that the layout type frequently appears in 3D online environments (Table III). Donohoe and Needham (2009) consider that a 60 per cent agreement is enough to reach a consensus, and in light of this recommendation, a sufficient degree of consensus has been achieved. Therefore, the five layouts identified in the Delphi study can form the basis for our second study, investigating the effects of layout in 3D online shopping behavior. The next section presents the theoretical background supporting the theoretical model and set of hypotheses that guide Study 2 of our research work.

Study 2: model and hypotheses

Elaborating on the literature review and the Delphi study, we identified store layout as an important influential factor on consumer behavior in 3D online environments. To investigate how layout affects in-store behavior, we adopt the S–O–R paradigm framework (Mehrabian and Russell, 1974) to develop our model. This is consistent with studies in e-retailing, which measure the effects of store design on consumer attitudes (Manganari *et al.*, 2011). The manipulation of the layout types (i.e. layout#1-layout#5, as identified in the Delphi study) serves the environmental stimulus (S) of the model. The remainder of this section discusses the constructs used in our research model and the relevant hypotheses. Consumers' enjoyment, ease of navigation, entertainment and online customer experience reflect the organism (O) dimension, which intervenes between the store layout manipulation and consumer responses (R) (i.e. word-of-mouth and purchase intentions). The selection of the variables was made in a way to test the identified typology of 3D-store layouts, based on

Table I. Delphi panel information

Panel information	Round 1	Round 2	Round 3
Questionnaires disseminated	24	13	10
Completed questionnaires received	13	10	10
Response rate %	*54.17*	*76.92*	*100*

Layout type	Characteristics of the layout/description
Avant-garde store (Store#1)	Theme-/similarity-based display of products
	Demo products or models wearing the products/images posted will help the customer reach a decision
	Posters need to highlight the details of the products
	Insertion of screens in the floor plan to increase the amount of the display space they have
	Requires avatars to move through the store rather than just being able to pan the walls with the camera
	These stores tend to use images on the walls and may also use additional structures but will leave some room in the middle for a model or two
	Helpful display for the customer to compare products with each other
Warehouse store (Store#2)	Functionality of comparing similar products
	Theme-/similarity-based display of products
	Designers should be able to be contacted for further information on the products because of the way they had the products designed
	Ability to teleport into specific product-related areas
	Easy ability to get into the building through alternative entry points
	A virtual salesperson could guide customers to find the products
	Not visually exciting design; customers have to move through long parallel aisles to locate the products they are interested in
Pragmatic store (Store#3)	Wall-only-items
	Image stores are a great way for the retailer to reduce the lag of the store
	Theme-based display of products
	Very simple product management for the end-user
	Owing to simple images, the simulation is much lighter and system requirements can be kept much lower. However, this sacrifices the realism of having a proper 3D model on screen
	Inexpensive approach: makes it possible to show a broad range of different items in what can be a relatively small space, particularly when extra display walls are included
Boutique store (Store#4)	They sell small items such as virtual hair for avatars or shoes
	They tend to mimic physical stores with display cabinets and shelves
	Customers browse the store quickly, and if they do not find something they like, they can simply move on to the next one
	The owner may also design note cards that are easy to give away and be shared between avatars/customers
	Demo products also play a major role in this category
	One should be able to try on the product before reaching the decision to buy it
	Clear display of products
	Limited number of the available products
	Feasible for some products such as artistic items
	Theme-/similarity-based display of products
	Visual interest: interesting architecture, walls of glass, attractive materials – appeals to residents
	Need to have enough blank space to make it easy for people to see the content of the shelves
	Need to give distinctive names to items for people to be able to differentiate among them
Department store (Store#5)	Ability to find a great variety of products in a specific place (e.g. from clothing to food)
	Similarities to traditional stores regarding space layout, product clustering and store's walk-through scenarios
	Simulation of traditional (physical) department retail stores
	Encourages customers to view a new product that they had not intended to buy (i.e. unplanned purchases)
	Ring format, which connects all the entrances of the store and allows customers to move through
	A long aisle to lead customers to a new department

Table II.
Store layout classification scheme

the S–O–R framework, and reveal different behavioral patterns for different layouts. The research model (Figure 1) depicts the variables and their interrelationships, formed by the conceptual framework. The constructs and related hypotheses are presented below.

Online shopping enjoyment

The environmental attributes of the store are positively related to in-store consumer behavior (Tai and Fung, 1997). The experience of browsing in a store's environment affects

shopping enjoyment (Cox *et al.*, 2005). Kim *et al.* (2007) stated that the excitement created by the store environment has a positive impact on shopping enjoyment, whereas Vasquez and Bruce (2002) reported that the design of the store's layout aims to offer enjoyment during the consumers' shopping process. The layouts that favorably affect enjoyment are those considered by consumers to be appealing, exciting, enjoyable, exciting, fun and interesting (Kim *et al.*, 2007). The visual interest that is created in a "boutique" store layout with the interesting architecture and the attractive materials may create a shopping experience that would be appealing and exciting for the consumer. The exciting aspect is likely to be met in a department layout where the consumer walks through the "small" stores within the department store and is exposed to a great variety of high-quality products all available in a specific place.

3D online stores provide platforms for highly vivid interfaces development and various ways of product presentation. The presentation of 3D virtual products is positively related to enjoyment (Li *et al.*, 2001). On the one hand, the "boutique", the "avant-garde" and the "department" store layouts emphasize the 3D representation of products through the adoption of 3D models, while on the other hand, the "pragmatic" and the "warehouse" layouts emphasize functionality and low system requirements. They avoid the use of 3D product representation that leads to less positive enjoyment in terms of appeal, excitement and fun which are the dimensions that influence the perceived enjoyment. Thus, the following hypothesis is formulated:

Table III.
Consensus among participants on distinct layout types

Store layout type	Consensus among participants
Avant-garde stores	90% (9/10) participants
Warehouse stores	90% (9/10) participants
Pragmatic stores	90% (9/10) participants
Boutique stores	100% (10/10) participants
Department stores	90% (9/10) participants

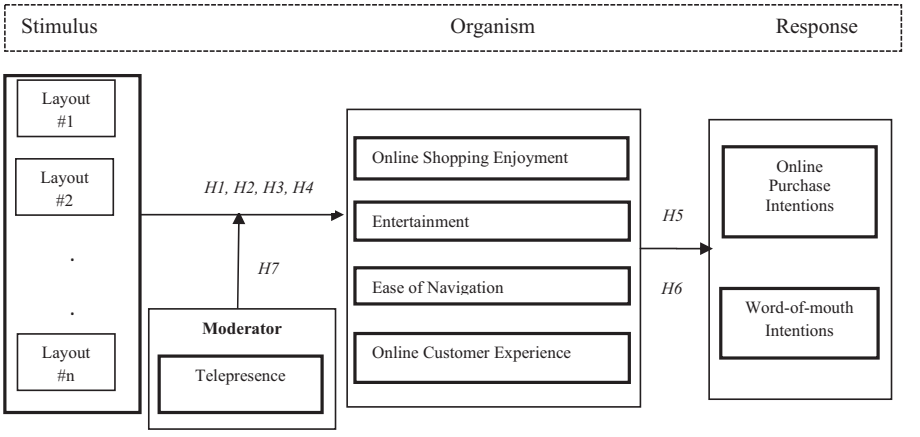

Figure 1.
Research model

H1. The "boutique", the "avant-garde" and the "department" store layouts (the "pragmatic" and the "warehouse" store layouts) influence more (less) positively the online shopping enjoyment of customers during their 3D online store visit.

Entertainment

Store layout offers entertaining experiences to users/customers (Ghosh, 1994; Levy and Weitz, 2012). The layouts that are considered to increase entertainment are those that are not just selling – they are absorbing, and they emphasize the look and feel of the store (Vrechopoulos *et al.*, 2004). Kim and Forsythe (2008) noted that virtual reality applications and, specifically, the aesthetics of those applications (Huang and Liao, 2015) enhance consumers' entertainment during their shopping. There are specific store layout designs in traditional retailing which are more pleasant than others (Mason *et al.*, 1991). Similarly, in online environments Bruner and Kumar (2000) confirmed the influence of the interface of a website on entertainment. In the same vein, Vrechopoulos *et al.* (2004) found that the free-form layout significantly influenced the entertainment dimension of users.

The diversity of store layout types in 3D online environments is likely to influence the entertainment of users in different ways. The "boutique" layout places emphasis on providing a superior look and feel of the store. By the adoption of 3D characteristics such as the 360° view of the whole store and the synchronous interaction with the store and its products, the experience becomes more stimulating and entertaining. Similarly, the insertion of store screens in the floorplan as part of the store design and posters and demo products or models at the "avant-garde" and "department" store layouts makes the navigation of the stores a more amusing experience, and not one just about selling products. The complex interfaces in 2D online stores have a positive effect on entertainment, and we expect that the complexity of the "department" layout where small stores are positioned within the main store, will lead to a better look and feel of the store and a more entertaining experience. The "pragmatic" layout, which provides simple images, light simulation and simple product display, is considered to be less fun for the visitor. In this regard, the "warehouse" layout is not believed to provide an entertaining layout either, owing to its functional orientation. Thus, we hypothesize:

H2. The "boutique", the "avant-garde" and the "department" store layouts (the "pragmatic" and the "warehouse" layouts) influence more (less) positively customers' entertainment during the 3D online store visit.

Ease of navigation

Manganari *et al.* (2011, p. 327) underlined the influence of store layout on online ease of navigation. Specifically, they note that "the design and development of the virtual store layout is very important as the layout directs consumer online navigation". However, according to the results of Vrechopoulos *et al.*'s (2009) online experiment conducted in the context of 3D virtual retailing, consumers' perceived ease of use of the store is not affected by store layout. Ease of navigation in an online context "includes the process of exploring the interactive environment in alternative ways to seek-out product related information" (Childers *et al.*, 2001, p. 515). The consumer may have more or less control over searching products within a store in both offline and online retail contexts. In traditional retail stores, the simple floor design has been shown to improve the ability to navigate within the store (Weisman, 1981). According to Childers *et al.* (2001), traditional retail stores retain a layout that is more obvious to consumers than an online web store,

which will follow internal structures. Specifically, Lynch and Ariely (2000) showed a direct effect of ease of navigation on purchase intentions in cases where information about the products is easily navigable.

Ease of navigation plays an important role in 3D online retail stores because of the avatar movements throughout the store. Consumers interact with the layout of the stores through their avatars. Activities such as flying through the store instead of walking, visiting a store by emerging from its open floor, 3D display and allocation of products, virtual salesmen and lightning signs guiding customers through the stores are some of the usual navigational behaviors in 3D online retail stores. The "pragmatic" store layout allows flexibility and ease of navigation owing to the simple product management and light graphics requirements, as there are no in-store "obstacles" such as aisles or promotional stands (Büttner *et al.*, 2015) to obstruct navigation around the store. Similarly, the "avant-garde" layout comprises of all the innovative 3D technologies offering a free environment for the avatars to navigate as they see fit. Conversely, the extended use of aisles in the "warehouse" layout, the sophisticated architecture and design of the "boutique" layout and the borderlines of small stores in the "department" layout is expected to set limits in terms of the fluidity of navigation through and around the shopping environment. Thus, it is considered that navigation within a 3D online store is affected by the design of the store layout. Thus:

H3. The "pragmatic", and the "avant-garde" store layouts (the "warehouse", the "department" and the "boutique"' store layouts) influence more (less) positively customers' ease of navigation within the 3D online store.

Online customer experience

Kaltcheva and Weitz (2006) emphasize the influence of store layout on customer experience. They contend that layout is an element of the store atmosphere, which is difficult to modify and, taking this into consideration, retailers should design their stores to provide an intermediate level of arousal in terms of the motivational orientation of customers. In online environments, the website characteristics influence online customer experience (Mallapragada *et al.*, 2016). On the basis of Mehrabian and Russell's (1974) assertion that arousal, pleasure and dominance capture the individual's affective states within an environmental setting, Rose *et al.* (2012) considered arousal, pleasure and dominance as elements of the affective experiential state of online customer experience. In the same study, they illustrated flow as the cognitive experiential state dimension of online customer experience. Cognitive, affective, social and physical states are considered attributes of customer experience according to Verhoef *et al.* (2009), who cite the layout of the store as part of the retail atmosphere as a direct influencing factor on customer experience.

The "avant-garde" layout, which uses all the innovative technologies available for the design of the store, is believed to influence more positively the customer experience. The availability of demo products or models, the posters highlighting the information about the products and the insertions of smart screens in the floor plan of an "avant-garde" layout are some of the features that might offer a superior customer experience. Also, the design of the "boutique" layout aims to provide a customer experience of high quality. Some of the characteristics that contribute to this experience of high quality are pleasant atmosphere, appealing materials and distinctive names for ease of differentiation. The long aisles of the "warehouse" layout, the limited availability of sophisticated features of the "pragmatic" layout and the range of small stores in a "department" store layout is likely to have a less positive effect on consumers' flow and experience. Thus, we hypothesize:

H4. The "boutique" and the "avant-garde" store layouts (the "department", the "warehouse" and the "pragmatic" store layouts) influence more (less) positively customers' experience (i.e. pleasure, arousal, dominance, flow) toward the 3D online store.

Online purchase intentions

The effect of layout on purchase intentions has been acknowledged in traditional and online retailing (Griffith, 2005; Park *et al.*, 2005; Verhagen and van Dolen, 2009). Verhagen and van Dolen (2009) studied the factors that affect online purchase intention and concluded that, among others, the offline store layout is perceived as the key point of reference for the online store layout and online purchase intentions. Also, a pleasant store layout has a direct effect on moods, and positive moods have a direct positive effect on purchase intentions (Park *et al.*, 2005). More recently, Krasonikolakis *et al.* (2014) found that "ease of walking through the store" and "store atmosphere" constitute, among others, important criteria when consumers select a 3D virtual store in which to conduct their purchases. The present study examines the attributes that constitute store layout in 3D online retail stores. As layout has been shown to affect purchase intentions, it is likely that the attributes of layout in 3D online stores predict customers' online purchase intentions. Thus, we hypothesize:

H5. Customers' online purchase intention toward 3D online stores is predicted by customers' evaluation of 3D online store layouts in terms of *H5a* online shopping enjoyment, *H5b* entertainment, *H5c* ease of navigation and *H5d* online customer experience.

Word-of-mouth intentions

Krasonikolakis *et al.* (2014) found that social aspects of 3D retailing ("my friends visit the particular store") constitute important criteria when consumers select a 3D virtual store to conduct their purchases. Similarly, Jung and Kang (2010) noted that people visiting 3D virtual worlds wish to enjoy social relationships; however, Kim *et al.* (2011) reported that customer satisfaction with the online store positively affects electronic word-of-mouth intentions. Word of mouth has been a sensitive influencing factor in various domains because of its intangible aspect (Berry, 2000; Groeger and Buttle, 2014); for example, that is the reason why word of mouth is usually at the top of reasons for customers' choice of a doctor, which is a sensitive matter (Berry, 2000). Investigating the role of image on negative word of mouth, DeCarlo *et al.* (2007) showed that there are interactive effects between customers' negative word of mouth and the image of the retailer. Similarly, Babin *et al.* (2005) found that the hedonic and utilitarian values of servicescape components seem to affect word-of-mouth intentions. Bridson *et al.* (2008) demonstrated the influence of store layout as part of the trading format of the retailer on word-of-mouth intentions. In this regard, it is hypothesized that the attributes of layout in 3D online environments will predict the word-of-mouth intentions of the customers:

H6. Customers' word-of-mouth intention toward 3D online stores is predicted by customers' evaluation of 3D online store layouts in terms of *H6a* online shopping enjoyment, *H6b* entertainment, *H6c* ease of navigation and *H6d* online customer experience.

Telepresence

Steuer (1992) contributed to virtual reality techniques in the early 1990s, and he investigated the terms "presence" and "telepresence". He suggested that presence should be considered as the sensory experience of someone who interacts with the physical environment. As humans have different perceptions of environmental triggers, it is reasonable to postulate that a physical environment could engender different feelings in each person being in the same physical environment. In this regard, telepresence is considered as the "essence of presence" in an environment supported by a communication medium. Steuer (1992) explains that the extent and significance of telepresence rests on a human's ability or will to perceive two different environments; the physical environment around them and the environment created through the communication medium. The sense of presence in a virtual reality environment is created by automatic conceptual procedures, aiming to illustrate the virtual environment as real.

Academia embraced Steuer's (1992) arguments and many researchers studied telepresence in online environments, in the context of the internet as the communication medium. Novak *et al.* (2000) identified telepresence as the antecedent of flow in 2D online environments, and Skadberg and Kimmel's (2004) results supported the same hypothesis. On the other hand, Draper *et al.* (1998) separated telepresence into cybernetic and experiential components, emphasizing on efficiency and experience, respectively. Also, in their investigation of telepresence in the online apparel industry, Song *et al.* (2007) identified the influence of telepresence on enjoyment. Involvement and interactivity seem to be related and affected by telepresence in virtual environments (Lombard and Ditton, 1997). Leister *et al.* (2007) considered telepresence an attribute of communication in 3D environments that influences navigation. Similarly, Söderman (2005) reported that telepresence is the main feature of responsive virtual worlds. Finally, Vrechopoulos *et al.* (2009) suggested that virtual reality retailers should place more emphasis on enhancing telepresence through the use of evolutionary technologies. Thus, the literature leads us to formulate the following set of hypotheses:

H7. Customers' telepresence during a 3D store visit moderates the degree of store layout influence on customers' *H7a* online shopping enjoyment, *H7b* entertainment, *H7c* ease of navigation and *H7d* online customer experience.

Study 2

Laboratory experiment design

On the basis of the outcome of the Delphi method and the research hypotheses, a causal research design was considered the most appropriate approach to investigate the cause–and–effect relationships among the various store layout types and determinants of consumer behavior.

To visualize the five distinct layout types, a 3D tool for the development of stores was used, followed by a video recording to capture all aspects of the in-store layout patterns. Several computer programs provide the ability to develop a 3D appearance of a building. This option facilitates the development of 3D stores in a laboratory setting and provides a clear view of the interior of a store. Google SketchUp v.8 served as the main tool for building and modifying 3D models in this research. This tool offers the additional advantage of import and export capabilities to other design programs.

An obstacle that this study had to overcome is that the actual products offered in virtual world stores could not be copied and used in the experiment because of copyright restrictions. Furthermore, design of products from actual 3D stores could influence study

participants in different ways. To overcome these obstacles, products offered in the Database of Google SketchUp were used. However, the variety of products offered by this program is limited. The use of Adobe Photoshop CS6 was considered appropriate to design clothes that are based on the products offered by Google SketchUp but look different (Figure 2).

The same products were used in all layout types. With regard to the boutique layout, because of the characteristics of this layout, fewer products were presented compared to the other layouts. However, to avoid bias, all the products that are available at the boutique layout are displayed in the other layouts as well. As far as the allocation of products within each store is concerned, specifications coming from the Delphi method results determined merchandise allocation guidelines in each store (Figure 3).

Sample, procedure and measures

The sampling frame of the experiment consisted of undergraduate and postgraduate students from two universities in Southern Europe. According to the theory of the diffusion

Figure 2.
Indicative examples of designer dresses and complete avatars' outfits displayed in laboratory store layouts

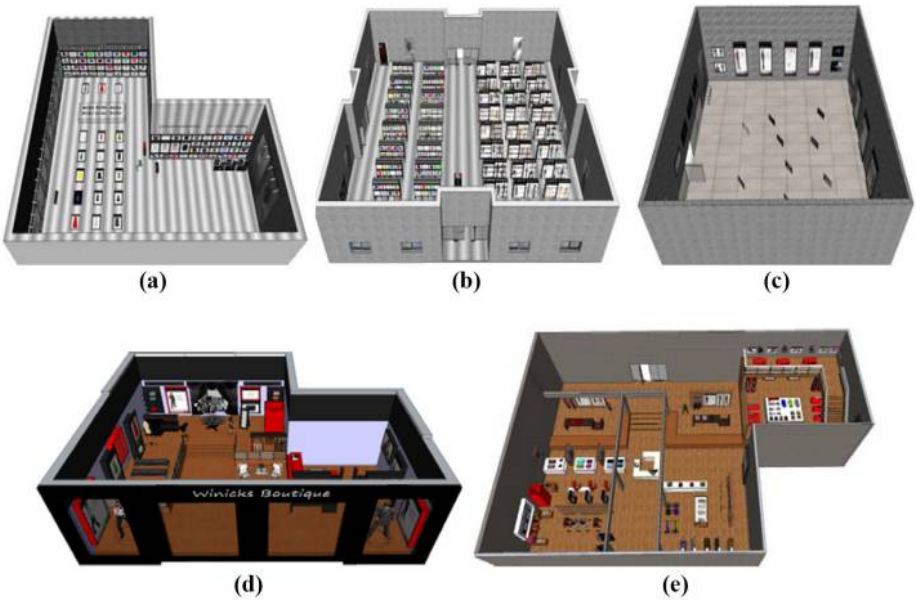

Figure 3.
Panoramic view of laboratory store layouts

Notes: (a) "Avant-garde"; (b) "Warehouse"; (c) "Pragmatic"; (d) "Boutique"; (e) "Department"

of technology (Eads, 1984), students are considered innovators, and more eager to use and experience new products and services and new environments (e.g. 3D interfaces). The innovative aspect of this experimental setting fits with the profile of university students. Sampling without replacement was selected as the general approach of the sampling technique. The elements of this study are individual shoppers and non-shoppers who are familiar with the internet, 3D online environments and virtual worlds. To ensure that all participants would have had experience with 3D online environments, the first question of the survey was used as a filter.

Respondents of the lab experiment were asked to fill in a questionnaire. The first part of the questionnaire included questions such as the purpose of internet usage, the purpose of 3D online environment usage, the products that they buy from 3D online environments, the shopping motivation and the degree of telepresence in 3D online environments.

Before issuing the second part of the questionnaire, the lead researcher of the study provided each participant a video and description of the layout of a store. The participant watched an approximately two-minute-long video of the layout and then read the description of the layout (i.e. the list with the characteristics of the layout that was the outcome of the Delphi study). Then, the participant evaluated the characteristics of the store in the second part of the questionnaire. Given the five layouts, this process was repeated five times (within-subjects design). The sequence of each of the videos of the stores along with the description of the layout that was presented to the participants was random. In the third part, the respondents were invited to fill in the final part of the questionnaire, which consisted of questions related to their demographic data. Each interview lasted 2.45-3.00 h approximately.

To assess the constructs, we used established and validated scales. To measure entertainment, the four items from Vrechopoulos *et al.*'s (2004) study were adopted. The instrument of Kim *et al.* (2007) with six items was used to measure online shopping enjoyment. In their investigation of the role of hedonic and utilitarian motivation for online shopping, Childers *et al.* (2001, p. 515) consider navigation as "the process of self-directed movement through the media involving nonlinear search and retrieval methods that permit greater freedom of choice", based on Hoffman and Novak's (1996) work. This definition fits with avatars' navigation in 3D online stores, and we adopted the four items they used in their study to measure ease of navigation. Rose *et al.* (2012) considered online customer experience as the merging of cognitive and affective experiential states of consumers. In this regard, they used eight items of the PAD scale constructed by Mehrabian and Russell (1974) to measure the afffective experiential state, and flow by Novak *et al.* (2000) to measure the cognitive experiential state. To measure customer experience the present study includes both cognitive and affective components. The cognitive dimension is captured through the flow variable, whereas the affective part is measured via the pleasure, arousal and dominance variables. The three items used to measure word-of-mouth intentions were adopted from Babin *et al.* (2005); similarly, online purchase intention was measured by the three items adopted from Verhagen and Van Dolen (2009). Telepresence was measured by adopting the seven items of Novak *et al.* (2000) study. The list of items and corresponding constructs is presented in Appendix 1.

To investigate the realism of this experimental design, a realism check was used. The items for this check were drawn from Wagner *et al.*'s (2009) study. We asked participants whether they believed that the described situation could happen in real life, and whether they could imagine an actual 3D store offering the things described in the situation cited above. A high level of internal consistency reliability was achieved (Cronbach's $\alpha = 0.786$), and taking into account the means of these two realism check items which are 4.4 and 4.6

(five-point Likert scale), respectively, a high level of realism of the laboratory experiment can be assumed.

Reliability and validity

To establish the reliability and validity of our measures the following analyses were performed. Cronbach's α was used to test the reliability of the constructs and, given that all the participants of the experiment evaluated the constructs of the research model in terms of five distinct store layout formats, the internal consistency of each variable was measured for each layout type. All scales demonstrated acceptable reliability scores (>0.70, Bagozzi and Youjae, 1988). To further validate these results, the composite reliability was calculated and all values exceeded the recommended threshold of 0.7 (Hair *et al.*, 1998).

Next, to assess convergent validity, the average variance extracted (AVE) of the constructs was used (Fornell and Larcker, 1981); AVE for all constructs was above the cut-off value of 0.5 (Zaiţ and Bertea, 2011).

Finally, to assess discriminant validity, we first calculated the maximum shared variance (MSV). The MSV scores are lower compared to AVE scores for each construct; therefore, we found support for discriminant validity (Malhotra and Dash, 2011). For a more stringent evaluation of discriminant validity, we proceeded with the Fornell and Larcker (1981) technique, as recommended by Farrell (2010): all possible paired combinations for all constructs in each store layout were calculated. We confirmed that the square root of AVE of each construct is greater than the correlation of the specific construct with each of the other constructs. Given these tests, the model proved to be appropriate in terms of reliability, convergent and discriminant validity, and we proceeded with the test of our hypotheses. A summary of the tests' results, performed using AMOS v22, is presented in Tables IV and V.

Statistical methods and tools

We then investigated the underlying assumptions regarding the statistical techniques adopted to test the research hypotheses. Hypotheses *H1-H4* were tested through one-way repeated measures analysis of variance (RM ANOVA), hypotheses *H5-H6* through multiple regression and hypothesis *H7* through mixed/split-plot analysis of variance. We used these methods because of the causal research design of this study.

In terms of RM ANOVA, the largest and the smallest variances of each group were divided to obtain the F-max score. The score was lower than three in all cases, showing that the assumption for homogeneity of variance has not been violated. To measure sphericity, the value for Mauchly's test was found to be significant ($p < 0.5$) in most cases. In this regard, the F-ratio was calculated using new degrees of freedom. The corrective actions were based on the Greenhouse–Geisser and Huynh–Feldt values. In each case, if the value of epsilon was >0.75 then the Huynh–Feldt correction was used. If the value of epsilon was <0.75, then the Greenhouse–Geisser correction was used.

For multiple regression, the assumption of having 20 times more cases than the predictor variables for standard regression has been met (Coakes *et al.*, 2009), and the residual scatter plots confirmed the absence of outliers in the regression models. Also, residual scatterplots shed light on the normal distribution of the obtained and predicted dependent variables' values, on the linearity of the predicted variables' values and on the same variance for all predicted values.

Five assumptions underpin the use of split-plot ANOVA; the first four are the same with RM ANOVA and the homogeneity of intercorrelations. The Box's M statistic was used to identify whether the model of intercorrelations among the repeated measures levels is

Construct	Cronbach's α	CR	AVE	MSV
Avant-garde				
Online shopping enjoyment (OSE)	0.948	0.949	0.758	0.681
Entertainment (ENT)	0.922	0.924	0.752	0.681
Ease of navigation (NAV)	0.919	0.920	0.741	0.625
Online customer experience (OCE)	0.888	0.905	0.707	0.643
Online purchase intentions (OPI)	0.906	0.950	0.864	0.305
Word of mouth (WOM)	0.947	0.910	0.772	0.613
Telepresence (TLP)	0.885	0.887	0.532	0.233
Warehouse				
Online shopping enjoyment	0.955	0.955	0.781	0.691
Entertainment	0.935	0.937	0.788	0.427
Ease of navigation	0.951	0.952	0.831	0.691
Online customer experience	0.950	0.950	0.827	0.696
Online purchase intentions	0.882	0.899	0.750	0.696
Word of mouth	0.926	0.926	0.807	0.579
Telepresence	0.885	0.888	0.533	0.189
Pragmatic				
Online shopping enjoyment	0.928	0.930	0.689	0.397
Entertainment	0.885	0.895	0.681	0.566
Ease of navigation	0.898	0.897	0.685	0.521
Online customer experience	0.914	0.919	0.741	0.606
Online purchase intentions	0.922	0.928	0.811	0.606
Word of mouth	0.852	0.859	0.673	0.508
Telepresence	0.885	0.888	0.533	0.039
Boutique				
Online shopping enjoyment	0.900	0.901	0.606	0.560
Entertainment	0.863	0.874	0.638	0.598
Ease of navigation	0.840	0.853	0.594	0.370
Online customer experience	0.878	0.881	0.656	0.598
Online purchase intentions	0.863	0.864	0.680	0.527
Word of mouth	0.868	0.876	0.703	0.447
Telepresence	0.885	0.887	0.532	0.024
Department				
Online shopping enjoyment	0.879	0.882	0.561	0.326
Entertainment	0.820	0.821	0.536	0.424
Ease of navigation	0.825	0.843	0.577	0.410
Online customer experience	0.885	0.887	0.668	0.424
Online purchase intentions	0.750	0.762	0.517	0.392
Word of mouth	0.822	0.825	0.611	0.364
Telepresence	0.885	0.887	0.532	0.038

Table IV. Measures of reliability, convergent and discriminant validity

Notes: CR = composite reliability; AVE = average extracted variance; MSV= maximum shared variance

consistent with between-subjects levels. The statistic was not significant (i.e. $p > 0.001$) in all cases.

Results

A total of 59 individuals took part in the laboratory experiment. With respect to gender, the sample was almost evenly split (54.23 per cent being male), whereas most participants

Construct	OSE	ENT	NAV	OCE	OPI	WOM	TLP
Avant-garde							
OSE	*0.871*						
ENT	0.825	*0.867*					
NAV	0.717	0.633	*0.861*				
OCE	0.802	0.798	0.791	*0.841*			
OPI	0.552	0.384	0.355	0.446	*0.929*		
WOM	0.783	0.709	0.779	0.761	0.515	*0.879*	
TLP	0.336	0.256	0.122	0.483	0.353	0.260	*0.729*
Warehouse							
OSE	*0.884*						
ENT	0.469	*0.888*					
NAV	0.831	0.523	*0.912*				
OCE	0.422	0.635	0.486	*0.910*			
OPI	0.709	0.653	0.815	0.834	*0.866*		
WOM	0.659	0.529	0.761	0.414	0.658	*0.898*	
TLP	0.434	0.435	0.418	0.205	0.391	0.321	*0.730*
Pragmatic							
OSE	*0.830*						
ENT	0.630	*0.825*					
NAV	0.282	0.499	*0.827*				
OCE	0.514	0.752	0.638	*0.861*			
OPI	0.518	0.703	0.722	0.779	*0.900*		
WOM	0.554	0.695	0.549	0.706	0.712	*0.820*	
TLP	0.193	0.087	−.016	0.197	0.126	−0.087	*0.730*
Boutique							
OSE	*0.778*						
ENT	0.748	*0.799*					
NAV	0.526	0.568	*0.771*				
OCE	0.737	0.773	0.589	*0.810*			
OPI	0.539	0.660	0.518	0.726	*0.824*		
WOM	0.559	0.668	0.609	0.669	0.586	*0.838*	
TLP	−0.154	−0.039	−0.120	0.016	0.014	0.065	*0.729*
Department							
OSE	*0.749*						
ENT	0.442	*0.732*					
NAV	0.220	0.482	*0.759*				
OCE	0.457	0.651	0.640	*0.817*			
OPI	0.571	0.458	0.414	0.626	*0.719*		
WOM	0.512	0.603	0.413	0.463	0.425	*0.782*	
TLP	0.108	−0.195	−0.034	0.056	−0.115	−0.020	*0.729*

Notes: All values are significant; the diagonal values are the square root of AVEs and the rest are the correlations between pairs of variables

Table V.
Discriminant validity and matrix of correlations

reported themselves as single (94.91 per cent). The majority (91.52 per cent) of the sample was below 29 years old; approximately 52 per cent were aged between 18 and 23 years old and 39 per cent between 24 and 29 years old. Also, about 76.27 per cent of the respondents were students, and 8.87 per cent held a Master's degree. The vast majority (83.05 per cent) selected the student identity as their main occupation. Finally, 79.66 per cent of the

population had an average income up to 500 euros. Table VI summarizes the results of the hypotheses testing and is followed by a detailed presentation and discussion of findings.

H1 (online shopping enjoyment: supported). The artistic items that appear in a boutique store layout and the orientation of this layout to provide a unique, high-quality experience were expected to achieve the highest score for this layout. On the contrary, the emphasis of the warehouse store layout is on displaying a great variety of products and the ease of finding products without paying particular attention to the enjoyable side of the customer experience. Similarly, the department store layout includes all the characteristics that appear in the avant-garde store layout and pragmatic store layout that could influence

Research hypothesis	Reject/accept	Statistical method	Results	Ranking for *H1-H4*
H1	Accepted	One-way repeated measures ANOVA	F(2.852, 165.429) = 7.720, sig. = 0.000 Statistically significant differences: 4 ≠ 2,4 ≠ 3,2 ≠ 5	1.Boutique, 2. Department, 3. Avant-garde, 4. Pragmatic, 5. Warehouse
H2	Accepted	One-way repeated measures ANOVA	F(2.384,138.244)=24.559, sig. = 0.000 Statistically significant differences: 1 ≠ 2, 1 ≠ 4, 1 ≠ 5, 2 ≠ 4, 2 ≠ 5, 3 ≠ 4, 3 ≠ 5 F(17.497, 165.078)=6.148, sig. = 0.001	1. Boutique, 2. Department, 3. Avant-garde, 4. Pragmatic, 5. Warehouse 1. Avant-garde,
H3	Accepted	One-way repeated measures ANOVA	Statistically significant differences: 1 ≠ 2, 1 ≠ 4, 1 ≠ 5, 2 ≠ 3 F(11.507,147.442)=4.527, sig. = 0.09	2. Pragmatic, 3. Boutique, 4. Department, 5. Warehouse 1. Avant-garde,
H4	Rejected	One-way repeated measures ANOVA	Statistically significant differences:-	2. Boutique, 3. Department, 4. Pragmatic, 5. Warehouse
H5	*H5a*: Accepted *H5b*: Rejected *H5c*: Rejected *H5c*: Rejected	Multiple regression	R square = 0.756, F = 11.879, sig. = 0.000, Online shopping enjoyment: t = 2.266, sig = 0.028	
H6	*H6a*: Accepted *H6b*: Rejected *H6c*: Accepted *H6d*: Accepted	Multiple regression	R square = 0.816, F = 16.986, sig. = 0.000, Online shopping enjoyment: t = 2.938, sig = 0.005, Ease of navigation: t = 2.871, sig= 0.006, Online customer experience: t = -2.047, sig = 0.046	
H7	*H7a*: Accepted *H7b*: Rejected *H7c*: Accepted *H7d*: Accepted	Mixed/split-plot ANOVA	Significant main effect in cases: Online shopping enjoyment (i.e. F(1,57) = 10.08, p = 0.002), Ease of navigation (i.e. F(1,57) = 9.81, p = 0.003), Online customer experience (i.e. F(1,57) = 9.92, p = 0.003)	

Table VI.
Hypotheses' testing results

shopping enjoyment. For example, the use of images, the use of models/avatars to display the products and the theme-based/similarity-based display of products are characteristics included in all three layout types. In addition, the department layout emphasizes the appealing and exciting aspect of various departments within the store. The positive influence of excitement on the shopping enjoyment is also confirmed by Kim *et al.*'s (2007) study.

H2 (entertainment: supported). The look and feel of the store is probably one of the reasons that explain why the "boutique" store was considered the most entertaining layout. Also, the results of the RM ANOVA indicated that the "boutique' store is perceived in the same way as the "department" store. This was expected, as previous research conducted in traditional environments shows that it is more entertaining to go shopping in a department store than in a supermarket (Mason *et al.*, 1991). This finding is likely to explain the fact that the "department" store is perceived differently from the "warehouse". "Warehouse" stores share similar characteristics with supermarkets as there are long aisles enabling greater variety and view of products. An unexpected result is that the "avant-garde" store differs from the "warehouse" store but not from the "pragmatic" store. There are screens in the floor plan and demo avatars wearing the products in the "avant-garde" stores that were expected to affect the look and feel and entertainment aspect of the store (these characteristics do not appear in "warehouse" stores) but do not.

H3 (ease of navigation: supported). In traditional retail stores, there is evidence that the simple floor plan positively influences ease of navigation (Weisman, 1981). Among the five layout types in 3D online retail environments, the pragmatic stores maintain a very simple floor plan (avoid system lag, use of images only, simple product management and light simulation, among other features). Taking this point into consideration, this layout type was expected to elicit the highest score. However, the avant-garde layout was found the best for navigation, although it did not differ significantly from the pragmatic store. This can be attributed to the lack of familiarity with this new environment, as consumers are more familiar with traditional store layouts than with the 2D online stores (Childers *et al.*, 2001); or it is likely that the use of models within the store (appearing in "avant-garde" but not in "pragmatic" stores) does not seem to affect navigation. The difference between the "avant-garde" store and the "warehouse" store can be attributed to the long aisles that usually exist in "warehouse" stores, whereas the difference between the "avant-garde" store and the "boutique" is explained by the more complex layout of "boutique" stores. Similarly, the difference between the "avant-garde" store and the "department" store is explained by the size of department stores. The latter could include multiple small stores, further complicating the navigation experience.

H4 (online customer experience: not supported). In recent years, various studies have introduced store layout as an important influencing determinant of customer experience (Verhoef *et al.*, 2009). In this study, the combination of the four variables used to test customer experience in the context of 3D online environments showed that customer experience is not influenced by store layout. As 3D store layouts present highly vivid, entertaining and interactive features that could affect the cognitive and experiential state of visitors (Rose *et al.*, 2012), this result was unexpected. Elaborating on the outcome following this testing of this hypothesis, RM ANOVA was used to identify any significant differences among the three (i.e. pleasure, arousal and dominance) of the four variables used to test customer experience. Results showed that there are significant differences in each variable in relation to the store layout. In view of this, we suggest two possible interpretations for this result. Either each of the four variables is affected by the store layout but their combination is not, or other scales oriented to the distinct and unique characteristics of the 3D

environments need to be developed to measure online customer experience. In the study, the "avant-garde" store scores highest in online customer experience; it is an entirely new layout type in relation to the other layout types, which share common characteristics with the traditional retail stores. For example, the "department" store shares common characteristics with traditional department stores, and the same applies to "boutique" stores. Also, the "avant-garde" store emerged from conditions and requirements (e.g. use of demo products, avatars for model use and screens in the floor plan, among others) that were formed in the business practice of 3D online environments. Thus, the experience of customers when visiting these types of stores is considered of high value.

Summary of layout types and organism variables. The following table (Table VII) shows how each layout type is perceived by the respondents with regards to the four organism variables. The mean (*M*) and standard deviation (*SD*) for each layout type and each of the organism variables are presented accordingly. For example, the table shows that the boutique layout scores the highest on enjoyment and entertainment, whereas the avant-garde layout scores the highest on ease of navigation and online customer experience. Conversely, the warehouse layouts have the lowest score on all variables.

H5 (online purchase intentions: supported). The analysis showed that an increase in the online shopping enjoyment will increase the online purchase intentions of customers visiting 3D online stores. 3D online retail stores can offer various services that are not provided in other retail channels to enhance enjoyment. For example, the ability for the customer's avatar to try on demo clothes before making a purchase decision, or the organization of events and exhibitions are some of the services that can be provided in 3D online stores and not in 2D online stores, leading to higher enjoyment for consumers.

Contrary to our expectations, ease of navigation around the 3D store does not predict purchase intentions. We expected that the customers who find a store easy to navigate, and can move fluidly through the environment, would be more likely to purchase. However, if we take into consideration recent studies (Krasonikolakis *et al.*, 2014), where the time spent in the store does not predict sales, we can speculate that some consumers may visit 3D stores for purposes other than for conducting purchases. Similarly, we measured entertainment by considering whether the layout is fun to browse, is entertaining and has a nice look, and the results show that entertainment does not predict purchases. As in the previous case, consumers may visit the 3D stores to search for products, or to evaluate alternatives but not to proceed with the purchase through that retail channel. Finally, customer experience was not found to be influenced by store layout and so, in turn, does not predict purchase intentions.

H6 (Word-of-mouth intentions: supported). The results indicate that a decrease in online customer experience will increase word-of-mouth intentions. It should be noted that customer experience was measured in light of the layout of the store, and not as the overall customer experience brought about by the store visit. In the presence of other variables, customer experience is negatively linked to word of mouth. Although this

Table VII. Matrix of store layout types and organism variables

Layout type	Enjoyment	Entertainment	Ease of navigation	Online customer experience
Avant-garde	$M = 3.34$, $SD = 0.75$	$M = 3.27$, $SD = 0.76$	$M = 3.82$, $SD = 0.73$	$M = 3.59$, $SD = 0.68$
Warehouse	$M = 2.97$, $SD = 0.89$	$M = 2.93$, $SD = 0.94$	$M = 3.14$, $SD = 1.01$	$M = 3.24$, $SD = 0.92$
Pragmatic	$M = 3.21$, $SD = 0.89$	$M = 3.11$, $SD = 0.93$	$M = 3.67$, $SD = 0.85$	$M = 3.35$, $SD = 0.85$
Boutique	$M = 3.73$, $SD = 0.88$	$M = 4.02$, $SD = 0.87$	$M = 3.41$, $SD = 0.81$	$M = 3.47$, $SD = 0.75$
Department	$M = 3.55$, $SD = 0.84$	$M = 3.99$, $SD = 0.83$	$M = 3.32$, $SD = 0.93$	$M = 3.40$, $SD = 0.76$

outcome merits further exploration, it is likely that one or more of the constructs used to test customer experience (i.e. pleasure, arousal, dominance and flow) is negatively related to word-of-mouth intentions.

An increase in the perception of ease of navigation within the store layout will increase the word-of-mouth intentions. RM ANOVA regarding the *H3* confirmed that the store layout influences ease of navigation in 3D online retail stores. "Avant-garde" and "pragmatic" stores scored higher than the others in terms of ease of navigation. Elaborating on the characteristics of these store layout types, the insertions of screens in the floor, encouraging avatars to move through the store (instead of just panning the walls with a camera) and the focus on lighter simulation, system requirements and simple products management, will increase the evaluation of perceived ease of navigation which, in turn, will increase word-of-mouth intentions.

An increase in online shopping enjoyment will increase the word-of-mouth intentions. The RM ANOVA regarding *H1* confirmed that the store layout type influences shopping enjoyment. "Boutique" and "department" types elicited the highest scores in light of enjoyment, implying that their underlying characteristics will increase the shopping enjoyment. From this point of view, the characteristics of these stores such as artistic and attractive materials, and simulation of real-world activities (e.g. display cabinets and shelves), which focus on creating an enjoyable, appealing and exciting shopping experience, will positively influence online shopping enjoyment, in turn, increasing word-of-mouth intentions.

H7 (telepresence: supported). The moderating role of telepresence applies to online shopping enjoyment, ease of navigation and online customer experience. The environmental attributes of 3D online apparel stores have a more positive impact on individuals with high-telepresence than with low. People with high-telepresence perceive these environments as "real" and are more concerned about the attributes that trigger the sense of enjoyment, ease of navigation and experience.

Furthermore, the results of *H1* indicated that the store layout types comprising of characteristics such as artistic items, demo avatars and screen displays among others were evaluated higher in terms of enjoyment. In this regard, it was expected that pragmatic stores, which are focused on simple product management and display of products, are not considered different enough in terms of enjoyment. In this context, a recent study of Roggeveen *et al.* (2016) examined the role of retail format and message content on the relationship between digital displays and sales and found a positive effect for hypermarkets.

Discussion

The objective of this study was two-fold: establish a classification of store layout types in 3D online environments and investigate the impact of the alternative layouts on customers' attitudes and behavior.

The findings of the Delphi method led to the identification of five distinct layout types with distinguishing characteristics. The value of the adopted research approach lies in the identification of layout types in the 3D context, which were shown to differ from those of the traditional and 2D online classification schemes. This classification scheme constitutes a suitable theoretical vehicle that lays the foundations for investigating whether and how store layout affects consumer behavior in this emerging retailing landscape.

The classification scheme was used to investigate whether and how each attribute or characteristic of each layout type influences consumer behavior. Similarly, and in line with research conducted in traditional and 2D online environments, through a laboratory research design, this study examined how each layout type influences online shopping

enjoyment, entertainment, ease of navigation, online customer experience and, in turn, purchase and word-of-mouth intentions. The study also examined the moderating role of telepresence.

Online shopping enjoyment, entertainment and ease of navigation were shown to be influenced by the store layout types of 3D online environments. Conversely, online customer experience was not influenced by the store layouts. Online shopping enjoyment in terms of store layout evaluation was shown to have a predicting power on online purchase intentions, whereas online customer experience, ease of navigation and online shopping enjoyment were shown to have a predicting power on word-of-mouth intentions. Finally, telepresence moderates the degree of store layout influence on customers' online shopping enjoyment.

Implications for theory

In line with the study's objectives, the contribution of this research lies first in the identification and validation of a typology of 3D stores layout. To the best of our knowledge, this is the first time that such a typology has been established. Second, the influence of these layouts on 3D online behavior has been validated through the identification of different consumers' patterns for specific store layouts.

Based on the Delphi study results, the avant-garde layout is a new layout type proposed by the respondents. The novelty lies in that this type does not simulate enough characteristics of any other layout type in traditional and 2D online stores to be considered as a replicate layout, even though it shares common characteristics with traditional and 2D online stores. Apart from following a theme-based display along with a similarity-based display of products, it includes demo products or models wearing part of the available merchandise, with a twofold purpose. The first is to assist customers to reach a purchasing decision by trying on clothing, and the second is to facilitate merchandise exploration. The second purpose is enhanced by the insertion of screens on the store floor. The display of products is distributed around the walls; the models and screens encourage customers to move through the store to explore the available merchandise and in turn increase unplanned shopping (Hui *et al.*, 2013). Also, the insertion of screens provides an increased amount of display space. In this regard, a retailer can offer a greater variety of products without being forced to confine the display space of each product. This layout type tends to reduce the wasted space of the store. Also, there are cases where retailers give distinctive names to their items in this layout type, to advertise them on posters and/or via note cards that they distribute to their groups. In conclusion, this type is considered an ideal combination of new technological capabilities and a traditional shopping approach.

The "warehouse" layout is similar to the grid layout type in traditional retailing (Levy and Weitz, 2012) and is surrounded by long comparable aisles for the display of products. The display of products in this layout follows a theme- and similarity-based style, while product display is broad enough to accommodate an appropriate view of the products along with their characteristics. The display of products is quite helpful in that the consumer can compare similar products displayed next to each other. The long aisles of these store types contain multiple shelf levels. On the one hand, this approach increases the variety of products that can be displayed and decreases wasted space, but on the other hand, the consumer is not exposed to all the available products. One of the concerns of warehouse retailers is to provide suitable communication mechanisms, so that customers can easily contact them for further information regarding questions about the products' design. The large size of these stores has prompted retailers to use teleporting stations to guide consumers to specific product-related areas and alternative entry points for them to access the store. Finally, some retailers tend to use boxes in warehouse stores for promotional

purposes. These boxes (often called "freebies") usually contain free products for the consumers' avatars, and are typically preferred by "newbies".

The trade-off between providing a simple product display for the end-user and an interesting layout is established by the needs of consumers who visit the "pragmatic" layout type. This type targets consumers who know what they are looking for and wish to avoid system lag owing to "heavy" graphics. In this regard, this layout type does not place emphasis on providing an exciting and appealing layout, but follows a rather utilitarian style based on current 3D establishments in terms of graphical constraints. The products are displayed only by images around the walls, reducing lag. The "pragmatic" layouts do not exploit the advantages offered by 3D technologies as they do not contain models/avatars displaying the products and do not benefit by the realism of a 3D model display. However, to decrease the space wasted in the center of the store, they include extra walls, showcasing the variety of products.

A quite common layout that appears in virtual worlds and 3D online environments is the boutique layout. It is believed that this type has been embraced by consumers and designers of the virtual world Second Life, and was soon adopted as a popular approach. It shares some common characteristics with the free-form or boutique layout of traditional retail stores (Levy and Weitz, 2012). Specifically, the asymmetric design and allocation of products adopted in traditional boutique stores also appears in 3D online boutique stores. 2D online stores lack the opportunity of properly showing expensive or unique items. Also, similar to traditional boutique stores, this layout sacrifices display space to create a pleasant atmosphere and provide the customer with the opportunity to easily explore the small variety of products offered. Boutique stores emphasize enhancing visual interest; their main scope is to provide an enjoyable, appealing and meaningful consumer experience. The layout of the store contributes to creating a store atmosphere that is tempting and attractive, where the consumers feel they are regarded as special.

Finally, the "department" store layout shares many common characteristics with the traditional department stores' layout or the racetrack layout (Levy and Weitz, 2012). Two of the primary aims of the traditional "racetrack" stores adopted by 3D online department stores are to encourage customers to visit multiple areas of the store and to provide access to all areas in the store. The space layout and product clustering follow the same principles as the physical department stores. The aisles are arranged in such a way as to encourage customers to explore the various "small" stores within the department store through multiple loops.

Managerial implications

This research study provides a structured instrument/framework at least as far as the components and characteristics of the store layout are concerned, enabling companies to effectively address and adjust decisions on their store layout. Apart from the framework, the study sheds light on how each layout type influences all variables that – according to the literature in traditional, 2D and 3D online environments – are influenced by the layout. Similarly, in the 3D online environments, there were cases where 3D retailers simulated practices from traditional and 2D online retailing. However, business practice over the years has indicated that these environments should be treated as different. The numerous examples of the total failure of large multinational companies to enter 3D commerce following successful strategies from the other retailing channels is quite enlightening, making it clear that an IT expert who can design and develop a 3D store will not guarantee success. Experts from the areas of marketing, information systems, informatics, architecture

and graphic design should collaborate to develop 3D online stores that meet consumer needs and realize business objectives.

The results of this study could serve as a useful source for both virtual and non-virtual worlds' 3D e-tailing stores toward designing stores that meet customers' preferences. However, although the store atmosphere in general and the store layout in particular may not show significant differences between virtual and non-virtual worlds, other important aspects that differentiate the virtual worlds from the non-virtual ones (e.g. business models, purchases of real vs virtual goods) should be taken into account when generalizing the results of the present study.

The review of the current business practice in the context of e-tailing indicates that the majority of online retailers use 2D graphical user interfaces for their online stores. This may change in the near future as both consumers' preferences and technology evolutions may drive e-tailers to design and offer their online stores (also) in 3D formats. Besides, consumers today seem to be quite familiar with 3D graphical user interfaces and content (e.g. online games, virtual worlds and 3D movies, among others). For example, a future online retail store may offer both 2D and 3D versions as alternatives to satisfy different consumer needs and preferences (similar to the "design for the slow and the fast user" online retail store alternative versions offered in the past owing to bandwidth limitations).

In sum, in the context of the evolving Omni-channel retailing era, customers are more omnipresent (Banerjee and Dholakia, 2013) and 3D online retail stores could well serve as one more retail channel that promises to support consumers during their shopping process. For example, consumers could use their smart phones (either through mobile apps or not) within the physical retail store (they already do that for various purposes – e.g. price comparisons) to appreciate an integrated shopping experience provided through a simultaneous interaction with the 3D physical store and the 3D online one (e.g. the 3D online interface could support consumers' navigation within the physical store to easily locate their desired products). In this context, a recent study of Fong *et al.* (2015) investigated the potential of the locational targeting of mobile promotions, providing a series of important implications and future research perspectives.

The exploitation of universal marketing analytics (e.g. enabled through loyalty card programs applied in a multichannel retail context) could also contribute to the customization of the features of the 3D online store toward effectively serving individual customer's needs (e.g. based on consumers' multichannel shopping history, personalized product promotions could be displayed through the 3D graphical user interface of a smart phone during a customer's visit to a physical retail store). Similarly, Roggeveen *et al.* (2015, p. 45) report that "online retailers can substantially increase their sales and profits by systematically incorporating more dynamic presentation formats to convey their product/service offers". However, the results of the Lunardo and Roux, D. (2015, p. 646) study indicate that retailers should "carefully design their store environments, such that the arousal they create does not lead consumers to believe that the environment is manipulative".

Limitations and future research directions

Although the two studies in this paper addressed the research gap concerning the effect of store layout on shopping behavior in 3D online environments, there are some unavoidable limitations. The store layout types were not developed within a virtual world, which would have been useful for the design and execution of a field experiment, ensuring higher external validity compared to the laboratory setting chosen. However, the approach followed eliminated any potential brand effects and ensured high internal validity. Another limitation of this study is that the participants did not really interact with the features of each store

layout type; instead, they were presented with a description and a video of each layout. Taking into account this limitation, a realism check was included in the study's design which revealed that all participants were able to imagine an actual 3D online store doing the things described in the aforementioned situations.

Another consideration for the generalization of the results is the level of telepresence experienced by the users/consumers with regard to the medium used to visit 3D online environments. The level of telepresence may be different when someone visits a 3D online environment through a laptop in their home, compared to a visit through a mobile phone in a crowded place. As the external environment and the medium are different, it is expected that they affect the level of telepresence differently and future studies should investigate how these dimensions influence the level of telepresence experienced by the consumers.

The fact that the participants of the main research study were students from two universities is considered a limitation of the study. However, the use of student samples constitutes a common research practice in studies focusing on technology or innovation-related issues such as the present one, as this population is familiar with the latest technological developments and its members are early adopters of innovative services. Nonetheless, it should also be noted that precisely these characteristics of student samples may also constitute a limitation for our research as they may introduce a bias toward the "avant-garde" and "boutique" layouts, with regards to their impact on enjoyment and entertainment.

The exemplars of the five store layout types developed in this study could be used as a research tool to investigate how each layout store type influences consumer behavior variables that were not investigated herein. Specifically, this visual representation can guide other studies to examine the link between layout, customer experience, control, shopping orientation and brand recall. For example, the "department" layout is likely to increase impulse-buying behavior, whereas the "warehouse" planned purchases. In the same vein, a store layout type in a 3D virtual store is likely to influence brand recall in a physical store and circuitously increase sales. In such cases, the layout does not increase sales directly in a specific retail channel, but there are indirect effects in the alternative retail channels that a retailer owns. Owing to restrictions of the experimental design, this study did not look at the effects of brand recall; future research could explore which layout type is best suited for improving brand recall in online or offline retail channels.

This study illustrated the need to provide customized services to consumers. Retailers of 3D online stores are technologically enabled to gather, take advantage of and analyze consumer information (e.g. point of sale data) to customize the virtual retail mix. Managers have access to a thorough analysis of their customers' personality and behavioral traits, both of which can be used to offer personalized services following permission marketing rules. However, the prospect of providing customized layout store types is a matter of future research investigation. The social aspect that dominates in 3D online stores and provides an intuitive ground for virtual experiences (Piyathasanan *et al.*, 2015) raises critical issues regarding the ability to provide customized designs/services regarding the layout of the store. The presence of more than one avatar is a common practice in 3D online stores. A limitation of this study is the exclusion of the virtual social presence owing to laboratory experiment design constraints. Future research should investigate how managers could take advantage of store layout customization (e.g. presence of others at the same store – similar to traditional retailing) or provide effective customized services (e.g. sharing gift coupons or emails – similar to 2D online retailing). In addition, research can also explore which other experiential factors (Singh *et al.*, 2014) influence consumer perceptions and how. Finally, future research could also treat other store atmosphere variables (e.g. scent – see Madzharov *et al.*, 2015) that affect consumers' spatial perceptions in retail environments.

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Appendix 1: List of the constructs and corresponding items

Construct	Items	Source
Telepresence	I forget about my immediate surroundings when I use the 3D environments Using the 3D environments often makes me forget where I am After using the 3D environments, I feel like I come back to the "real world" after a journey Using the 3D environments creates a new world for me, and this world suddenly disappears when I stop browsing When I use the 3D environments, I feel I am in a world created by the websites I visit When I use the 3D environments, my body is in the room, but my mind is inside the world created by the websites visit When I use the 3D environments, the world generated by the sites I visit is more real for me than the "real world"	Novak *et al.* (2000)
Entertainment	The store would have been very amusing to browse I thought that the store was clever and quite entertaining The store was not just selling – it was entertaining me and I appreciated that I would like the look and feel of the store	Vrechopoulos *et al.* (2004) *(adapted from Lastovicka, 1983)*
Ease of navigation	This store would allow flexibility in tracking down information This store would offer a very free environment which I could navigate as I saw fit This store would allow navigation through the environment This store would allow me to move fluidly through the shopping environment	Childers *et al.* (2001)
Online customer experience	*Pleasure*: Visiting this store would make me feel *(I was felt):* 1. Angry to 5. Satisfied Visiting this store would make me feel: 1.Unhappy to 5:Happy Visiting this store would make me feel: 1.Dissatisfied to 5:Very pleased Visiting this store would make me feel: 1.Sad to 5:Joyful Visiting this store would make me feel: 1.Disappointed to 5:Delighted Visiting this store would make me feel: 1.Bored to 5.Entertained *Arousal:* Visiting this store would make me feel: 1.Depressed to 5:Cheerful Visiting this store would make me feel: 1.Calm to 5:Enthusiastic	Mehrabian and Russell (1974); Novak *et al.* (2000)

(*continued*)

Table AI.
List of the constructs and corresponding items

Construct	Items	Source
	Visiting this store would make me feel: 1.Passive to 5:Active Visiting this store would make me feel: 1.Indifferent to 5:Surprised *Dominance:* Visiting this store would make me feel: 1:Guided to 5:Autonomous Visiting this store would make me feel: 1:Cared for to 5:In control Visiting this store would make me feel: 1:Melancholic to 5:Contented Visiting this store would make me feel: 1:Influenced to 5:Influential Visiting this store would make me feel: 1:Controlled to f:Controlling Visiting this store would make me feel: 1:Submissive to 5:Dominant *Flow:* Please rate the extent to which you believe you have experienced flow when visiting this 3D store	
Online shopping enjoyment	If I were actually shopping for clothing online, this 3D store would create a shopping experience that would be enjoyable If I were actually shopping for clothing online, this 3D store would create a shopping experience that would be interesting If I were actually shopping for clothing online, this 3D store would create a shopping experience that would be fun If I were actually shopping for clothing online, this 3D store would create a shopping experience that would be exciting If I were actually shopping for clothing online, this 3D store would create a shopping experience that would be entertaining If I were actually shopping for clothing online, this 3D store would create a shopping experience that would be appealing	Kim *et al.* (2007)
Word of mouth	I would say positive things about this 3D store to other people I would recommend it to someone who seeks my advice I would encourage friends and relatives to visit the 3D store	Babin *et al.* (2005)
Online purchase intention	How likely is it that you would consider purchasing apparel from this 3D store in the longer term? How likely is it that you would consider purchasing apparel from this 3D store in the short term? How likely is it that you would return to this 3D store?	Verhagen and van Dolen (2009)

Table AI.

Appendix 2. Synopsis of the three-round Delphi questionnaires

Questionnaire round – 1

Purpose of the research

The purpose of the present study is:

- to develop and validate a framework regarding different types of Store Layout (store design) in three-dimensional retail stores; and
- to generate ideas about which are the characteristics that constitute the layout of three-dimensional stores today (i.e. according to current business practice).

Question 1

Please provide a list of the characteristics of the virtual 3D retail stores that in your opinion are important for the design/layout of the store.

> The information provided in the previous section is indicative and in no way intended to guide your answer. Feel free to express your opinion, regardless of whether you agree or not with the description and characteristics presented in the previous section. Please justify your answer. Your answer can be as long as you wish.
> DO NOT WISH TO ANSWER []
> DO NOT KNOW THE ANSWER []
> DO NOT HAVE THE EXPERIENCE TO ANSWER []

Question 2

Can you please describe the specific layouts (designs) that according to your opinion have been formed in 3D environments?

> 1. You can design a figure of each layout (design) type or,
> 2. You can describe (in a paragraph) each layout (design) type or,
> 3. You can provide a screenshot or a link of a store that is a typical example of each layout (design) type that you propose or, You can provide a combination of the above. Your answer can be as long as you wish and may be attached in a separate file, should this be more convenient. DO NOT WISH TO ANSWER []
> DO NOT KNOW THE ANSWER []
> DO NOT HAVE THE EXPERIENCE TO ANSWER []

Questionnaire round – 2

The responses of the First Round Questionnaire resulted in 15 store layout/design types. These are described below in detail, following the panelists' views. As they result from different participants' perspectives, the 15 layout types are not necessarily common or distinct in a 3D environment. The purpose of the first question (*Question 1*) is to consider whether each layout frequently appears in 3D

environments or not. In addition, it is likely that some of the proposed layouts can be grouped together to provide a distinct layout, resulting in a consolidated list. The objective of the second question (*Question 2*) is to let participants indicate any such groups.

Question 1

The following section includes the store layout types and presents their main characteristics according to the Delphi panelists' opinion.

- For each layout type please indicate whether you agree or disagree that this type frequently appears in a 3D environment, using a seven-point Likert Scale (to answer please highlight or *underline* your choice), where 1: Strongly Disagree, 2: Disagree, 3: Disagree somewhat, 4: Undecided – 5: Agree somewhat, 6: Agree, 7: Strongly Agree.
- For each layout type that you believe exist in a 3D environment (i.e. where your score varies from 5 to 7), please list the relevant, most important *characteristics* (i.e. for each layout type separately) in the *Notes* part below each description (feel free to use the characteristics listed earlier and/or add additional characteristics). You can also use this part to provide any additional comments concerning the particular layout type (additional description, clarifications, revisions, etc).

Question 2

In Table III, all layout types are presented across a horizontal and a vertical axis. For each layout in each row, please mark with an *X* or a *XX* where you believe the particular layout resembles one or more of the other layout types, or includes a considerable number of identical/similar characteristics. The aim of this question is to explore whether some of these 15 layout/design types could be grouped together in a smaller number of distinct layout types.

Note: X: Share common characteristics but are not similar enough to group in a single layout type
XX: Can be grouped in a single layout type (one of the two layout types may be more generic than the other)

Questionnaire round – 3

Question

The responses of the Second Round Questionnaire indicated *5 (five) distinct store layout/design types*. These are described below in detail, following the panelists' views. The purpose of this question is to reach consensus among participants about whether each layout appeared in the following table, can provide a distinct layout in 3D environments. The final set of responses will be used to compile a consolidated list of store layout types.

- For each of the five layout types please indicate whether you agree or disagree that it is indeed a distinct layout type in a 3D environment by highlighting your choice in the appropriate box.
- In the Notes part on the right column of each layout type feel free to provide any additional comments concerning the particular layout type (additional description, clarifications, suggested revisions etc).