Designing Visual Exemplars of 3D Online Store Layout Types

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Abstract. This paper presents the design issues in the visualization of five distinct store layout types in the context of 3D online retailing and discusses appropriate design decisions. The development of the stores is based on the requirements (layout characteristics) elicited from a three-round Delphi method with 3D expert users and designers which served as the qualitative empirical research vehicle. Along with the visualization of the characteristics of each layout type, the theoretical and practical implications, limitations, and the future research avenues of the study are discussed.

Keywords: Store Layout, Design, 3D Online Retail Stores

1 Introduction

There has been considerable research in traditional and 2D online retail environments in light of the influence of store design/layout on consumer behaviour [5]. Levy and Weitz [8] illustrate in their textbook the three established layout types in traditional retail stores; i.e., the grid, the freeform, and the racetrack. Vrechopoulos et al. [15] transformed these types in the context of 2D online stores and found significant differences among them in terms of their influence on consumer behaviour. However, while retailing activity is gaining momentum in 3D online environments in recent years, there is not established knowledge about the layout/design formed in these stores.

Motivated by the aforementioned discussion, this study is based on the outcome of a qualitative research to visualize the design of the 3D online retail stores. A Delphi method was used to identify whether there are distinct layout types in 3D online stores and which are their characteristics, since this method is considered as an appropriate one for developing frameworks and concepts [10]. Following three rounds (13 participants in the first round, 10 in the second and 8 in the third one from both academic and business contexts), the Delphi method led to the identification of five distinct layout types and their underlying characteristics.

Elaborating on these results this study is positioned in the area of Electronic Retailing and follows a multidisciplinary approach to visualize the five distinct store types.

adfa, p. 1, 2011.

Expertise from the research domains of Information Systems, Marketing, Architecture and Graphics Design was necessary and was combined to accomplish the aim of this research endeavor (i.e. research idea generation, design principles, implementation tools, etc.).

2 Development Options

Three development options were considered as the most appropriate to meet the requirements of the distinct 3D store layouts. The characteristics of each option, and the arguments for the most suited for the scope of this study are discussed below.

- Development of "real" 3D online retail stores

A possible development option could be the development of the five layout stores within a virtual world or in five different URL links on the internet. However, budget constraints indicated that this could not be an option. Specifically, in order to rent virtual land in a virtual world for five stores allocated in different virtual places or in five-storey block, one has to pay at least 500 US$ for a one month period. Also, specialists who have expertise with the specific development tools of the virtual world should be engaged in the development of the stores. Quite the same applies to the development of the stores in URL links.

- Visual exemplar of 3D online retail stores

Another development option could be the use of a 3D tool for the development of stores and a video recording could capture all aspects of the in-store layout patterns. There are freeware programs such as Goggle SketchUp providing 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.

- "Paper-and-Pencil" visualization

This option could also meet the requirements of this research and is adopted in many research studies [12],[11],[16]. In this approach, the ground plan of each store layout could be designed in paper in order to visualize the store layout.

The second option is preferable to the third for deriving a clear picture/representation of store layout. Taking into consideration the relevant resources that made the first approach impractical, the second approach was adopted. Google SketchUp v.8 served as the main tool for building and modifying 3D models, as it is free software usually used by architecture to design 3D buildings. This tool offers the additional advantage of import and export capabilities to other design programs.

2.1 Retail Sector Selection

Retailing activity is taking place in various areas of the 3D shopping channel. There are several examples of apparel, furniture, real-estate, and tourism retail stores. The most popular outlets in coming years will be malls and retail stores [6]. 3D stores selling avatars' clothing is a common phenomenon in virtual worlds, while there are many companies such as Land's End, Kenneth Cole, and Levi's [4] that facilitate virtual try-on, through technology coming from Bodymetrics [7]. Following this market evolution, the apparel industry was considered a pioneering sector to serve as the experimental part of this study.

2.2 Product Selection and Allocation of Merchandize

Second Life is considered one of the leaders in virtual worlds [13]. To finalize the list of product categories that would be offered in the 3D online experimental stores of this study, it was considered appropriate to use the search engine for places in Second Life and visit the ten top listed apparel stores. These places are likely to be the most crowded and "famous" places. However, an obstacle that this study had to face is that the products offered in the stores visited in Virtual worlds, could not be copied and used for the scope of this study, because of copyright permissions. To overpass this obstacle, it was decided to use products offered in the Database of Google SketchUp 8. However, the variety of products offered by this program is limited. The use of Adobe Photoshop CS6 assisted to design clothes which are based on the products offered by Google SketchUp, but look quite different. The final database of the products developed was entirely used in almost all store layout types. The variety of products designed and used in the laboratory stores are: Dresses, Trousers, Ladies coats, Shirts, Shoes, Skirts, T-shirts, Ties, Tuxedos, Ladies' bags, Suitcases, Complete outfits (A common trend for retailers in 3D online retail stores is to sell complete formal or casual outfits). Indicative examples are presented in Figures 1,2 and 3:

Fig. 1. Indicative example of designed dresses, jeans, shirts, and skirts displayed in laboratory store layouts

Fig. 2. Indicative example of designed ladies coats, suitcases, and tuxedos displayed in laboratory store layouts

Fig. 3. Indicative example of designed complete avatars' outfits displayed in laboratory store layouts

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 separately. Specifically, at the first-round of the Delphi, a panelist introduced the theme-based and similar-based allocation of products; these terms were validated from all panelists in the second-round Delphi. Theme-based display of products refers to a practice where products of the same category (e.g., shirts) are located in the same place in a part of the store, one next to the other. Similar-based display refers to the practice where complete outfits (e.g., shirt, jeans, belt, socks and shoes) are displayed, the one next to the other. The first practice serves the ease of searching among products of the same category, while the second serves matching an outfit's parts.

2.3 Real Models as Promoters of the Virtual Store's Collection

The same brand name was used in each store layout type for internal validity purposes of the forthcoming laboratory experiments. Clothing displayed in each store was named "Winick's Collection"; it comes from the first name of one of the researchers' avatar in the Virtual World Second Life since 2008, which is Winick Ceriano. The practice of displaying images of real world models to promote products, in walls of a 3D store, is common in Virtual Worlds retailers' stores. Copying images from models appeared on the Internet or 3D stores was not an option because of copyright permissions. To avoid this difficulty, one of the researchers captured images with an iPhone 4s mobile device, from six individuals who approved for their images to be displayed around each laboratory store layout. The final editing of the images was developed through Adobe Photoshop CS6. The images of the models are presented in figure 4.

Fig. 4. Indicative images of models displayed in the walls of the laboratory store layout types

2.4 Currency Selection

A notable amount of virtual worlds such as Whyville and Second life retain their own local currency within the world [9],[3],[2],[14]. In some virtual worlds, inhabitants can engage their virtual funds to get for example extra privileges, equipment etc; while in others the virtual currency can be exchanged for real dollars or Euros. For the virtual laboratory stores of this research study, it was decided that prices should be presented on the displayed products in order to provide a more realistic simulation of the shopping experience in the forthcoming laboratory experiment. In this regard, an imaginary currency was invented, namely the "$GRT". The "$" is a familiar notation of currency for participants, while the "GRT" symbolism comes from the consonants of the word "Gortyna" which is one of the most historic cities of the island Crete, achieving considerable growth three thousand years ago. A gortynian coin was auctioned at the end of 2011, for about 480.000 US$, which has been a world record for this type of auctions [1].

3 Graphical Interface of Store Layout Types

This section is dedicated to the presentation of images of the laboratory store layout types according to the specifications that resulted from the Delphi method. Specifically, there are three images representing views of each store layout type. It should be clarified that the above images on their current state do not include interactive features but rather transfer the layout design characteristics from text in to a graphical format. However, these prototypes enable the user to obtain a thorough view of each store through an automated navigation and display of its contents. Similarly, it should be also noted that it is out of the scope of the present paper to proceed in to the evaluation phase of the described layout types.

3.1 Store #1 (Medium Size Store)

The specifications of this layout type according to the Delphi study results are listed below, while the corresponding visualization is presented in Figures 5, 6 and 7:

- Theme-based/Similar-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.

Fig. 5. View of a demo model

Fig. 6. Screens in the floor plan to increase space

Fig. 7. Images on the walls leaving space for model display

3.2 Store #2 (Large Warehouse Store)

The specifications of this layout type are listed below, while the corresponding visualization is presented in Figures 8, 9 and 10:

- Helpful display to the customer to compare products to each other.
- Functionality of comparing similar products.
- Theme-based/Similar-based display of products.
- Designer should be able to be contacted for further info 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 salesmen could guide customers find the products.

Fig. 8. Customer Service Kiosk (Contact designer info/compare products)

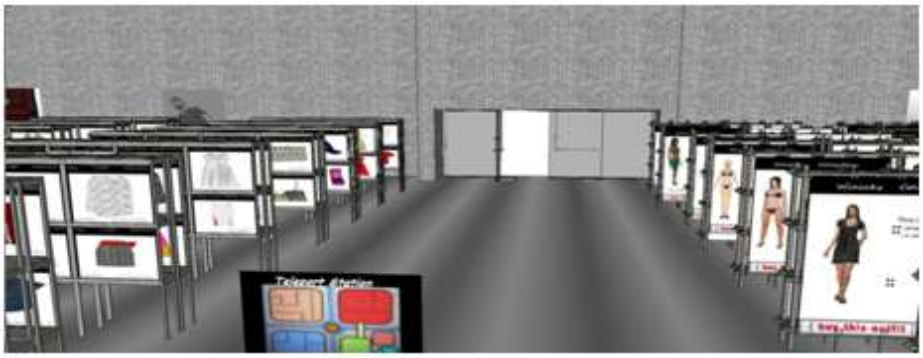

Fig. 9. Teleporting Station

Fig. 10. Salesman

3.3 Store #3 (Image-reliant Store)

The specifications of this layout type are listed below, while the corresponding visualization is presented in Figures 11, 12, and 13:

- 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.
- Due 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 lot of different items in what can be a relatively small space, especially when extra display walls are included.

Fig. 11. "Wall" items

Fig. 12. Sacrifice of 3D models/simple images

Fig. 13. Inexpensive approach with extra display walls

3.4 Store #4 (Boutique Store)

The specifications of this layout type are listed below, while the corresponding visualization is presented in Figures 14, 15, and 16:

- 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 don't 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 try on the product before reaching the decision of buying it.
- Clear display of products.
- Limited number of the available products.
- Feasible for some products such as artistic items.
- Theme-based/Similar-based display of products.
- Visual interest: interesting architecture, walls interesting architecture, wall of glass 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.

Fig. 14. Demo products

Fig. 15. Distinctive names to items

Fig. 16. Attractive materials/appeals to residents

3.5 Store #5 (Department Store)

The specifications of this layout type are listed below, while the corresponding visualization is presented in Figures 17, 18, and 19:

- 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.
- Similarities to traditional stores regarding product clustering.
- Similarities to traditional stores regarding store's walk-through scenarios.
- Simulation of traditional (physical) Department retail stores.

Fig. 17. Similarities to traditional stores regarding space layout

Fig. 18. Simulation of traditional allocation of products

Fig. 19. Similarities to traditional stores regarding product clustering

4 Implications, Limitations and Avenues for Future Research

The main theoretical contribution of this paper refers to the visualization of the 3D retail stores' layout types similarly to the established existing theoretical knowledge in conventional and 2D Internet retailing. Along these lines, the exemplar of the five distinct 3D online store layouts serves the visual representation of the stores and can be critical tool for marketing research initiatives (e.g. investigate store layout effects on consumer behaviour). While the visualization and underlying store layout characteristics have been adequately illustrated in the traditional and 2D online retail context, this is the first study to address and develop these issues in the context of 3D online environments through a multidisciplinary research approach. However, it should be reminded that the research objective of this paper was not to present the methodology followed for developing the layout classification scheme but rather to present the methodology followed for visualizing the corresponding layouts' design patterns.

A limitation of the study is that the store types were not developed within a virtual world that would be useful for the design and execution of field experiments that ensure higher external validity compared to laboratory ones. However, apart from the budget constraints that averted this venture, the followed approach has an additional advantage in that it is not subject to potential brand name effects and other field ex-

periment's related phenomena that could bias the results of a causal research study. In other words, the followed approach ensures higher internal validity of the forthcoming experimental testing. Another limitation of the study is that the layout types were derived through business and academic experts' feedback and not from users-customers. Thus, future research could proceed to testing this framework against real customers.

This visualization could be used for educational purposes, assisting academia and practitioners to get a picture of how the current business practice, as far as store design is concerned, is formed in 3D online environments. Similarly, the methodological steps taken for visualizing the store layouts could also serve as a useful instrument for replicate studies. As also discussed above, this exemplar could be used as a research tool in order to conduct experiments in a laboratory setting, to identify how each layout store type influences consumer behavior. Specifically, this visual representation can help research the link between layout, customer experience, e-word of mouth, and online purchase intentions. Finally, a more technical future research approach could enrich the visualization schemes of the present study with more interactive features and dynamic capabilities.

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