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# The influence of interactive product visualization on customer satisfaction

An investigation based on the SOR model

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## **Abstract**

Interactive product visualisation (IPV) addresses the shortcomings of product visualisation on e-commerce sites, such as the absence of tactile information and the inability to directly examine products. Previous research has not addressed the influence of IPV on customer satisfaction. Therefore, the objective of this study was to address this gap by investigating factors that may influence customer satisfaction. The Stimulus-Organism-Response (SOR) model was used as a lens to further investigate the effect of stimuli of an IPV environment on the affective states of users as well as satisfaction as a response to stimuli. The furniture e-commerce industry and IKEA's IPV tool were selected as the basis for this research. To gather data, an online survey with 5-point Likert scales was created based on previous research to discover the relationships between these factors. A total of 115 questionnaire responses were validated and analysed using multiple regression analysis. The results of the analysis indicated that interactivity, perceived ease of use, and entertainment had a positive influence on customer satisfaction as mediated by pleasure and dominance. Practical implications are presented to guide businesses that seek to implement IPV effectively.

## **Keywords**

Interactive product visualisation, furniture e-commerce, customer satisfaction, SOR, PAD, IKEA.

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## 1. Introduction

Development in online shopping to enhance the user experience has, in recent years, been increasingly noticeable. And with the continued growth of the e-commerce industry, where global online retail sales are estimated to increase by nearly 50% between 2021 and 2025 (eMarketer, 2022), furthering this technological development becomes more pertinent. One inherent aspect of online retail is the absence of an option to touch or otherwise interact with a physical product. To compensate for this, retail website improvements must be made to improve customer experience. One method of doing so is to allow customers to interact with items visually in an online space.

Product visualisation technologies enable online shoppers to interact with products in various ways: to zoom in on details, rotate, or place within a virtual environment in combination with other products. Together with advancements in visualisation software and high-speed Internet accessibility, *interactive product visualisation* (IPV) has become a frequently used feature in online retail (Kim & Forsythe, 2010). IPV tools are online interfaces that enable consumers to interact with products rendered in a way that simulates the functionality and/or appearance of physical products. Compared to the more conservative product display approach that is limited to a static product picture complemented with descriptive text, IPV tools provide online customers with a close-to-direct product experience and help them make purchase decisions more easily while shopping online. The findings of a study by Jiyeon (2014) suggest that by using IPV tools, online marketers improve the customer experience in terms of increasing the effectiveness of product information, providing a more engaging shopping experience, as well as reducing the perceived risk of the product being unsuitable.

While not common in the e-commerce sphere today, some retail websites do use IPV tools to display and promote products. These span varying industries and include websites such as Roam Luggage ([www.roamluggage.com](http://www.roamluggage.com)), Audi ([www.audi.com](http://www.audi.com)), and FDomes ([www.3d.fdomes.com](http://www.3d.fdomes.com)). Other companies, for example Marxent ([www.marxentlabs.com](http://www.marxentlabs.com)), 2Pi Digital ([www.2pidigitaltech.com](http://www.2pidigitaltech.com)), and Cylando ([www.cylindo.com](http://www.cylindo.com)), have built their businesses around their own 3D rendering software to sell IPV solutions to retailers.

Among the categories of items that can be purchased through e-commerce, furniture is one that is still bought in-store more than online (Statista, 2021b). A possible reason for

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why in-store shopping is preferred in this category is the barrier to physical contact and examination of furniture pieces. Another possible factor is that furniture is often placed at a higher price point compared to other consumer goods. This may then be linked to greater risk associated with online purchases, leading to a preference for shopping in-store.

Both online and physical retail stores face the same issue of not being able to display products in the same context they will be used in after purchase. This is of particular concern within furniture retailing. When shopping online or offline, consumers are unable to view cupboards, desks, or coffee tables in the context, or room, they will be used in without transporting furniture to the intended environment. IPV interfaces can allow consumers to view products in a space similar to the one they may be purchased for, thereby serving as a convenient, informative, and valuable tool. The experience of using an IPV tool will not be identical to visiting a physical furniture store, naturally, it cannot be. Consumers cannot sit on a sofa or feel the velvet cloth of a chair. Instead of precisely mimicking a physical store or replacing its function, IPV tools can act as an improvement to the more commonly implemented 2D online shopping experience.

Within the furniture sector, IKEA ([www.ikea.com](http://www.ikea.com)) is a notable user of IPV technology. IKEA has named this feature a planning tool and have multiple versions based on the type of room to be furnished, whether it be a kitchen, bathroom, or office. Other versions on the website allow users to customize IKEA products to their needs. The IKEA office planning tool is the particular IPV tool investigated in this study.

### 1.1. Background

IPV is one form of image interactivity technology (IIT), which refers to the technology that allows users to recreate or surpass real-life experience with a tangible product or environment. This is done by enabling the users to create and manipulate product or environment images digitally (Fiore, Jin, et al., 2005). IIT allows users to alter the product's design features, background, context, viewing angle, or distance and mimic the product's functionality on a website, resulting in enhanced product information via visual, non-textual cues (Fiore, Kim, et al., 2005).

IIT enables consumers to interact with a virtual product. According to Li et al. (2001), this form of consumer experience can be understood as a virtual experience. Previous



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research has shown that IIT and the virtual experience it creates influence consumer responses to products (Hu & Wise, 2020; Li et al., 2003) and e-tailer websites (Fiore & Jin, 2003; Hu & Wise, 2020; Yang & Wu, 2009). Virtual experiences have previously been studied in the context of online apparel shopping and have been shown to aid consumers in their process of product evaluation (Li et al., 2003), influence brand attitudes (Daugherty et al., 2008), and increase purchase intentions in comparison to the same information being delivered passively (Schlosser, 2003).

The use of 3D imagery also impacts consumer responses positively compared to static images. The feature of rotating a 3D product image has a positive effect on affective, cognitive, as well as behavioural user responses and is related to lower perceived risk within the apparel website context (Ha & Lennon, 2010; Park et al., 2008). This form of interaction can therefore serve as a useful attribute in encouraging customer satisfaction regarding their need for product information and for instilling in them pleasurable experience (Park et al., 2008).

Implementation of IIT types such as 3D product visualisation addresses the major constraint associated with consumers' lack of physical contact with products (Klein, 2003; Park et al., 2008). Sobociński et al. (2021) also expressed a need for developing the e-commerce sector to support more efficient and useful ways to display products to customers. In view of this the Sobociński et al. (2021) study created and tested the performance of a model that visualised household appliances in a virtual store environment. Certainly, designing a 3D visualisation tool is a complex process that requires the consideration of factors such as the convenience of interaction, representational design of the environment and products, and devices through which the tool is accessed. Despite this, using these 3D web-based tools can be beneficial to encourage customer immersion and can be accessed conveniently from any location. Virtual and augmented reality applications, on the other hand, require tools other than a web browser to function (Sobociński et al., 2021). IPV technology is highly advantageous for the household appliance industry, as the previously mentioned study exemplified, but also for industries such as apparel, automobiles, and furniture, where tactile and visual information undoubtedly enrich consumers' product knowledge.

The benefits of 3D product visualisation are not limited to the aforementioned. Within the furniture domain, Oh et al. (2008) compared furniture shopping using non-immersive virtual reality (VR), which excludes appliances such as headgear, and 2D

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image-based solutions. The VR solution was found to be more successful in providing consumers with a positive experience of the product and higher purchase intent. The study also revealed that the ability to arrange furniture visually was an important factor in the decision-making process. While not the same as an IPV tool, the VR solution indicates the usefulness of an online tool that allows consumers to interact with and arrange furniture in a 3D environment. Shopping online can be problematic when consumers cannot see how a furniture piece would fit in their home (Hilken et al., 2018). Tools like IPVs are therefore expected to be perceived as advantageous by providing consumers the ability to try out furniture in a space with customized dimensions that mirror reality. This is one reason IKEA's IPV tool was chosen for this study.

As part of their office planning tool, IKEA allows users to customize the shape of a 3D room. This presents the possibility of entering the dimensions of the room according to the physical office space that is to be furnished. The layout can be determined with specific measurements and placement of windows, doors, and obstacles such as pillars or radiators. Thereafter, a selection of desks, chairs, sofas, and other furniture pieces that IKEA offers can be placed in the desired spaces. For more personalization, users can modify the colours of walls, select flooring, and choose wall trims. The resulting layout can be rendered in either 2D or 3D at a low, medium, or high level of detail. Finally, the products in the office room can be added to a cart for purchase. Examples of other furniture companies that use IPV software to display their products are Wayfair ([www.wayfair.com](http://www.wayfair.com)) and Elfa ([www.elfa.com/en](http://www.elfa.com/en)). Wayfair offers functionalities that are most similar to IKEA's tool in that they allow users to customize room dimensions and characteristics, place products from the company's catalogue, and add them to a cart. Elfa offers the ability to customize different combinations of storage solutions along a wall. Since IKEA's IPV tool provides a diverse interactive experience and is optimised for the European and International markets, IKEA was found suitable as the target for this study.

### **1.2. Problem statement**

In-store purchasing is commonly considered superior in terms of product presentation when compared to online shopping. Online shopping is perceived to have a higher level of risk than traditional shopping due to the absence of tactile information and the inability to examine the product directly (Phau & Meng Poon, 2000). These

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shortcomings of online shopping increase the probability of the purchased product not meeting customers' expectations. Technological advancements allow e-commerce companies all around the world to continuously improve product presentation on their websites to create a close-to-reality experience for their customers. 2D product images and lengthy product descriptions from the early years of e-commerce have been partially replaced by IPV tools and other product visualisation technologies. However, IPV tools can quickly become complex depending on the product that needs to be visualised and the functionalities that companies decide to include. A balance needs to be found between making the IPV tool easy to understand and resourceful for the customer.

As for the effect of IPV tools on consumer attitudes and behavioural responses, little research has been carried out on how IPV tools affect consumer attitudes and behavioural responses. It is beneficial to address this research gap to help online retailers efficiently use and modify IPV tools to achieve their marketing goals by creating unique and valuable virtual experiences for their customers. With the conscious use of IPV tools, online retailers can improve the online ordering experience of their customers, which in turn would lead to higher levels of customer satisfaction and, subsequently, a competitive advantage for retailers.

### **1.3. Purpose and research questions**

The purpose of this work is to identify the factors that affect customer satisfaction with interactive product visualization within e-commerce. This technology will be examined in the context of the furniture retail sector of e-commerce, a sector that has made use of similar product visualization techniques previously. To narrow down the study further, IKEA's IPV tool for office planning will be used as the basis for data collection. The question below will guide the study in its exploration of interactive product visualization.

RQ: Which factors of an IPV tool affect customer satisfaction?

### **1.4. Scope and delimitations**

This study aims to contribute to research within interactive product visualization tools and other similar techniques implemented for displaying products on websites. It covers the furniture e-commerce sector and customer satisfaction regarding their experience

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using IPV tools. Given that the purpose of this study is to explore customer satisfaction with IPV tools, the target group is best described as those who have access to the internet and laptop or desktop computer. This means that the data is not widely limited by geographic distribution nor specific demographic categories. Perspectives other than that of the customer have not been included in this research.

### **1.5. Disposition**

The remainder of this study is structured as follows. First, existing literature on topics related to the research scope are explored and theoretical frameworks are explained. Next, the research design and hypotheses are presented, followed by a description of the research methodology. The data analysis is then summarized after which results are discussed. This discussion informs the conclusions established. Finally, practical implications as well as further research are suggested.

## **2. Theoretical framework**

Before the SOR framework is explained in detail, other frameworks are discussed and compared to it in terms of how they are used to study e-commerce website features and their effects on consumer responses. Thereafter, each element of the Stimulus-Organism-Response framework is presented in terms of previous studies.

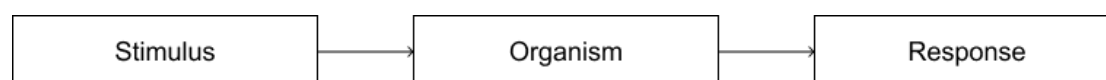
### **2.1. Existing frameworks**

The SOR framework was chosen to explore the factors of IPV tools. This theory has been commonly used to analyse the relationships among input (stimulus), behaviour (organism), and output (response). It has been widely used in relation to innovative technologies, for instance, Peng and Kim (2014) developed a research model based on the SOR model to study online shopping behaviour. A comparison of similar frameworks to SOR follows.

The Technology Acceptance Model (TAM) proposed by (Davis, 1986) has been used in previous studies both as a theoretical framework on its own as well as in combination with SOR (Kimiagari & Asadi Malafe, 2021). TAM in its original form was used to explain the acceptance of technology by examining the effect of its features on perceived ease of use, perceived usefulness, and attitude towards using a technology. These variables then predicted how the technology would be used (Davis, 1986). While similar to SOR in structure, TAM uncovers why consumers use a technology, which does not align with the purpose of this study. The Uses and Gratifications (U&G) theory, often credited to Blumler and Katz (1974), was developed to understand the use of traditional media and has later been used to understand why people use media online (Ma et al., 2019). The theory has also been used to explore users' adoption of new technology, such as in-store self-checkout systems (Boudkouss & Djelassi, 2021). The primary purpose of applying U&G theory is to understand the motivations for using a particular technology and the gratifications people receive from using it. As the intent of the current study is to identify factors that affect customer satisfaction rather than to understand the motivations behind using an IPV tool, U&G theory was discarded in favour of the SOR model.

## 2.2. SOR model

The Stimulus-Organism-Response (SOR) model (Figure 1) is the theoretical framework that was first developed by Mehrabian and Russell (1974) within environmental psychology research. It was developed to understand consumer decision-making processes on an individual, group, or organizational level. According to the SOR model, environmental cues act as stimuli (S) that influence individuals' cognitive and affective processes (O), which in turn drive their behavioural response (R) (Mehrabian & Russell, 1974). Perceptions, feelings, and thoughts are the inner states that the term "organism" refers to (Bagozzi, 1986).



**Figure 1**

*SOR Framework According to Mehrabian & Russell (1974)*

In 1982, Donovan and Rossiter published research that adapted SOR to the retail environment. They also applied Mehrabian and Russell's (1974) Pleasure-Arousal-Dominance (PAD) framework to study the organism. Many studies have since used SOR to study the online retail environment and its effects on consumer responses. For instance, in the work by Eroglu et al. (2001) the SOR model was used as the basis for the study on the influence of atmospheric qualities of online retailing in terms of approach/avoidance behaviours. Atmospheric stimuli of traditional retail settings, such as scent, have shown to be irrelevant in the context of electronic retail. Instead, other stimuli, such as product images and product descriptions gained a higher relevance (Eroglu et al., 2001). Eroglu et al. (2003) also acknowledged the moderating role of individual traits (involvement and atmospheric responsiveness) within the relationship between atmospheric cues (stimuli) and shoppers' affective and cognitive states (organism). Jeong et al. (2009) conducted research on the impacts of product presentation on consumer responses to an apparel website, and Aboubaker Ettis (2017) examined the relationship between online store atmospheric colour, flow experience and consumer behaviour. In the present study, customer satisfaction was the specific behavioural outcome in question.

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### 2.2.1. Stimuli (S)

The stimuli aspect of the model is referred to as the total of all visible and audible cues. In previous research, the stimulus part of the model was represented using one of two different approaches: (1) as a consumer assessment of the stimuli (Jang & Namkung, 2009; Jeong et al., 2009; Wang et al., 2011) and (2) as actual stimuli (Wang et al., 2011). The choice of stimuli in the present study was based on prior literature. The stimuli were limited to seven variables that were expected to have the most impact and were divided into interactivity, informativeness, effectiveness of information content, entertainment, perceived ease of use, aesthetic design, and product variety. Each of these variables is described below.

#### *Interactivity*

*Interactivity* (IA) has been defined diversely, hence there is not just one definition of interactivity (Wu, 2006). However, most of these definitions address the concept of two-way communication (Liu & Shrum, 2002). As specified by Rafaeli (1988), interactive communication is a phenomenon in which subsequent messages must refer to previous messages. According to Steuer (1992, p. 84), whose definition has been cited as a basis in many sources, interactivity is “the extent to which users can participate in modifying the form and content of a mediated environment in real time”. Cho and Leckenby (1997) acknowledged that most definitions of interactivity are classified by whether they focus on user-machine interaction, user-user interaction, or user-message interaction. To address the importance of each of these phenomena, Liu and Shrum (2002, p. 54) defined interactivity in the following way:

The degree to which two or more communication parties can act on each other, on the communication medium, and on the messages and the degree to which such influences are synchronized.

Interactivity can also be examined in three main approaches, viewing interactivity as a message, technology, or experiential variable (Yang & Shen, 2019). For this study, interactivity is best viewed as a technological variable as the IPV tool permits interaction between human and computer, rather than between people, and its definition as interactive is not based on user perception.

Liu and Shrum (2002) also specified three dimensions of interactivity: active control, two-way communication, and synchronicity. Active control refers to the process when

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a user is given the opportunity to choose information and guide the interaction. The findings of a study by Ariely (2000) suggest that active control influences the feeling of pleasure of a customer. The ability for reciprocal communication between organizations and users, as well as between users and users, is referred to as two-way communication. The degree to which the exchange between two entities is simultaneous is referred to as synchronicity. In the scope of the current study, it was decided not to address two-way communication since the environment of the IPV tool in question does not allow the user to interact with the company or other users. In other words, a user is not able to give feedback to the company or communicate with other users through the IPV tool environment itself.

The interactivity of a website offers its customers a higher level of communication and entertainment, customization of presented information, and image manipulation (Fiore, Kim, et al., 2005). Including interactive elements in websites affects customer relationships with a company (Yoon et al., 2008), since a positive perception of the company can be strengthened by providing the user with some control over the website. Xu and Sundar (2014) define interactivity in a website as the technological features that allow for an exchange between user and interface. A higher level of interactivity benefits a company through the improvement of customers' intentions toward a website and product (Xu & Sundar, 2014). Interactive websites attract users to spend more time investigating products and website features. Having an interactive tool provides users with entertainment and control and the positive feelings activated by being engaged result in favourable attitudes towards the website (Fiore, Jin, et al., 2005; Sheng & Joginapelly, 2012; Xu & Sundar, 2014). A study by Sheng and Joginapelly (2012) found that interactivity had a positive effect on both pleasure and arousal which were correlated with an increase in purchase intent.

### *Informativeness*

When consumers search for products online, it is often for the purpose of obtaining the information which is needed to make a purchase decision, such as price, characteristics, or appearance of a product. For this reason, Wu et al. (2020) consider *informativeness* (IN) to be among the most significant gratifications of online shopping within the uses and gratifications (U&G) theory and use it as a characteristic of websites in their study. Informativeness is regarded as the quantity and richness of information held on a



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website (Richard et al., 2010) and is described by Luo (2002) as a website's ability to include resourceful and useful information. Informativeness concerns information quality and is one of the pivotal variables that affect customer satisfaction with e-commerce websites (Lin, 2007). Hsieh et al. (2014) suggest that this is because informativeness relates to customers' perceived dominance over their shopping experience, which then leads to satisfaction.

### *Effectiveness of information content*

*Effectiveness of information content* (EIC) concerns the timeliness of the information provided on a website as well as whether it is accurate, complete, and relevant from a user perspective (Richard et al., 2010; Vijay et al., 2017). Despite scarcity of research using EIC, the findings that do use it as a stimulus variable for e-commerce have shown positive results, in particular pertaining to customer satisfaction. This indicates its relevance for this study and as a useful variable when applied to the context of an IPV tool. Vijay et al. (2017) found that effectiveness of information content was a strong predictor of customer satisfaction with an e-commerce website. Similarly, Albarq (2021) observed a strong correlation between entertainment, informativeness, and effectiveness of information content on user satisfaction with a website. On its own, however, effectiveness of information content did not have a clear impact on satisfaction. The findings given by Richard (2005) state that EIC has a strong impact on consumers' willingness to explore a website, their level of involvement, and was related to greater purchase intent which generally follows satisfaction.

### *Entertainment*

*Entertainment* comprises all features that encourage enjoyment. The extent to which users feel excited, imaginative, and pleased is what characterizes a shopping experience as entertaining (Elliott & Speck, 2005; Wu et al., 2020). Despite most users being goal-oriented in their shopping behaviours, many are driven by hedonic motivations to be entertained (Wolfenbarger & Gilly, 2001). When shopping online, consumers also seek to enjoy the experience rather than solely focus on meeting their information needs (Wolfenbarger & Gilly, 2001). Wu et al. (2020) confirmed their hypothesis that a higher level of entertainment would contribute to more positive behaviours and attitudes

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toward a store when online shopping. This was as a result of pleasure being an important mediating factor between entertainment and attitudes towards the store.

### *Perceived ease of use*

*Perceived ease of use* (PEOU) is an aspect under the perspective of the Technology Acceptance Model (Davis, 1989). The definition of perceived ease of use proposed by Davis (1989, p. 320) is “the degree to which a person believes that using a particular system would be free of physical and mental effort.” Users may believe in a technology and be aware of its usefulness but may still refuse to utilize it if it is perceived to be too complex.

Research has shown perceived ease of use to be a predictor of e-commerce acceptance (Featherman & Pavlou, 2003) and to have a direct positive effect on consumers’ intentions to shop online (Ashraf et al., 2014) According to (Mosteller et al., 2014, p. 2491):

If consumers perceive the presentation of online information as pleasing and easy to absorb, they may also regard their thoughts and feelings associated with the online task as more enjoyable and less effortful, thus leading to more positive evaluations of the shopping experience.

Customers’ perception that using a website is instrumental in their task performance and that it does not require much effort will positively affect their intentions such as revisiting a website and willingness to purchase (Chuan-Chuan Lin & Lu, 2000).

In the previous research perceived ease of use was found to directly influence perceived usefulness and consumer attitude (Davis, 1989). However, in the more recent study by Nagy and Hajdu (2021) the connection between perceived ease of use and consumers’ behaviour was found to be indirect.

### *Aesthetic design*

The components included in *aesthetic design* (AD) have been studied by Robins and Holmes (2008) as the professional graphic design concepts applied to an interface. In research by Seckler et al. (2015) aesthetic design was studied as the objective design factors: vertical symmetry, visual complexity, and colour. In the present study, aesthetic

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design encompasses the appearance of the product and environment rendering as well as the overall visual layout of the IPV tool.

The atmospherics of retail stores impact the affective states of shoppers through conditions such as the visual layout of the store (Bitner, 1992), scent (Doucé & Janssens, 2013; Spangenberg et al., 1996), touch (Hulten, 2012), and music (Biswas et al., 2018). These affective states, when positive, have a positive effect on customer attitudes and may lead to purchase behaviour as many of these findings suggest. Given the lack of tactility and other sensory stimuli in online stores, visual design has become an imperative aspect of websites in order to facilitate positive emotions in consumers (Porat & Tractinsky, 2012).

The appearance of a website is one of the first aspects noted by consumers and contributes to their overall impression of the website. This suggests that aesthetics play a large role in forming either a positive or negative user experience. It also suggests that the design of a website and the attitudes users develop toward a store are indicated as being mediated mostly by pleasure (Ha & Im, 2012; Porat & Tractinsky, 2012) but also by arousal (Kumar et al., 2021). According to Porat and Tractinsky (2012), a well perceived aesthetic design thus contributes to customer satisfaction. Other findings show that websites with a greater level of aesthetic design are viewed as more credible by users (Robins & Holmes, 2008). This was compared to seeing the same content with a low degree of aesthetic design. Robins and Holmes (2008) also noted that the assessment occurs within seconds of opening a website.

### *Product variety*

The breadth and depth of a retail store's product assortment is referred to as *product variety* (PV) (Chang, 2011). To broaden consumer choices and create competitive opportunities, businesses nowadays emphasize the trend of expanding their product variety offering available in the market (Lyons et al., 2020).

According to previous research, perceived product variety rather than actual variety influences consumer behaviour (Kahn & Wansink, 2004). In an online environment, consumers rely on various cues to evaluate product variety, for instance, by using available product filtering options. That is, visual merchandise is not perceived by consumers in isolation, instead, consumers consider other dimensions related to the visual display (Park et al., 2015). These dimensions include colour, variety of product

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displays, and the ease of locating them (Ladeira et al., 2016). Results of a study by Chang (2011) on the effect of product variety on consumers' preferences and choices show that relevant categorization makes it easier for consumers to navigate the website and achieve a greater level of pleasure. That, in turn, creates better attitudes toward the website and increases purchase intentions. Product variety of an e-commerce website has a significant and positive impact on customer satisfaction (Chang, 2011; Lyons et al., 2020; Mofokeng, 2021), perceived quality (Alanadoly & Salem, 2022), and subsequently, the sales of e-tailers (Sorkun, 2019), as it enhances chances of a match between the customer's preference and the available alternatives (Chang, 2011).

In the scope of this study a difference between product variety offered by the IKEA website and by the IPV tool within that website should be acknowledged, since the range of products featured on the website appeared to be wider than the range featured within the IPV tool's environment.

### **2.2.2. Organism (O)**

The SOR framework's organism element deals with a person's emotional reaction to environmental stimuli (Mehrabian & Russell, 1974). Researchers that adapted the SOR framework to their studies have captured the organism element using different factors fitting to the specific study. Alanadoly and Salem (2022) have used perceived quality to represent the organism in the context of fashion e-commerce and investigate its moderating role between fashion involvement, opinion-seeking, and product variety as the stimuli and buying behaviour as the response. Yin and Qiu (2021) divided the organism into perceived utility and hedonic values to study the effect of artificial intelligence technology on online purchase intentions. Hwei and Youngsook (2022) used perceived value and immersive experience to capture the cognitive and affective mediation between social media interactivity and continuous purchase intention.

A widely-used approach to depict the organism in the context of online shopping is flow, a concept that was first introduced by Csikszentmihalyi (1974) (Aboubaker Ettis, 2017; Gao & Bai, 2014; Hoffman & Novak, 1996). Flow is a state in which an individual is intensely invested in an activity to the elimination of all other thoughts (Hoffman & Novak, 1996). For flow to be applicable to this study, participants of the survey (Section 4.2.1) would need to use the IPV tool for a long enough period to enter a state of fluidity. Environmental factors are uncontrolled given that participants will

## Theoretical framework

take the survey online in whichever space they are in. It is therefore possible for participants to become distracted by other stimuli, such as people entering the room or notifications on various devices. Distraction inhibits entering flow and would therefore undermine the study. The Pleasure-Arousal-Dominance (PAD) model was instead selected as suitable for this study to examine the organism. The model was introduced within the context of the SOR framework from its inception and establishes affective states as the organism. PAD is the most commonly used model in the context of studying emotional responses to stimuli in an environment (Mazaheri et al., 2011).

### *Pleasure, Arousal and Dominance (PAD)*

In their research on environmental psychology, Mehrabian and Russell (1974) propose that the emotional state of people is directly affected by stimuli in their physical environment. Emotional states are defined as transitory and changing within a shorter period of time (Mehrabian, 1996) and are viewed in terms of three basic dimensions – pleasure, arousal, and dominance. Following the development of PAD, the theory has continued to be applied in various research areas in order to examine affective internal states (Chang et al., 2014; Han et al., 2018; Kevin et al., 2021). Donovan and Rossiter (1982) are known as the first to have applied the PAD model to the retail setting. Since then, it has been relied upon within the retail environment in both offline (Donovan et al., 1994) and online settings (Koo & Lee, 2011; Wu et al., 2008). Within online environments, PAD has been used for studying e-commerce stimuli and the effect on purchase intention (Verhagen & Bloemers, 2018), satisfaction (Eroglu et al., 2003), and approach/avoidance behaviours (Eroglu et al., 2001; Loureiro, 2015). Numerous stimuli have been studied within the retail environment, such as scent, ambiance, music, and lighting. However, examining an IPV tool as the stimulus has not been done previously.

### *Pleasure*

*Pleasure* encompasses such emotions as feeling good, happy, or satisfied in a situation (Mehrabian & Russell, 1974). It is the resulting emotion from received stimuli in an environment and leads to a response in either attitude or behaviour. In previous research, pleasure has shown a consistently positive impact on customer behaviour, whether that be their opinion of the store, purchase intention, or how much money is spent in the store (Koo & Lee, 2011).

## Theoretical framework

Customer satisfaction and playfulness are significant aspects of pleasure, these can be fostered when users engage interactively with a website as interactivity brings greater control and perceived freedom of choice (Hsieh et al., 2014). Hsieh et al. (2014) found that dominance has a positive effect on pleasure, and that higher degrees of pleasure in turn stimulates purchase intention. They state that perceived dominance can help facilitate a more pleasant shopping experience, meaning that users who feel in control of their online choices may be more satisfied with their experience.

### *Arousal*

The degree of *arousal* a person experiences varies from sleep to excitement and is characterized by stimulation and energy (Koo & Lee, 2011; Mehrabian & Russell, 1974; Yani-de-Soriano et al., 2013). The arousal dimension has been shown, along with pleasure, to significantly affect customers' attitudes, satisfaction, and behaviours towards an online store (Eroglu et al., 2003) and affects shoppers' willingness to purchase (Fiore, Jin, et al., 2005) and time spent shopping (Sherman et al., 1997). Similarly, Loureiro (2015) noted that arousal and dominance had a direct influence on developing positive attitudes towards websites. However, contrasting results have also been found that indicate a negative effect on approach behaviours when arousal levels are high, resulting in consumers being less likely to continue using a website that may lead to overstimulation (Menon & Kahn, 2002). This may be due to a depletion in cognitive resources when faced with large amounts of stimuli and as a result, some customers may be discouraged from continuing the interaction with the store. It is, therefore, more advantageous to limit the number of stimulating elements. Arousal has been studied as a two-dimensional concept, including tense arousal and energetic arousal (Koo & Lee, 2011). However, for the purpose of this study, arousal as a single dimension is deemed to be sufficient and has been the concept used in many prior studies, including the aforementioned papers.

### *Dominance*

According to Mehrabian and Russell (1974), *dominance* refers to the extent to which one feels in control over a situation and able to influence one's environment. In contrast, feelings of submissiveness occur when the environment is the influencing factor and impedes one's control. Consumers' sense of dominance can thereby be increased when

## Theoretical framework

they are able to complete the actions they expect to achieve, which in an online environment may be a link that takes the user to the expected page. In other studies, dominance has been described in relation to the retail environment as the belief in one's ability to induce change towards an intended outcome (Koo & Lee, 2011). Therefore, in the present study, dominance is similarly defined as the perceived control users experience when interacting with the IPV tool.

Several studies have excluded dominance from the dimensions and considered only pleasure and arousal in their use of the model (Ha & Lennon, 2010). This may be due to the suggestion by Russell (1979) that pleasure and arousal are sufficient for describing the emotional states of in-store shoppers. However, the online environment differs from its physical counterpart and offers a heightened sense of control and freedom over the shopping experience (Wolfenbarger & Gilly, 2001). Bakker et al. (2014) suggest reinstating dominance as the third dimension of PAD in future research, as it does provide value in understanding people's internal states. For example, Hsieh et al. (2014) show that dominance does have a significant role in the emotions of e-commerce users. Other studies have also argued for its significance in the model, specifically in e-commerce (Chang et al., 2014; Eroglu et al., 2001; Mazaheri et al., 2011). Consumers may experience an elevated sense of dominance when interacting with an e-commerce website rather than a physical store. However, the opposite may also be true, that obstacles to accessing the information on webpages, such as a long download time or confusing navigation, can reduce users' sense of control (Eroglu et al., 2001). In comparison to in-store retail, dominance becomes a more relevant factor in the context of online shopping.

### **2.2.3. Response (R)**

The response component of Mehrabian and Russell's (1974) SOR framework involves the behaviours and attitudes toward stimuli in an environment. In the current study, customer satisfaction is examined as the response.

#### *Customer satisfaction*

Customer satisfaction (CS) is one of the essential concepts in marketing because it is a crucial factor of consumer loyalty, repeat sales, positive word-of-mouth. Kotler and Armstrong (2010, p. 547) define *customer satisfaction* as “the extent to which a

## Theoretical framework

product's perceived performance matches or exceeds a buyer's expectations". Therefore, satisfaction is achieved when product performance or service quality meets or exceeds a consumer's expectations. On the other hand, if product or service fail to meet a consumer's expectations, the consumer will be dissatisfied.

Two different approaches to customer satisfaction have been determined and used, namely cumulative and transaction-specific. Cumulative satisfaction refers to customers' overall evaluation of their consumption experiences with a product or service to date (Johnson & Fornell, 1991). Cumulative satisfaction has a direct impact on customer loyalty and subsequent profitability; hence it is used as a common factor for describing differences among businesses and industries (Johnson et al., 1995).

On the other hand, customers' evaluations of and reactions to a unique product transaction, episode, or service encounter are defined by a transaction-specific approach (Oliver, 2010). In the earlier studies of satisfaction, scholars and psychologists have focused on transaction-specific approach, defining the process underlying customer satisfaction and its antecedents (Oliver, 2010; Yi, 1990). Transaction-specific approach offers the possibility to shed light on complex psychological reactions customers have to a product or service provider's performance of a particular product or service experience (Oliver, 2010). This study, therefore, refers to customer satisfaction in its transaction-specific definition as participants were questioned regarding one particular interaction with IKEA's IPV tool.

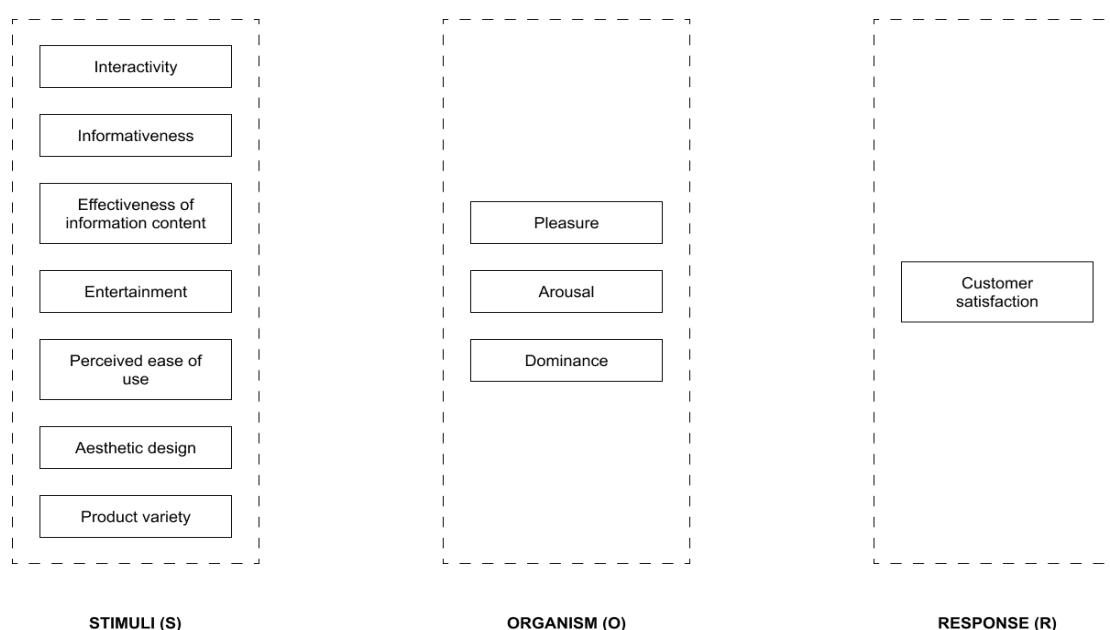


### 3. Research framework and hypothesis

This section presents the research framework used for this study following the SOR and PAD models. A list of hypotheses is also provided.

#### 3.1. Research framework

The construct of the research framework was based on related literature. According to the results of the literature review, this research focuses on the factors that are anticipated to have an influence on customer satisfaction (Figure 2) The respective hypotheses will be presented in the methodology section (Figure 3).



**Figure 2**

*SOR Model Adapted to This Study*

##### 3.1.1. Stimuli of the IPV tool

According to the SOR model adapted for this paper, there are seven variables in this study that can reflect the model's stimulus part (S) and are included in the research framework. These variables' descriptions and measurements are as follows:

1. Interactivity (IA) refers to the ability of the IPV tool to guide users' interaction, as well as allow users to simultaneously exchange information with the environment.
2. Informativeness (IN) captures the capability of the IPV tool to make information available to users.

## Research framework and hypothesis

3. Effectiveness of information content (EIC) determines whether the information provided by the IPV tool is correct, up-to-date, complete, and relevant for shoppers.
4. Entertainment (EN) concerns the degree to which the IPV tool makes users feel excited and entertained.
5. Perceived ease of use (PEOU) refers to the degree to which users believe that using the IPV tool would be free of effort.
6. Aesthetic design (AD) refers to how appealing and meaningful the IPV tool's visual content is seen as.
7. Product variety (PV) is the perceived sufficiency of the range of products.

### 3.1.2. Experience with IPV tool and customer satisfaction

According to the SOR model and PAD concepts, there are three variables in this study that can reflect the model's organism part (O) and are included in the research framework. These variables' descriptions are as follows:

1. Pleasure (P) is the degree to which users feel joyful, happy or satisfied.
2. Arousal (A) is the degree to which users feel stimulated.
3. Dominance (D) is the degree to which users feel in control and influential.

In this study customer satisfaction is the only variable that reflects the response (R) part of the adapted SOR model. Customer satisfaction (CS) is the degree to which users feel satisfied with their experience with the IPV tool.

## 3.2. Research hypotheses

The general pattern is that stimulus variables are expected to influence the organism variables, which then affect customer satisfaction in the response. All links between variables that are to be tested are supported by previous research. Two hypotheses were formulated to represent this pattern.

**H1:** Factors of the IPV tool (stimulus) influence pleasure, arousal, and dominance (organism).

**H2:** Pleasure, arousal, and dominance (organism) influence customer satisfaction (response).

## **4. Method and implementation**

The following subsections explain the choice of method and describe how data was collected and analysed. The reliability and validity of the data are also presented.

### **4.1. Method selection**

Quantitative research can be viewed as a linear process that unfolds in stages, from theory to conclusions. It involves the collection of numerical data and predominantly takes on a deductive approach to the relation between theory and research (Bryman, 2012). Qualitative research, on the other hand, commonly places weight on words rather than on quantifying data in numbers and often places an emphasis on the generation of theories. Furthermore, qualitative strategies embrace a reality that is more subjective and fluctuating in nature, whereas quantitative research strategies generally orient themselves toward reality as objective. The line between these two methods, however, is not always as clearly distinguished and variations in research do occur (Bryman, 2012). As this study seeks to find the relationship between variables that may or may not affect satisfaction, a quantitative procedure is considered a more suitable method to adhere to, compared to a qualitative approach as explained in the following paragraphs.

### **4.2. Data collection**

A survey is suitable for this study as it allows data to be collected from a larger group of people, providing an overview of a user population, this is especially true when the survey is distributed online and gains a global reach (Evans & Mathur, 2005; Lazar et al., 2017). More participants enable the results of the study to be generalised which is important for scientific conclusions to be drawn. Considerations of time constraints were also made when deciding on a research method. The speed at which online surveys can be amassed is advantageous given that responses are gathered without a need for interviewers to be present (Evans & Mathur, 2018).

The absence of interviewers does, however, present an issue of validity as it cannot be verified that participants complete the tasks to the degree described in the questionnaire instructions. The genuineness of the survey results, therefore, relies on the integrity of respondents. This is a known risk with conducting a survey (Evans & Mathur, 2018) and the extent to which a participant responds truthfully can be questioned even with

## Method and implementation

other forms of research methods. For this reason, in the introductory text of the questionnaire, respondents were encouraged to answer truthfully and to read the instructions carefully. Other potential weaknesses include the risk of a low response rate, questionable representativeness of the sample, and technological variations, for example, the type of internet connection and configuration of the user's computer (Evans & Mathur, 2005).

Another aspect sometimes considered to be a drawback of surveys is that the data collected is less detailed compared to data insights gathered from qualitative methods. Further, a survey is often self-administered, hence, if interesting phenomena occur there will be no opportunity to probe for more information. Despite these issues, a survey presents itself as a sufficient method since the data needed for answering the research question does not require elaborate responses from participants. Surveys are widely used in customer satisfaction research and have been the method of choice in numerous related e-commerce studies that employ the SOR framework (Albarq, 2021; Chang et al., 2011; Hwei & Youngsook, 2022; Kumar et al., 2021).

### **4.2.1. Research design**

The theory behind the SOR framework as well as the existing relationship between characteristics of online shopping platforms and customer satisfaction were discovered through a review of the literature presented in the theoretical framework. Using the gathered information, a research model specific to this study was constructed (Figure 2) and a questionnaire was thereafter developed to test the model.

An introductory text explained how the survey would unfold and provided respondents with information such as the length of the survey, the anonymity of responses, and how to contact the authors. After questions on demographics, the participants were asked about their previous experience with furniture e-commerce websites and if they had previously used IKEA's IPV tool or tools like it. All questions were in multiple-choice format. The participants were thereafter given instructions on how to complete several tasks using IKEA's IPV tool to get acquainted with it (Appendix A). Two links were provided to the tool, one for a version in English and the other in Swedish as this study took place in Sweden and as most of the respondents were expected to come from Sweden. Once this step was completed, further questions addressed the research question according to the 5-point Likert scale (Likert, 1932) based on the SOR and PAD

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models. These questions were created to explore the core of each construct in the model in a straightforward manner, beginning with questions on the IPV tool as the stimulus, then questions following PAD, and finally questions on customer satisfaction as the response. The 5-point Likert scale, ranging from a one that indicates *strongly disagree* to a five that indicates *strongly agree*, was used to simplify the questionnaire and assure respondents' understanding and the meaningfulness of their responses. For pleasure and arousal, a continuum scale with five points ranging from, for example, unhappy to happy was used according to the original questions. To conclude the survey, an open-ended question gave participants the option to add comments on their experiences.

### **4.2.2. Participants**

To gather participants, the convenience sampling method was adopted for this study. Convenience sampling is a form of non-probability sampling in which members of the target population who meet certain practical requirements, such as ease of access, geographical proximity, availability at a given time, or desire to participate are included in the study (Etikan et al., 2016). Convenience sampling is frequently used as a basis for social research (Bryman, 2012).

The sample of this study was not subjected to any definitive sampling criteria. Users of various social media were encouraged to participate in the survey. Public forums on social media sites such as Facebook and Reddit were also used to reach a possibly more diverse audience albeit with an interest in IKEA products or interior design. Distributing the survey in this manner enabled a higher probability of the sample having some technological familiarity as participants would be users of social media platforms.

### **4.2.3. Procedure**

After the initial construction of the questionnaire using Google Forms ([www.forms.google.com](http://www.forms.google.com)), some questions were revised according to the feedback gathered during a pre-test with five participants to ensure that the questions were unambiguous. This was to avoid any misinterpretations and potential bias. Once these alterations were made, the survey was sent out through convenience sampling. The survey was circulated online over a period of roughly five weeks, at the end of which 120 responses were collected. Of these 120 responses, two were discarded due to comments left in the open-ended question field that said the respondents failed to access the IPV tool, thereby disqualifying those answers. Another three responses were deleted

## Method and implementation

as they exhibited response sets and were therefore invalid. The concept of a response set means that people reply consistently to a series of questions, but in a way that is unrelated to the topic being measured. This type of response bias is common in multiple-indicator measures such as the ones used in Likert scales (Bryman, 2012). After removing these responses, 115 remained for analysis.

### 4.3. Data analysis

The hypotheses developed in this paper are tested by multiple regression analysis (MRA) using IBM SPSS software. This approach was implemented as it provides a method for analysing possible connections between several independent variables and one dependent variable. Multiple regression analysis measures the significance of the relationship to either verify or disprove hypotheses (Cohen, 2003; Lazar et al., 2017; Pallant, 2020). For this study, multiple regression analysis has been proven as an appropriate tool as it has been used as the data analysis method in several comparable studies that use the SOR framework (Chang et al., 2011; Essawy, 2019).

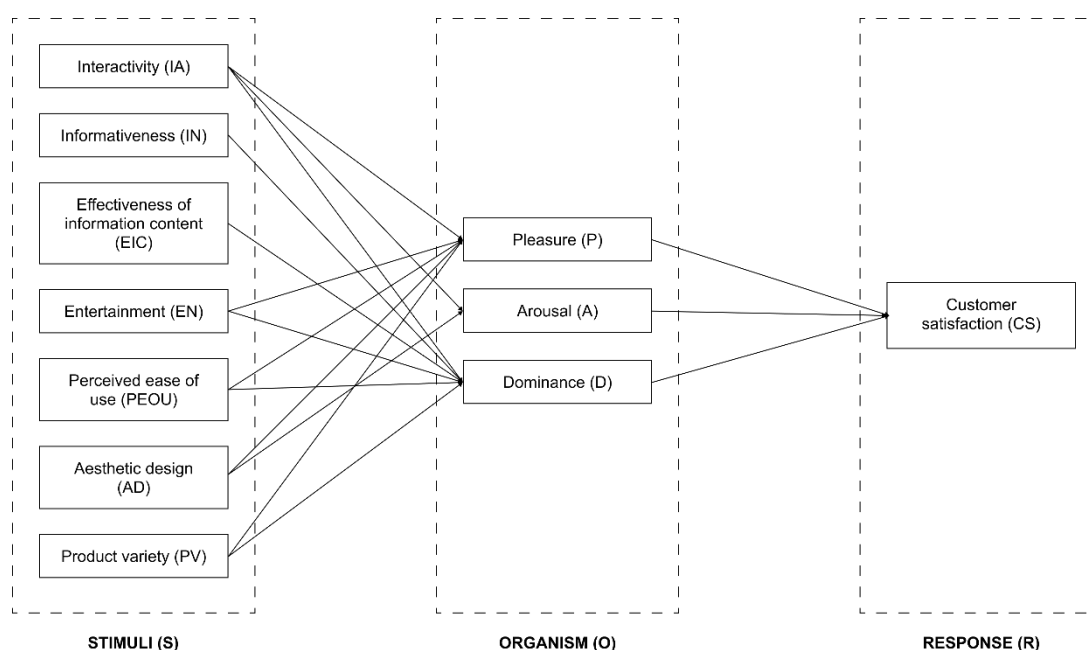
The completed questionnaires were first exported to Microsoft Excel. Answers from Likert-scale and Likert-type items that were used to capture all the elements of the SOR model (Table 1) were transformed into the format necessary to run the multiple regression. Some items had to be reverse coded so that a high score would be transformed into the corresponding low score on the scale. The reverse-coded items are as follows: IA7, P2, and CS3 (Table 1). After this, the means and standard deviations of scales were calculated.

Before the multiple regression models were carried out, internal reliability of all the variables was investigated using Cronbach's alpha and Spearman-Brown coefficients. The results of reliability analyses are presented and interpreted in the following subsection (Table 2).

Four multiple regression models were created with pleasure, arousal, dominance, and customer satisfaction as dependent variables. The choice of independent variables for each model was based on the findings from previous literature and in the case of dominance, the natural association of some stimuli with user control. Figure 3 features the specific links that indicate the relationship between the variables. Hence, in the first model, interactivity, product variety, entertainment, perceived ease of use and aesthetic

## Method and implementation

design acted as predictors of pleasure. Interactivity and aesthetic design were chosen to be predictors of arousal. The model that described the variance of dominance included the following predictors: interactivity, informativeness, effectiveness of information content, entertainment, perceived ease of use and product variety. The last model was built to reveal the effect of the organism element represented by Pleasure-Arousal-Dominance on customer satisfaction. Additional analysis was completed as a sensitivity analysis to see whether the potential endogeneity of P, A, and D variables affected the results of the customer satisfaction model.



**Figure 3**

*Variable relationships*

### 4.4. Validity and reliability

The stimuli are attributes of the website and IPV tool, namely: interactivity, informativeness, effectiveness of information content, entertainment, perceived ease of use, aesthetic design, and product variety. Most of the scales used for the stimuli factors were taken from literature and adapted to the IPV tool context. Interactivity was measured with seven items adapted from Wu (1999) and Liu (2003). Informativeness and entertainment contained two items each from Mazaheri et al. (2011). Effectiveness of information content was assessed with two items from a scale by Prashar et al. (2017). Two items were adapted from Vrechopoulos et al. (2004) to measure perceived ease of use. Aesthetic design included four items partially from Cyr et al. (2006).

## Method and implementation

Finally, product variety was measured with two items modified from Alanadoly and Salem (2022) to correspond with this study. Organism refers, in this study, to the users of the website. To measure their emotional states, the Pleasure-Arousal-Dominance scale (PAD) first developed by Mehrabian and Russell (1974) was used. This model has been applied in previous literature and for studies connected to e-commerce testing. The last part of the SOR theory, response, refers to the potential outcomes of the testing, which will be the aspects of customer satisfaction. The scale used to measure customer satisfaction was adapted from Eroglu et al. (2003). Refer to the table below (Table 1) to get an overview of the constructs and their scale items.

**Table 1**

*Constructs and Respective Items*

Corresponding SOR element	Construct	Items (questions)
Stimuli (S)	Interactivity (IA)	<i>IA1</i> : The buttons, icons, and texts tell me exactly what to expect
		<i>IA2</i> : The visual layout guided me during my exploration of the tool
		<i>IA3</i> : I was delighted to be able to choose what and when to click
		<i>IA4</i> : I felt good about the way I could manipulate the furniture pieces within the environment
		<i>IA5</i> : I felt excited about the goals I could achieve with IKEA's planning tool
		<i>IA6</i> : When I clicked on buttons, icons, and texts I felt good about the instantaneous display of information
		<i>IA7</i> : The tool was very slow in responding to my requests



## Method and implementation

Organism (O)	Informativeness (IN)	<i>IN1</i> : IKEA's planning tool is useful to me
		<i>IN2</i> : IKEA's planning tool is informative to me
	Effectiveness of information content (EIC)	<i>EIC1</i> : The information content of IKEA's planning tool is sufficient
		<i>EIC2</i> : The information content of IKEA's planning tool is relevant
	Entertainment (EN)	<i>EN1</i> : IKEA's planning tool is entertaining
		<i>EN2</i> : IKEA's planning tool is exciting
	Perceived ease of use (PEOU)	<i>PEOU1</i> : I think it is easy to navigate within the tool
		<i>PEOU2</i> : I think it is easy to customize the room measurements according to my needs
	Aesthetic design (AD)	<i>AD1</i> : The graphics in this tool are meaningful
		<i>AD2</i> : The overall look and feel of the tool are visually appealing
	<i>AD3</i> : I was delighted to be able to view the products in a 3D environment	
Product variety (PV)	<i>PV1</i> : The tool has a wide variety of products	
	<i>PV2</i> : I am satisfied with the product range offered	
Pleasure (P)	<i>P1</i> : Dissatisfied-satisfied	
	<i>P2</i> : Happy-unhappy	
	<i>P3</i> : Annoyed-pleased	
Arousal (A)	<i>A1</i> : Relaxed-stimulated	
	<i>A2</i> : Calm-excited	

## Method and implementation

Response (R)	Dominance (D)	<i>D1</i> : While using the tool, I felt that I had a lot of control
		<i>D2</i> : While using the tool, I could choose freely what I wanted to see
		<i>D3</i> : While using the tool, my actions decided the kind of experiences I got
	Customer satisfaction (CS)	<i>CS1</i> : I enjoyed using IKEA's planning tool
		<i>CS2</i> : I was satisfied with my experience of using the tool
		<i>CS3</i> : Given a choice, I would probably NOT use the tool again
		<i>CS4</i> : I would recommend the IKEA's planning tool to other people

A Cronbach's alpha (Cronbach, 1951) analysis tested the internal reliability of the questionnaire items. The index ranges between zero ( $\alpha=0$ ) to one ( $\alpha=1$ ), with an alpha value closer to one indicating higher reliability. Cronbach's alpha is claimed to be unsuitable for scales with a low number of items (Eisinga et al., 2013). For this reason, Spearman-Brown coefficient was used in addition to Cronbach's alpha to test the scales with two items. The Spearman-Brown formula predicts the reliability of a questionnaire when employing subgroups of items to assess internal consistency (de Vet et al., 2017). There was no significant difference between the values acquired from the two reliability tests (Table 2). According to Pallant (2020), an acceptable result is above 0.7. Most of the factors fell within this acceptance level of  $\alpha > 0.70$ . However, Vaske et al. (2017) claim that factors with  $\alpha > 0.65$  are still considered "adequate" and that the alpha value depends on the number of items in the scale. All the variables had  $\alpha > 0.50$ ; the threshold of unacceptability is the  $\alpha > 0.50$  range. Only three variables, namely effectiveness of information content (EIC), perceived ease of use (PEOU), and Arousal (A), have fallen within the  $0.65 > \alpha > 0.50$  range. For this study, it was decided not to eliminate any variables from further analysis, as these variables have been taken from the literature cited earlier and for this reason proven to be externally valid.

## Method and implementation

**Table 2**

*Descriptive Statistics and Reliability Test Results (Cronbach's Alpha, Spearman-Brown Coefficient)*

Factor	Variables	Cronbach's Alpha	Spearman-Brown coefficient	Mean	Std. Deviation
Interactivity (IA)	IA1, IA2, IA3, IA4, IA5, IA6, IA7	.795	-	3.4	0.6
Informativeness (IN)	IN1, IN2	.665	.669	3.5	0.7
Effectiveness of information content (EIC)	EIC1, EIC2	.582	.591	3.5	0.7
Entertainment (EN)	EN1, EN2	.678	.690	3.5	0.7
Perceived ease of use (PEOU)	PEOU1, PEOU2	.568	.576	3.5	0.7
Aesthetic design (AD)	AD1, AD2, AD3	.706	-	3.6	0.5
Product variety (PV)	PV1, PV2	.754	.757	3.4	0.8
Pleasure (P)	P1, P2, P3	.851	-	3.5	0.9
Arousal (A)	A1, A2	.529	.529	3.1	0.8
Dominance (D)	D1, D2, D3	.741	-	3.5	0.6
Customer satisfaction (CS)	CS1, CS2, CS3, CS4	.860	-	3.5	.7

#### **4.5. Considerations**

The questionnaire was designed in a way that would allow participants to get acquainted with its purpose. Before getting to the questionnaire content, participants are informed of the anonymity of their answers and given the researchers' contact information in case any questions occur. The responses were deleted from the server they were stored on when the responses were no longer needed. The approximate completion time was calculated during the pre-test phase and mentioned in the introductory text.

## Results

### 5. Results

This section provides a summary of the results gathered from the survey. Demographics are presented to provide background on participants. The results of several multiple regression models are thereafter presented. Lastly, responses of the open-ended question are covered.

#### 5.1. Sample characteristics

The results of the demographics from the questionnaire are presented in Table 3. The majority of respondents were female (63.5%) and between 18 and 24 years of age (51.3%). The highest number of respondents were employed full-time (32.2%), lived in Europe (72.2%), and lived with their immediate family (53.0%).

**Table 3**

*Demographics*

	n	%
<b>Gender</b>		
Female	73	63.5
Male	38	33.0
Prefer not to say	3	2.6
Other	1	0.9
<b>Age</b>		
Under 18	3	2.6
18-24	59	51.3
25-34	27	23.5
35-44	12	10.4
45-54	6	5.2

## Results

55-64	4	3.5
Above 64	4	3.5

---

### Current employment status

Employed full-time	37	32.2
Employed part-time	29	25.2
Self-employed	10	8.7
Unemployed	36	31.3
Retired	3	2.6

---

### Residency

Asia	12	10.4
Europe	83	72.2
North America	18	15.7
South America	1	0.9
Oceania	1	0.9

---

### Living situation

Living alone	22	19.1
Living with immediate family	61	53.0
Living with roommate(s)	32	27.8

## Results

Questions regarding respondents' familiarity with furniture e-commerce websites and interactive product visualization (IPV) tools were included. As shown in Table 4, the highest number of respondents answered that they visit furniture e-commerce websites a few times a year (31.3%). Figure 3 presents that the intent of browsing these websites was mainly for pleasure without purchase as the main goal (60.7%). Of the categories listed in the multiple-choice question, the most important feature of a furniture e-commerce website was considered to be the visual representation of the product (73%) (Figure 4). Table 4 also shows that the majority of respondents had not, to their knowledge, previously used any of IKEA's planning tools (66.1%). Roughly half of respondents had previously used any interactive product visualization tools similar to the tested tool (50.4%).

**Table 4**

*Familiarity With Furniture E-commerce and IPV Tools*

	n	%
<b>Frequency of furniture e-commerce visits</b>		
More than once a week	10	8.7
Once a week	2	1.7
Two or three times a month	13	11.3
Once a month	13	11.3
A few times a year	36	31.3
Once a year	7	6.1
Less than once a year	21	18.3
Never	13	11.3

## Results

### To their knowledge have previously used any of IKEA's planning tools

Yes	39	33.9
No	76	66.1

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### To their knowledge have previously interacted with an IPV tool

Yes	43	37.4
No	58	50.4
Unsure	14	12.2

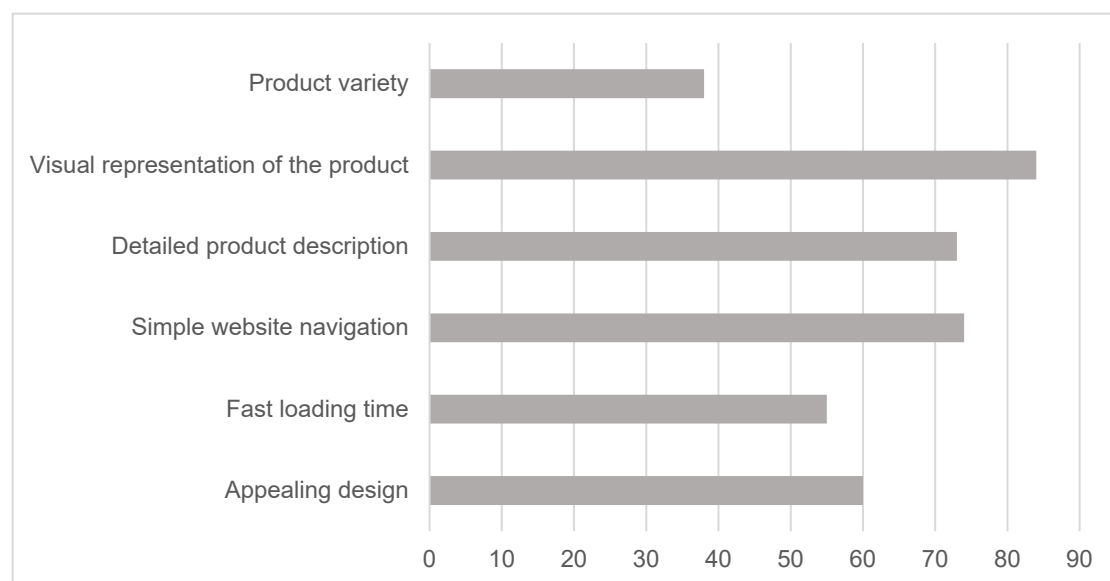


**Figure 4**

*Intent of Visiting Furniture E-commerce Websites*



## Results



**Figure 5**

*Features of a Furniture E-commerce Website Considered to Be Most Important*

### 5.2. Multiple regression analysis results

Given that there are four dependent variables, namely pleasure, arousal, dominance, and customer satisfaction, four multiple linear regression models were investigated. The acceptance level of  $p < 0.1$  was adopted for this study.

#### 5.2.1. Influence on pleasure

A multiple linear regression was conducted with pleasure (P) as the dependent variable and interactivity (IA), product variety (PV), entertainment (EN), perceived ease of use (PEOU), and aesthetic design (AD) as the independent variables (Table 5). The overall regression for pleasure was statistically significant ( $R^2 = .555$ ,  $p < .001$ ). Of the five factors tested, IA, PV and PEOU were shown to have significance. IA has a  $b$  coefficient = .86 and  $p < .001$ , PV has a  $b$  coefficient = -.196 and  $p = .030$ , and PEOU has a  $b$  coefficient = -.296 and  $p = .016$ . The results showed that interactivity and perceived ease of use positively influenced pleasure, while product variety had a negative effect on pleasure. The  $b$  coefficients of entertainment and aesthetic design did not show any significance; hence no conclusions could be drawn.

## Results

**Table 5**

*Coefficients (Dependent Variable: Pleasure)*

	Unstandardized Coefficients		Sig.
	B	Std. Error	
IA	.875	.155	<.001
PV	-.196	.089	.030
EN	.181	.111	.106
PEOU	.296	.121	.016
AD	.031	.144	.832

R Square = .555

### 5.2.2. Influence on arousal

In this model, arousal (A) was entered as the dependent variable, and interactivity (IA) and aesthetic design (AD) were entered as the independent variables (Table 6). The overall regression for arousal was not statistically significant ( $R^2 = .007$ ,  $p = .771$ ), therefore this specific model and its individual coefficients were not further investigated.

**Table 6**

*Coefficients (Dependent Variable: Arousal)*

	Unstandardized Coefficients		Sig.
	B	Std. Error	
IA	-.096	.141	.496
AD	.123	.154	.424

R Square = .007

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### 5.2.3. Influence on dominance

A multiple regression was calculated to test hypotheses regarding dominance (D) based on interactivity (IA), informativeness (IN), effectiveness of information content (EIC), entertainment (EN), perceived ease of use (PEOU), and product variety (PV) (Table 7). D was entered as the dependent variable and IA, IN, EIC, EN, PEOU, and PV were entered as the independent variables. Dominance was shown to have a statistically significant regression ( $R^2 = .724$ ,  $p < .001$ ). The factors IA, EN, and PEOU were shown to have significance, with IA having  $b$  coefficient = .459 and  $p < .001$ , EN having  $b$  coefficient = .106 and  $p = .065$ , and PEOU having  $b$  coefficient = .382 and  $p < .001$ . Coefficients of IN, EIC, and PV were found to be of no significance. Based on this data, interactivity, entertainment, and perceived ease of use had a positive effect on dominance.

**Table 7**

*Coefficients (Dependent Variable: Dominance)*

	Unstandardized Coefficients		Sig.
	B	Std. Error	
IA	.459	.086	<.001
IN	-.067	.062	.284
EIC	.064	.061	.296
EN	.106	.057	.065
PEOU	.382	0.67	<.001
PV	.008	.046	.866

R Square = .724

### 5.2.4. Influence on customer satisfaction

To measure customer satisfaction (CS), a multiple regression was calculated based on pleasure (P), arousal (A), and dominance (D) as predictor variables and all the Stimuli

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factors as instrumental variables (Table 8). The regression revealed that the customer satisfaction model is statistically significant ( $R^2 = .689$ ,  $p < .001$ ). The pleasure factor was shown to have significance ( $b = .344$ ,  $p < .001$ ) as well as the dominance factor ( $b = .513$ ,  $p < .001$ ). Thus, both pleasure and dominance had a positive effect on customer satisfaction. The coefficient of arousal, however, was not statistically significant and therefore did not indicate having a positive influence on customer satisfaction ( $b = .039$ ,  $p = .430$ ).

Additional analysis was done as a sensitivity analysis to see whether the potential endogeneity of P, A, and D variables affected the results. Endogeneity occurs when an explanatory variable in a regression model is correlated to the error term. The results of the sensitivity analysis were consistent with the results of the proposed model (Appendix B).

**Table 8**

*Coefficients (Dependent Variable: Customer Satisfaction)*

	Unstandardized Coefficients		Sig.
	B	Std. Error	
P	.344	.051	<.001
A	.039	.049	.430
D	.513	.076	<.001

R Square = .689

### 5.3. Open-ended question

An optional open-ended question was included in the questionnaire to allow the participants to share their opinions about the IKEA planning tool or the study. During the validation stage, two collected responses were found to be invalid as the participants acknowledged that they failed to follow the instructions due to a faulty configuration of their devices. Hence, these completed questionnaires were removed from the study. Out of 115 participants, whose responses were validated, 32 had entered some text in the

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answer field. Four of these responses only included a short text such as “Yes” and “No” and were therefore of no relevance to the study. The remaining 27 responses were analysed, and the following themes were established: interactivity, aesthetic design, product-related, and performance failures.

The interactivity of the tool was a common topic as 14 participants had mentioned it. Three participants supported the idea that the response time of the tool was slow. In one of these responses, a participant suggested that the response time was affected by the browser. One participant referred to the tool’s processing time as being “very slow” while the other two wrote that the tool was “sometimes slow” and “a bit slow.” The majority referred to the tool as being unintuitive, and difficult to navigate. The most common motivation for these statements was the difficulties faced during product placement and rotation within the environment. However, one participant noted that their previous experience using 3D software such as Blender allowed them to grasp the navigation within the tool’s 3D environment without any difficulties. Another participant stated as follows: “Had never used a tool like this. I feel like an educated designer. Loved it,” indicating that it was not difficult for them to understand the way the features of the tool work. However, one response indicated that it was difficult for the participant to find the option to render the environment in a higher quality. Another participant expressed their satisfaction with some of the features: “I enjoyed the possibility of editing the flooring and walls to efficiently match what my own room/office looks like.”

Two participants shared their opinion on the aesthetic design of the tool; one stated that “Office items didn't give an appealing setting ...too stark. Making objects look more realistic would have helped a lot ...more natural graphics”; while the comment of the other participant on the contrary refers to the 3D environment as being realistic and causing a feeling of joy.

Five respondents shared their opinion on product-related matters, such as product variety, product description, and product availability. Three participants mentioned a lack of product variety, with one of them stating that the tool was “extremely limited” due to this factor. Three participants expressed their desire to see the product price, which was only available after leaving the tool’s environment, to see the total price for all selected furniture pieces. One participant referred to an overall product information insufficiency as follows: “There are insufficient information about the products (e.g.,

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are the chair ergonomic, what material are the products made of...).” Another respondent mentioned the necessity to view the in-stock availability of products when choosing them from the product list, rather than after fully assembling the environment and pressing a button that takes users to the selected item list.

Four participants reported performance failures. One of them described a particular situation as follows: “I found that when trying to add anything besides the door, a window, and an obstacle that the site would not allow me to add anything else. For example, when trying to add a desk the site wouldn't allow me to do so. I then tried adding a different style desk to see if it would work, which it didn't. I tried adding another and none of them would work.” Another participant assumed that their device characteristics did not allow the tool to run smoothly, while the third participant did not provide more details regarding their experience, only writing that the tool stopped responding at some point during the interaction. The fourth participant hypothesised that the tool had stopped responding either because of their device or because of the tool being faulty.

## **6. Discussion**

This section features a discussion of first the results of the data analysis and then of the method chosen for data collection.

### **6.1. Result discussion**

The purpose of this study was to identify the factors that have an influence on customer satisfaction with interactive product visualization within e-commerce. To achieve this purpose, the research question that this study aimed to answer was “which factors of an IPV tool affect customer satisfaction?”

The results of the multiple regression analysis with pleasure as the dependent variable have in part supported the results of previous research. The present study illustrates that interactivity and perceived ease of use had a positive effect on pleasure while product variety had a negative effect. The observed positive effect of interactivity on pleasure aligns with previous findings (Ariely, 2000; Fiore, Kim, et al., 2005; Sheng & Joginapelly, 2012). The link between perceived ease of use and pleasure has not been previously studied in the context of e-commerce. This study expands the previous findings and identifies the effect of perceived ease of use on pleasure. The negative effect of product variety on pleasure does not align with the findings of a previous study by Chang (2011) that reported a positive effect of the former on the latter. More research should be done to see whether the effect of product variety on pleasure is positive. The relationship between aesthetic design and pleasure could not be observed as the coefficient did not show any statistical significance. However, findings of a study by Chang et al. (2014) suggest that pleasure is indeed affected by aesthetic design. The coefficient of entertainment was not significant, hence its influence on pleasure could not be concluded. The results from research by Liu et al. (2020), where both entertainment and pleasure scales were measured using four items, showed a positive effect of the first variable on the second. Misalignment with previous research on the effect of product variety on pleasure, as well as the coefficients for aesthetic design and entertainment lacking in significance might have been caused either by the low number of completed questionnaires or by the shortage of items that were used to measure the variables. These factors might have also caused a lower level of internal reliability of the variables. Based on the findings of the suggested model, IPV tools that are easy to

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navigate and enable customers to effortlessly interact with the environment in a meaningful way stimulate higher levels of pleasure.

The dependent variable arousal was shown to have no statistical significance based on the two variables interactivity and aesthetic design. Thus, no conclusion regarding the influence of interactivity and aesthetic design on arousal could be formed. If a larger study had been performed, the results may have aligned with the findings by Sheng and Joginapelly (2012) that interactivity had a positive effect on arousal. The influence of aesthetic design on arousal has also been confirmed as positive and significant by (Kumar et al., 2021), which contributes to demonstrating the need for more research on arousal in the context of IPV tools. A theory known as the excitation transfer effect may be one reason why the suggested model was not statistically significant. This theory, proposed by Zillmann (1971), explains that it is the intensity of arousal rather than the quality of arousal that changes with the exposure to stimuli (Xu & Sundar, 2014). If participants had been exposed to a stimulus that increased their level of arousal prior to conducting the survey, their answers regarding arousal would, according to this theory, be higher compared to participants who had not encountered a prior stimulus. The reverse is also true, if participants' beginning states were at a lower degree of arousal, the IPV tool as a stimulus would not have had as large of an impact on their states of arousal and may thereby have affected the results. As with other variables, the use of only two items to measure arousal may have had a negative impact on the results. It might have been beneficial to design the study in a way that would enable the comparison of the level of arousal before and after the interaction with the tool. As an example of how to ensure that all participants have roughly the same level of arousal, Xu and Sundar (2014) exposed participants to the same music prior to conducting the user testing.

The analysis of the dominance model showed that interactivity, entertainment, and perceived ease of use had a positive influence on dominance. The influence of these variables on dominance was not found in previous studies within the e-commerce context. Despite this, they were included in the dominance model due to relating to user control of a website by their nature. The level of perceived interactivity, enjoyment and ease with which consumers use websites are all determined partially by what users choose to interact with. Although effectiveness of information content has not been studied in relation to PAD, previous work has shown a correlation to satisfaction as



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well as the extent to which users become involved with a website (Albarq, 2021; Richard, 2005; Vijay et al., 2017). That aesthetic design was not statistically significant contradicted a study by Hsieh et al. (2014) that found that aesthetics had both a positive and significant effect on dominance. Similarly, informativeness was found to be insignificant, while prior work found a positive relation between informativeness and dominance (Essawy, 2019; Hsieh et al., 2014). From the variables that did show significance, this model determined that IPV tools including elements that are easy to use and understand, facilitate enjoyment, and are interactive have a positive influence on dominance.

The model that measured the effect of pleasure, arousal, and dominance on customer satisfaction indicated that pleasure and dominance had a strong positive effect. This correlates to results found in a study by Moez and Jamel-Eddine (2012) where both pleasure and dominance influenced satisfaction positively. The significance of pleasure is also in line with the results by Eroglu et al. (2003). That the effect of arousal was not found to be significant, on the other hand, is contrary to several past studies (Eroglu et al., 2003; Ha & Lennon, 2010; Moez & Jamel-Eddine, 2012). This may be due to the low reliability of the scale as demonstrated by Cronbach's alpha as well as the scale having only two items.

Based on the findings of this study, customer satisfaction in the context of IPV tools is moderately affected by pleasure and dominance. In turn, pleasure was positively affected by interactivity and perceived ease of use, and negatively affected by product variety. Additionally, dominance was positively affected by interactivity, entertainment, and perceived ease of use. Hence, interactivity, and perceived ease of use were concluded to be the most significant factors, the variance of which would lead to a higher level of variance in the customer response, namely customer satisfaction.

The hypotheses partially hold up against the proposed models, as some of the IPV tool's stimuli influenced the organism (H1) and pleasure and dominance that represented the organism influenced customer satisfaction (H2).

## 6.2. Method discussion

Using a survey to gather data allowed for insight to be collected from a larger group of people who have access to IKEA's IPV tool compared to conducting other forms of

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data collection, such as interviews or user testing. A qualitative method may have generated more detailed results concerning individuals' opinions and individual experiences, including technical difficulties. More time could then be spent on understanding the customer perspective and finding problematic areas of usage. With a survey, probing questions were not possible. For this study, however, in-depth responses were not essential for answering the research question. A wider range of perspectives was prioritised and, given the timeframe of this study, a large number of interviews or user tests was not feasible to complete.

The number of valid responses collected (N=115) is however a limitation. Several factors may have affected the low response rate. Since the survey required respondents to perform multiple tasks on an external website, the effort for completing the survey may have been considered too high and increased the drop-out rate. A shorter survey with fewer questions may have garnered a different result. Another factor was that IKEA's IPV tool was only supported for use on laptop and desktop computers. With mobile phones holding about half of the global website traffic (Statista, 2021a), this technological limitation may have served as a barrier to participation. In addition, some respondents indicated having technical difficulties with accessing the tool, this could point to hidden statistics on the number of people who withdrew from completing the survey.

Each questionnaire item was validated through support from previous literature. A few of the variables did not meet the commonly accepted criteria for reliability according to Cronbach's alpha and Spearman-Brown's coefficient, namely effectiveness of information content, perceived ease of use, and arousal. As previously mentioned, the low internal validity of these variables might have been caused by a lack of items, as they have been composed using only two items, rather than the full number used in the studies they were taken from. Some items from the original scales were not included as they were unrelated to the scope of this research. Despite this deletion, the use of these variables in prior similar studies indicates the reliability of adopting them in this study. The indicated low level of internal reliability might have caused inaccuracies in the regression results. If a greater number of items in each scale was used, the variables could have been more reliable and may have provided results that are more consistent with previous research. On the other hand, taking in consideration the number of scales

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used in the present study, adding more items to each scale may have increased response bias caused by participants' fatigue (Agbo, 2010).

### **6.3. Limitations**

One of the main limitations of the study was a low number of responses and therefore a poorly represented population. The data is limited in its generalisability by the demographics of participants. The majority of respondents were from Europe, most were female and within the age group of 18 to 24, more diverse nationalities, genders, and ages would help improve the external validity of the study. No definitive sampling criteria were imposed on the sample, which might have led to higher variance in participants' experiences with the tool. Reasons for existing variance may be uncontrolled factors such as previous experience with similar tools, type of device used to access the tool and quality of internet connection. As IPV tools are heavily reliant on device performance to function as intended, the study may benefit from having hardware and software as controlled factors. However, the IPV tool provided by IKEA is accessible on laptop and desktop computers with lower performance capabilities and was therefore expected to operate on any respondent's computer.

The reliability of the survey was impacted by the fact that multiple scales were composed of only two items. The decision to include a greater number of stimuli has been made due to the exploratory nature of the study and due to the lack of previous research that connects the stimuli of an IPV to customer satisfaction. It was necessary to study the impact of multiple stimuli to create a better foundation for further research. To compensate for the greater number of variables, it was necessary to shorten the number of items in each scale to limit the questionnaire to a reasonable length.

The nature of online surveying acts both as a drawback and an advantage. The drawback is that there is little to no control over the participants' actions and the environment they are present in, while an advantage of this method is that it does not require the geographical proximity of the sample. Additionally, it enables the participants to complete the survey at a time that is convenient for them without being affected by the presence of task administrators or interviewers.

## **7. Conclusions and further research**

Based on the results of this study, the following text presents the conclusions that were drawn in terms of practical and scientific implications. Areas of future research conclude this study.

### **7.1. Conclusions**

The absence of tactile information and the inability to examine the products directly are two factors that tend to affect the perception of online shopping. These shortcomings of online shopping increase the probability of the purchased product not meeting customers' expectations. Technological advancements enable e-commerce businesses all over the world to improve product presentations on their websites in order to provide customers with a virtual experience that would compensate for the shortcomings of the online environment. IPV tools and other product visualisation technologies have been invented to enhance customers' virtual experience. However, there has been little research on how IPV tools affect customer attitudes and behaviour. This study attempts to address this gap and shed more light on the factors of IPV tools that determine customer attitudes in the form of satisfaction. The SOR framework that is commonly used in environmental psychology was adapted for this study, with the IPV tool's factors serving as the stimuli. Pleasure-Arousal-Dominance elements were used to represent the organism and customer satisfaction served as the response. The results suggest that interactivity, perceived ease of use, entertainment and product variety are the factors that influence organism states, namely pleasure and dominance, that in turn influence customer satisfaction.

#### **7.1.1. Practical implications**

IPV tools may be a useful strategy for online retailers; nevertheless, these retailers must develop and utilise IPV tools that are relevant, easy to use, and that contribute to the customers' virtual experience. The level of interactivity must be considered when developing IPV tools. In this study higher levels of interactivity are linked to greater satisfaction with the tool, as mediated by affective states. However, in line with the suggestion by Liu and Shrum (2002), it is highly recommended to first understand the nature of interactivity before implementing it in an IPV tool. Depending on the nature of the retail sector a company is in, some interactive features of its website's IPV tool

## Conclusions and further research

may be more integral than others. In that case, the necessity of minor features may be debated, as they possibly contribute to the disturbance or confusion of users.

Along with interactivity, perceived ease of use was found to be significant in this study. When developing IPV tools, the ease with which users can navigate through and manipulate the tool should be one of the primary concerns. Customers need to be able to use the tool to complete their intentions with the interaction. This is part of what contributes to positive customer attitudes and satisfaction. Any difficulties with using the tool may lead to frustration, which, depending on the intensity, might cause users to abandon using the tool. In order to attract customers to engage with IPV tools, the experience must be gratifying. Adding guiding features to IPV tools may help users understand the optimal sequence of interactions, as some answers to the open-ended question remarked that the tool was not easy to interact with and navigate.

Despite not showing the highest influence on customer attitudes, entertainment might still be worthy of consideration when implementing IPV tools. As noted in this study, several respondents indicated that they felt entertained while using IKEA's IPV tool. The type of interaction that is inherent to the tool, namely modelling the interior of a room, encourages playfulness and could be an attractive component of IPV tools.

IKEA's IPV tool has been developed with support for only laptop and desktop computers, as other IPV tools have. However, as the number of e-commerce purchases made on mobile phones increases, so should mobile technological support. Global mobile e-commerce purchases were estimated to hold over 70% of the total market share in 2021 (Statista, 2018). By expanding support and improving the performance of IPVs on mobile devices, businesses can gain more customer touchpoints. The ease of use may also be affected by implementing smartphone support since it is possibly more intuitive for users to interact with IPVs on smartphones as many are already familiar with tapping and dragging objects on the screen. In comparison, clicking and dragging objects using a laptop's touchpad may present more difficulties and inhibit the interaction.

### **7.1.2. Scientific implications**

This study has theoretical implications as it is one of the few studies made on the customer perception of IPV tools. The use of SOR and PAD offers a framework to view the effects that IPV characteristics have on those who use these tools. As interactivity,

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entertainment, perceived ease of use, and product variety were those variables that showed a significant impact on affective states, these variables are to be considered when researching IPV tools and customer attitudes. The remaining variables that could not be verified as influential, namely informativeness, effectiveness of information content, and aesthetic design, point to a direction either for what may be excluded or what to investigate further in subsequent research.

### **7.2. Further research**

The current study did not draw any patterns that would identify the effect of previous experience with the same or similar tools on the customer response. A larger quantitative study that would take the previous experience with IPV tools as a control variable might obtain valuable insights into how the response of people who have not previously interacted with an IPV tool differs from the experience of those who have.

As the current study allowed questionnaire participants to write about their experience with the IPV tool, some suggestions and opinions have been collected. Most answers concerned participants' experiences with the interaction aspect of the tool, as many of them could not perform tasks efficiently due to various reasons, while others remarked on how easy it was for them to manipulate the furniture within the 3D environment. Hence, it would be beneficial to conduct a qualitative study with user testing and interviews to seek improvements in user interfaces of IPV tools.

Conclusions could not be drawn from the results of the current study regarding the effect of entertainment and aesthetic design on pleasure due to their statistical insignificance, therefore future studies should seek to address this gap. The same applies to all other connections that could not be evaluated in this study due to the statistical insignificance of their coefficients. In the future, researchers should also consider using different factors to represent an individual's affective, cognitive, and conative processes. The response variable in question may also be altered to see other consequences of IPV use. Moreover, to uncover the consumer motivation behind the use of IPV tools, a study that uses the Technology Acceptance Model should be conducted. In this study, interactivity was shown to positively affect pleasure and dominance. Future research could focus on studying the interactivity of an IPV tool as a control variable and examine its effect on the variance in the consumer response.

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## 9. Appendix

### 9.1. Appendix A

#### Description of The Tasks in the Questionnaire

At this point in the survey, we kindly ask you to follow the link provided below to a page on IKEA's website.

This page is an interactive product visualization tool and it allows users to plan the interior of office spaces.

Please take your time completing the tasks in the described scenario.

English version:

<https://officeplanner.ikea.com/lt?locale=en-lt#projects/anonymous/design/Office>

Swedish version:

<https://officeplanner.ikea.com/se?locale=sv-se#projects/anonymous/design/Office>

Scenario:

You intend to furnish your home office and decided to use IKEA's planning tool. You know that the office dimensions are 3000mm x 3000mm x 3000mm.

Tasks:

1. Place one window and one door anywhere in the room.
2. Select a desk, chair, and storage unit of your preference and place them in the room.
3. Add a light source and one decorative item of your choice.
4. Play around with the furniture placements and the environment view until you are satisfied with the result.

**9.2. Appendix B****Sensitivity Analysis****Table 9***Coefficients (Dependent Variable: Customer Satisfaction)*

	Unstandardized Coefficients		Sig.
	B	Std. Error	
P (predicted)	.426	.215	.049
A (predicted)	.792	.663	.235
D (predicted)	.546	.276	.050

R Square = .669