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Beyond 2D Product Presentation in E-commerce: A Literature Review

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Abstract

Product presentation in e-commerce has gained substantial attention from disciplines including information systems, marketing, psychology and management. Many studies compare newly emerging technologies and innovative presentation formats to traditional use of two-dimensional text and pictures. However, the emergent nature of these new technologies, like consumer focused virtual reality, results in instability of form and function in three-dimensional environments. This literature review synthesises the findings of extant literature, discusses important theoretical foundations and identifies the most popular research theories and research methods utilised. Additionally, it classifies constructs used to capture characteristics of presentation formats, consumers' reactions and performance, as well as marketing effects (e.g. attitudes to product and purchase intention). The literature review concludes with a discussion of implications and suggestions for future research of product presentation in e-commerce contexts.

Keywords

Literature review, online product presentation, virtual reality, presentation format, electronic commerce.

1   Introduction

E-commerce is an integral part of our life and the success of e-commerce depends largely upon consumers' satisfaction and attitudes towards the product and the seller, influenced by many factors such as product description, website design, and service quality, etc. (e.g. DeLone and McLean (2004)). With the rapid pace of technology development and growth of e-commerce, vendors seek competitive advantage by attracting consumers through applying latest technological innovations, such as interactive 3D environments, 360° images and Virtual Reality (VR). Product presentation is no longer just about providing product information, but also a virtual experience which arouses consumers' interest towards products and enhances their memory of a target brand. However, the information systems discipline has yet to grasp the ramifications of enabling such an experience.

The use of 3D technology to create virtual worlds has proven to be successful in areas such as gaming and social media. Researchers are investigating how 3D can be used for e-commerce, but confoundingly use different terms to describe the 3D product presentation, e.g. 3D models, interactive objects, virtual try-on, virtual product experience, VR, and so on, as well as different constructs to capture the same characteristic of the presentation format, e.g. vividness, media richness and modality richness. Additionally, a misinterpretation of the term VR has been noticed, with relatively simplistic 3D models or 360° imagery in a 2D space being equated with highly interactive stereoscopic immersive 3D environments. The premise of this paper is to urge a call for clarity through a systematic e-commerce literature review of product presentation that leads to future development of a framework that disentangles and differentiates constructs.

2   Online Product Presentation

A major differentiating point from in-store shopping is that e-commerce websites depend largely on the product information presented by e-retailers instead of a more comprehensive evaluation of store environment, service quality, product trials, etc. that are available in-store. Product presentation (i.e. how product information is being presented to consumers) has a strong relationship with consumers' cognitive efforts and time spent evaluating a product (van der Land et al. 2013), interest to search further (Yi et al. 2015), confidence in product quality (Li et al. 2016), attachment to the product (Vonkeman et al. 2017) , and trust in the e-retailer (Goel and Prokopec 2009), which contribute to the purchase behaviour and reduce the dissatisfaction due to discrepancy between the product presented online and the product received (Suh and Chang 2006). E-retailers invest heavily in providing convincing product presentation and traditional ways to present products (text and pictures) is being superseded by technologies that provide a "virtual experience" of products and services.

For example, Shangri-La Hotels and Resorts has 360° videos that provide a live and dynamic experience of hotel environments and services (Wilkinson 2015). When wearing a VR headset, consumers can sense the space of the hotel, which makes them feel situated and present in the virtual environment (although limited due to lack of dimensional depth). "Virtual experience" refers to the psychological and emotional states that consumers experience when interacting with 3D product presentation or a representation of the product in a 3D environment (often both). It has the characteristics of both indirect and direct experience of the product as the product is presented in a computer-mediated environment but still can be interacted with (Li et al. 2001). To generate this virtual experience and give a quasi-realistic in-store experience, 3D product presentation, 3D replication of physical environments, virtual product experience simulators, virtual worlds, etc. have been investigated using a wide range of theories and models. Synthesising salient studies provides useful instruction on whether and how adding more sensory cues, and providing more interactive functions, can improve consumers' performance, and positively affect marketing-related effects.

3   Literature Search and Identification

The literature on product presentation and virtual experience in e-commerce is interdisciplinary, spanning the fields of information systems and marketing (other disciplines are outside scope of this study). Following the structured approach (i.e. keywords, backwards and forwards search) introduced by Webster and Watson (2002) and elaborated upon by Levy and Ellis (2006), the researchers searched and identified papers that examine product presentation and virtual experience in the e-commerce context. The researchers conducted a manual search of keywords in top-tier ABDC A* journals: AIS "Basket of Eight", Decision Support Systems, Information & Management, Journal of Consumer Research, Journal of Marketing, Journal of Marketing Research, Marketing Science, and International Journal of Research in Marketing; and conferences (with full papers): International Conference on IS,

European Conference on IS, Pacific Asia Conference on IS, Hawaii International Conference on System Sciences, and Australasian Conference on IS. Future iterations of this study will expand the search to other highly regarded e-commerce oriented journals (e.g. International Journal of Electronic Commerce) to capture quality research at the ABDC A journal level.

Given the different terms used to describe product presentation, the researchers adopted a broad range of terms to represent product presentation and virtual experience in e-commerce, and used these keywords to search for relevant research. Keywords used were: "virtual experience", "virtual product experience", "virtual world", "virtual environment", "interface design", "product presentation", "website design", "3D", "presentation mode", "presentation format", "presentation platform", "virtual reality". In the first stage, the researcher then identified 63 papers with an e-commerce context, based on viewing the keywords the authors used and the abstract section content of each paper.

By applying the inclusion criteria (i.e. having product presentation or virtual experience in e-commerce as the core focus), 32 papers remained. Based on these papers, Webster and Watson (2002)'s method of using backwards search (i.e. inclusion of relevant papers cited by identified papers) and forwards search (i.e. inclusion of relevant papers citing the identified papers) was conducted, resulting in additional 13 papers being identified. In total, 45 relevant papers were found, published in the 20-year period 1997 to 2017 (the mid-1990s saw the start of consumer VR).

4   Preliminary Review

When examining the 45 identified papers, the researchers try to identify study trends and focus, frequently applied theories, commonly used research methods, and factors used to capture the characteristics of presentation formats and virtual experience and their effects.

4.1   Research Trends

Research on product presentation and virtual experience in e-commerce grow steadily with the popularity of e-commerce, with 31 papers published from 2007 to 2017 accounting for 69% of the total identified studies. The identified studies are across four disciplines: information systems (46%), marketing (32%), psychology (12%) and management (10%). The different terms given to refer to product presentation were: presentation formats (18%), product information type (13%), product presentation design (10%), interfaces (10%), platforms (10%), media (8%), modes (5%), conditions (5%), as well as other less frequently used terms, such as mechanism and views. This review will use the term presentation formats for the sake of clarity.

The most frequently investigated presentation format was static pictures, with a large proportion of identified papers comparing other formats, such as videos and different types of 3D product presentation, to static pictures. Additionally, the other popular format is the 3D product presentation (23 papers in 20-year period). This review classifies the 3D product model, the virtual try-on, and the virtual product experience simulator into the 3D product presentation category, which are different from virtual worlds (i.e. 3D representation of a virtual environment). 16 of those papers compare 3D product presentation with pictures, with a range of findings: the superiority of 3D product presentation over pictures in generating a higher perceived product knowledge (Jiang and Benbasat 2007a, 2007b; Li et al. 2002; Suh and Chang 2006; Suh and Lee 2005), a stronger product affect (Vonkeman et al. 2017), and a more positive attitude towards a product (Jiang and Benbasat 2007a; Suh and Chang 2006), towards a brand (Li et al. 2002), and towards a website (Jiang and Benbasat 2007a), and a greater intention to use an e-commerce website (Jahng et al. 2007). The results for using 3D product presentation to increase actual knowledge, enjoyment and purchase intention are conflicting. Jiang and Benbasat (2007b) find 3D product presentation gives consumers more actual product knowledge, but Suh and Lee (2005) find no such difference. Jiang and Benbasat (2007a) find 3D product presentation provides a higher enjoyment, while Visinescu et al. (2015) find consumers have higher enjoyment from 2D product presentation. Furthermore, Jiang and Benbasat (2007b), Suh and Lee (2005), Suh and Chang (2006) and Choi and Taylor (2014) find consumers have a higher purchase intention when examining products presented in 3D, but Li et al. (2002) and Debbabi et al. (2010) show such a difference is not statistically significant (in their own studies).

Mainstream VR has surging popularity in recent years, with advances in systems that incorporate "a variety of extra-peripheral devices, such as goggles, sensor gloves, and other haptic devices that enhance the sense of immersion inside the portrayed environment" (Davis et al. 2009). For example, Westland and Au (1997) investigated "VR" in an e-commerce context 20 years ago by duplicating a shopping experience in a 3D model of a store with products displayed on shelves and allowing consumers to

navigate via a joystick-like control ("best effort" VR at the time). Their result found that participants spent more time viewing products, but there is no statistically significant difference in the number of items selected and money spent, compared to webpages with pictures.

Further misinterpretation of the term VR appears in more recent studies. A study of "VR" (Yeh et al. 2017) replicates the physical environment using panoramic images and finds that "VR" attracts more consumer attention, induces more interest, and increases behavioural intention to consume. Suh and Chang (2006) and Suh and Lee (2005) examine "VR" in comparison with static pictures and videos, with the setting limited to 3D product presentation. These "VR" studies have experiment settings that are technically and conceptually distinct from the VR concept commonly accepted today. Modern consumer VR provides a computer-generated environment where user control can be reflected by the real-time update of sensory perception via movement (e.g. head turning), triggering the illusory sensation of being in the mediated environment (Slater and Sanchez-Vives 2016). Those prior "VR" studies used either 3D product presentation or panoramic images instead. It is difficult for consumers to feel that they are present inside the virtual environment (i.e. telepresence) and they have little control of the environment (i.e. unable to choose where to go and what product to select). Consumer VR (since 2016) has leapt ahead in capabilities and content diversity, so is ripe for further exploration.

4.2 Theoretical Foundation

Table 1 lists (alphabetically) theories serving as the foundation of identified research of product presentation and virtual experience in e-commerce. Telepresence Theory and Stimulus-Organism-Response (S-O-R) framework are the most frequently used theoretical foundations. Accordingly, interactivity, and vividness and their effects on telepresence are frequently investigated.

Theoretical Foundation	Study
Cognitive Absorption Theory	Visinescu et al. (2015)
Cognitive Appraisal Theory	Yeh et al. (2017)
Cognitive Fit Theory	van der Land et al. (2013); Suh & Lee (2005); Xu et al. (2015)
Cognitive Load Theory	van der Land et al. (2013)
Cue-summation Theory	Jiang & Benbasat (2007b)
Dual Coding Theory	Blanco et al. (2010); Jiang & Benbasat (2007b); Kim & Lennon (2008)
Elaboration Likelihood Model	Jahng et al. (2007)
Flow Theory	Jiang & Benbasat (2004); Nah et al. (2011); Yi et al. (2015)
Information Gap Theory	Yi et al. (2015)
Level of Processing Theory	Li et al. (2016)
Media Richness Theory	Jahng et al. (2007); Kim et al. (2013); Xu et al. (2015)
Self-congruity Theory	Suh et al. (2011)
Social Presence Theory	Jahng et al. (2007)
S-O-R Framework	Jiang et al. (2010); Khalifa & Shen (2007); Pinsonneault et al. (2011); Shen & Khalifa (2012); Yeh et al. (2017)
Task-technology Fit	Jahng et al. (2007)
Technology Acceptance Model	Kim & Forsythe (2009); Visinescu et al. (2015)
Telepresence Theory	Khalifa and Shen (2007); Li et al. (2003); Nah et al. (2011); Vonkeman et al. (2017); Yeh et al. (2017)
Theory of Brand Equity	Nah et al. (2011)
Theory of Hedonic Consumption	Wu & Holsapple (2014)
Theory of Reasoned Action	Jahng et al. (2007); Jiang & Benbasat (2007a)
Theory of Environment Preference	Visinescu et al. (2015)
Theory of Planned Behaviour	Debbabi et al. (2010); Gabisch (2011); Jahng et al. (2007)
Theory of Positive Emotions	Nah et al. (2011)

Table 1. Summary of Theoretical Foundation

4.3 Relevant Constructs of Product Presentation in E-commerce Research

S-O-R framework is a frequently used theoretical framework, which posits a relationship between the stimuli and people's responses. The product presentation format or the characteristics of the format often serve as the stimuli. This study classifies organisms into two types: cognitive reactions (i.e. mental activity of consumers when facing the stimuli) and affective reactions (i.e. emotional state having online shopping experience). Some of the identified studies investigate how stimuli influence consumers' cognitive and affective reactions and then influence consumers' performance, while others investigate how those influence marketing effects. Figure 1 shows constructs used to measure stimuli, organism/reactions, and the influence on consumers' performance and on marketing effects.
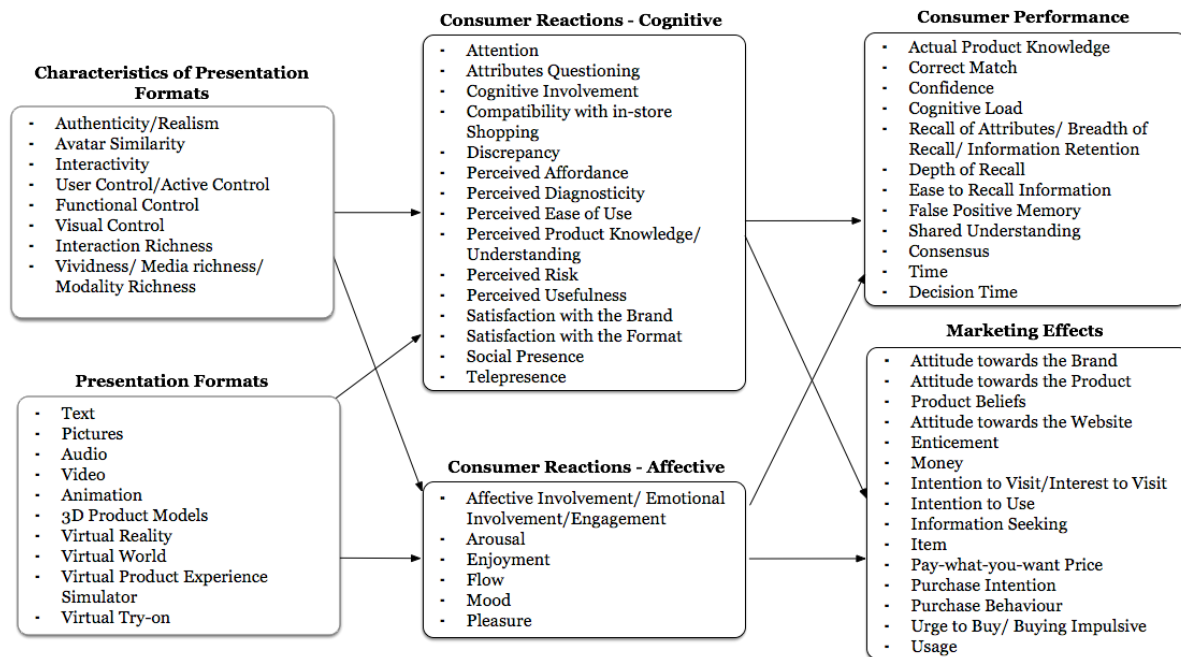
Characteristics of Presentation Formats
- Authenticity/Realism
- Avatar Similarity
- Interactivity
- User Control/Active Control
- Functional Control
- Visual Control
- Interaction Richness
- Vividness/ Media richness/ Modality Richness

Presentation Formats
- Text
- Pictures
- Audio
- Video
- Animation
- 3D Product Models
- Virtual Reality
- Virtual World
- Virtual Product Experience Simulator
- Virtual Try-on

Consumer Reactions - Cognitive
- Attention
- Attributes Questioning
- Cognitive Involvement
- Compatibility with in-store Shopping
- Discrepancy
- Perceived Affordance
- Perceived Diagnosticity
- Perceived Ease of Use
- Perceived Product Knowledge/ Understanding
- Perceived Risk
- Perceived Usefulness
- Satisfaction with the Brand
- Satisfaction with the Format
- Social Presence
- Telepresence

Consumer Reactions - Affective
- Affective Involvement/ Emotional Involvement/Engagement
- Arousal
- Enjoyment
- Flow
- Mood
- Pleasure

Consumer Performance
- Actual Product Knowledge
- Correct Match
- Confidence
- Cognitive Load
- Recall of Attributes/ Breadth of Recall/ Information Retention
- Depth of Recall
- Ease to Recall Information
- False Positive Memory
- Shared Understanding
- Consensus
- Time
- Decision Time

Marketing Effects
- Attitude towards the Brand
- Attitude towards the Product
- Product Beliefs
- Attitude towards the Website
- Enticement
- Money
- Intention to Visit/Interest to Visit
- Intention to Use
- Information Seeking
- Item
- Pay-what-you-want Price
- Purchase Intention
- Purchase Behaviour
- Urge to Buy/ Buying Impulsive
- Usage

Figure 1: Relevant Constructs of Presentation Format in E-commerce Research

4.3.1 Format Characteristics

Of 45 identified papers, 22 treated the presentation format as the stimulus, while the rest test how characteristics of the presentation format as stimuli affect consumers' reactions. In identified papers, media richness[1] (Klein 2003; Suh and Lee 2005) and modality richness (Jin 2009) shared the same concept as vividness referring sensory breadth and depth, thus are combined together. These three papers gained the concept (i.e. media richness and modality richness) from Telepresence Theory but changed the name because "media richness" is "more descriptive of the phenomenon". On the other hand, media richness[2] (Kim et al. 2013) is gained from Media Richness Theory and captures the performance of presentation format in facilitating communication. In addition, both authenticity and realism refer to how real the product or environment is presented, therefore, being classified together. Table 2 contains a summary of format characteristics of product presentation.

Characteristics of Product Presentation	Definition	Study
Authenticity, Realism	Extent to which the presented product/ environment makes consumers believe it is real.	Algharabat et al. (2017); van der Land et al. (2013)
Avatar Similarity	Extent to which an avatar looks like an individual.	Suh et al. (2011)
Interactivity	Degree to which users of a medium can manipulate the form or content of the mediated environment.	Coyle & Thorson (2001); Jiang & Benbasat (2007a); Khalifa & Shen (2007); Pinsonneault et al. (2011); Shen & Khalifa (2012); Suh & Lee (2005); van der Land et al. (2013); Voorveld et al. (2011); Vonkeman et al. (2017)
User/Active Control	The "range" of interactivity.	Jiang et al. (2010); Klein (2003)
Functional Control	Manipulation of product functionality to understand how a product works.	Jiang & Benbasat (2004)
Visual Control	Manipulation of product images to understand product looks by moving, rotating and zooming.	Jiang & Benbasat (2004)
Interaction Richness	Possibility of interaction with products and seller.	Jahng et al. (2007)
Vividness, Media Richness[1], Modality Richness	Ability of a media or communication technology to "produce a sensorily rich mediated environment", determined by sensory breadth (i.e. ability to present information across the senses) & sensory depth (i.e. the quality of information presented).	Choi & Taylor (2014); Coyle & Thorson (2001); Jiang & Benbasat (2007a); Khalifa & Shen (2007); Jin (2009); Klein (2003); Shen & Khalifa (2012); Suh & Lee (2005); Vonkeman et al. (2017)
Media Richness[2]	Extent to which interface facilitates communication.	Kim et al. (2013)

Table 2. Summary of Format Characteristics

4.3.2 Consumer Reactions

Table 3 contains a summary of constructs for the two types of organisms: cognitive reactions and affective reactions. Telepresence is the most frequently used construct. Some studies (e.g. Li et al. (2002)) refer to this feeling as "presence", whereas other studies (e.g. Shen and Khalifa (2012)) posit "presence" includes both "telepresence" and "social presence". In addition, other studies (e.g. Coyle and Thorson 2001) hold that "presence" refers to being present in real environment and "telepresence" refers to being present in mediated environment. In this research, "telepresence" refers to the feeling of being in the mediated environment and "social presence" refers to the feeling of connecting with other in the mediated environment. While some studies (e.g. Klein (2003)) highlight the influence of presentation formats on consumers' feeling of seeing the product in person as if they were in physical store, other studies (e.g. Shen and Khalifa (2012)) suggest formats such as virtual worlds can also enable the feeling of being presented in a virtual environment with other people. While the researchers noticed Shen and Khalifa (2012) treat telepresence and social presence as stimuli, this study classifies them as a type of consumers' cognitive reactions towards format characteristics (i.e. the stimuli), which is consistent with Pinsonneault et al. (2011).

Cognitive Reaction	Description	Study
Attention	Extent to which a consumer pays attention to evaluate product attributes.	Li et al. (2001)
Attributes Questioning	Uncertainty about attributes & no intent to search further.	Li et al. (2001)
Cognitive Involvement	A psychological state that is induced by utilitarian aspects of a website.	Jiang et al. (2010); Jin (2009); Li et al. (2001)
Compatibility with in-store Shopping	Extent to which a consumer feels the online shopping experience is consistent with physical stores.	Jiang & Benbasat (2007a)
Discrepancy	Differences in product presented online and received.	Suh & Chang (2006)
Perceived Affordance	Extent to which a format can provide tactile stimulation or reduce consumers' need to touch.	Li et al. (2001)
Perceived Diagnosticity	Consumers' perceptions of the extent to which a website is helpful to understand products in online shopping.	Jiang & Benbasat (2004, 2007a, 2007b)
Perceived Ease of Use	Extent to consumers perceive technology is easy to use.	Kim & Forsythe (2009)
Perceived Product Knowledge, Understanding	Extent to which consumers believe their acquisition and retention of product information is correct.	Jiang & Benbasat (2004); van der Land et al. (2013); Li et al. (2002, 2003); Suh & Chang (2006)
Perceived Risk	Possibility of suffering losses when purchasing a certain product online.	Park et al. (2005); Suh & Chang (2006)
Perceived Usefulness	Extent to which a website is expected to help online consumers to accomplish their shopping goal.	Jiang & Benbasat (2007b)
Satisfaction with Brand	Perception of pleasure fulfilment of service by a brand.	Goel & Prokopec (2009)
Satisfaction with Format	Perception of pleasure fulfilment of presentation format.	Algharabat et al. (2017)
Social Presence	Extent to which a consumer believes other individuals are psychologically present.	Khalifa & Shen (2007) ; Pinsonneault et al. (2011)
Telepresence	Extent to which one feels present in the mediated environment rather than in the immediate physical environment.	Coyle & Thorson (2001); Khalifa & Shen (2007); Klein (2003); Li et al. (2002); Nah et al. (2011); Pinsonneault et al. (2011); Shen & Khalifa (2012); Suh & Chang (2006); Suh & Lee (2005)
Affective Reaction		
Affective/Emotional Involvement, Engagement	Extent to which consumers immerse in the online product experience and feel they are a part of the experience.	Jiang et al. (2010); Wu & Holsapple (2014)
Arousal	Extent to which one feels stimulated, excited, alert, and active.	Khalifa & Shen (2007)
Enjoyment	Feeling of pleasure when interacting with the presented product	Jiang & Benbasat (2007a); Jin (2009); Li et al. (2001)
Flow	A state of optimal psychological experience when an individual completely immerses themselves in an activity and nothing else seems to matter.	Jiang & Benbasat (2004); Pinsonneault et al. (2011)
Mood	Transient affective state towards a situation.	Park et al. (2005)
Pleasure	Degree to which a person feels happy or satisfied.	Khalifa & Shen (2007)

Table 3. Summary of Consumer Reactions

4.3.3 Marketing Effects and Consumer Performance

Table 4 contains a summary of constructs for consumer performance and marketing effects. Consumer performance mainly addresses their memory about product attributes. Marketing effects focus on how a stimulus and its effect on consumers' reactions affect their attitudes towards brand, product and the e-commerce website, intention to further search product details, to purchase or to use an e-commerce website. In addition, it relates to the money a consumer spent or is willing to spend.

Performance	Description	Study
Actual Product Knowledge	Actual acquisition and retention of correct information of a presented product.	Suh & Lee (2005)
Correct Match	Match of product attributes to the product.	Schlosser (2006)
Confidence	Certainty of consumers' evaluation of product attributes and purchase decision.	Debbabi et al. (2010); Li et al. (2016)
Cognitive Load	Extent to which participants perceive the group purchasing task as difficult.	van der Land et al. (2013)
Recall of Attributes, Breadth of Recall, Info Retention	Number of product attributes a consumer can recall from their memory.	Blanco et al. (2010); Li et al. (2012, 2016); Wells et al. (2005)
Depth of Recall	Recall differences in products of same type.	Li et al. (2012)
Ease to Recall Information	How easy it is for consumers to recall product attributes from their memory.	Blanco et al. (2010)
False Positive Memory	Positive memory about presented products but the memory is incorrect itself.	Schlosser (2006)
Shared Understanding	Extent to which the individuals believe they understand others' opinions about their group purchasing.	van der Land et al. (2013)
Consensus	Extent to which the individuals believe they made the best decision for group purchasing.	van der Land et al. (2013)
Time	Time spent for a single shopping trip.	Westland & Au (1997)
Decision Time	Time used to make a team purchase decision.	van der Land et al. (2013)
Marketing Effects		
Attitude towards the Brand	Evaluation of whether the brand is associated with positive experiences.	Li et al. (2002); Liang et al. (2002)
Attitude towards the Product	Evaluation of whether owning the presented product brings positive feelings.	Debbabi et al. (2010); Jiang & Benbasat (2007a); Jin (2009); Kim & Lennon (2008); Klein (2003); Suh & Chang (2006)
Product Belief Strength	Intensity of beliefs about whether the presented product is attractive, functional, and comfortable, etc.	Debbabi et al. (2010); Klein (2003)
Attitude towards the Website	Evaluation of whether using an e-commerce website brings positive experience.	Coyle & Thorson (2001); Jeong & Choi (2004); Jiang & Benbasat (2007a)
Enticement	Extent to which presentation creates interest in product and intent to search more offline.	Khalifa & Shen (2007); Yi et al. (2015)
Money	Money spent on an e-commerce website.	Westland & Au (1997)
Intention/Interest to Visit	Intention to visit the physical location presented in the virtual environment.	Nah et al. (2011); Yeh et al. (2017)
Intention to Use	Intention to use an e-commerce website in the future.	Hamari (2015); Jahng et al. (2007); Jeong & Choi (2004); Jiang & Benbasat (2007a, 2007b); Suh et al. (2011)
Info Seeking	Intent to seek more info about the product.	Li et al. (2001, 2003)
Item	Number of items purchased.	Westland & Au (1997)
PWYW Price	Price determined by buyers instead of sellers.	Weisstein et al. (2016)
Purchase Intention	Intention to buy the presented product(s).	Blanco et al. (2010); Choi & Taylor (2014); Debbabi et al. (2010); Hamari (2015); Jiang et al. (2010); Jiang & Benbasat (2007a); Jin (2009); Kim & Forsythe (2009); Kim & Lennon (2008); Li et al. (2001, 2002); Park et al. (2005); Suh & Chang (2006); Suh & Lee (2005); Visinescu et al. (2015); Weisstein et al. (2016); Xu et al. (2015)
Purchase Behaviour	Purchasing action.	Gabisch (2011)
Urge to Buy, Buying impulsive	Experience of a sudden urge to buy some product.	Shen & Khalifa (2012); Vonkeman et al. (2017)
Usage	Frequency and hours spent using the system.	Wu & Holsapple (2014)

Table 4. Summary of Marketing Effects and Consumer Performance

4.3.4 Moderating Effects

The superiority of one format over the other is conflicting, thusly the investigation of factors contributing to the divide results needed to be examined. Product types and familiarity with presented product type have been most frequently used in research of product presentation as moderating effects.

Furthermore, two studies use product presentation format or virtual experience as the moderator. Weisstein et al. (2016)'s study shows that the presence of product video has a positive effect on consumers' perceived knowledge, perceived quality, purchase intention and pay-what-you-want price only for the unfamiliar brand. Algharabat et al. (2017) find that virtual product experience positively influences the relationship between attitudes towards the website and users' satisfaction, as well as the relationship between attitudes towards products and users' satisfaction. Table 5 summarises moderating effects investigated in the studies.

Moderator	Definition	Study
Arousal	Extent to which consumer is stimulated, excited, alert or active.	Yeh et al. (2017)
Brand Familiarity	Extent to which a consumer is familiar with a brand.	Weisstein et al. (2016)
Examination Type	Ways to evaluate the product before purchase: visual, tactile, behavioural.	Li et al. (2003)
Information Load	Amount of information provided via product presentations	Li et al. (2016)
Product Class, Domain Familiarity	General knowledge about a certain product type/ service type.	Blanco et al. (2010); Wells et al. (2005); Yi et al. (2015)
Familiarity with Website	General knowledge about a certain website type.	Blanco et al. (2010)
Product Type	Dominant product attributes: geometric and material.	Choi & Taylor (2014); Debbabi et al. (2010); Li et al. (2002)
	The complexity of quality evaluation.	Jahng et al. (2007); Jiang & Benbasat (2007)
	If a product's dominant attributes are virtually experiential	Suh and Lee (2005)
Perceived Diagnosticity	Extent product presentation is perceived useful to evaluate product	Gabisch (2011)
Virtual Product Experience	A psychological and emotional state experienced when interacting with products in a 3D environment.	Algharabat et al. (2017)

Table 5. Summary of Moderating Effects

5   Lessons Learned and Future Directions

Product presentation is still a vital topic, as new formats keep emerging. This paper synthesised the relevant research on product presentation and virtual experience in e-commerce in information systems and marketing disciplines. The findings of those studies give us some important implications.

5.1   Capturing Formats Characteristics

The researchers found 22 of 45 papers (48%) used presentation format (e.g. pictures and text) as the independent variables in their research model. For example, Nah et al. (2011) investigate how 2D and 3D virtual environments provide different levels of telepresence, which then impacts consumers' evaluation of brand and behavioural intention. Future research can consider what factors make one type of format different from another and how these characteristics trigger consumers' reactions.

Interactivity and vividness are frequently used format characteristics. Among the 23 papers using format characteristics as independent variable(s), 12 (52%) used one or both factors. Based on the original theory (i.e. Telepresence Theory), vividness and interactivity consist of sub-components (i.e. breadth and depth of vividness, speed, range and mapping of interactivity). Future research can investigate these sub-components of frequently studied vividness and interactivity.

Other relevant factors, such as place attachment, can be integrated into the model to capture media characteristics. We can see that "telepresence" and "social presence" are two importance constructs as 9 of 45 papers (20%) use either one in their model. They are closely related to the concept of space and place, and according to Interactionist Theory of Place Attachment (ITPA), features of a place can indicate and influence behaviours in it (Goel et al. 2011). Space becomes a place when people attach certain meanings to that place which is influenced by their past experiences and the features of that space. With the help of 3D VR technology, the features of shopping places in real life can be replicated virtually. Based on ITPA, people may transfer their attachment to shopping places in real life to those virtual

spaces and expect to have similar experiences. For studies such as selling products in a VR shopping mall (Lee and Chung 2008) or increasing brand equity in a virtual environment (Nah et al. 2011), the notion of space and place can be useful. It is worthwhile to investigate what characteristics of virtual space trigger this transfer of place attachment from real life to virtual, and whether the pleasurable experience in the virtual space can transfer to a certain product or brand in the real life.

5.2   Investigating Emerging Presentation Formats

Static 2D pictures and 3D product presentation have been frequently studied in extant research. However, there was no empirical study of increasingly popular innovations, such as augmented reality (AR) or immersive virtual reality (VR) (e.g. using head-mounted display) for presenting products and creating virtual experience. Though VR is not a new concept (roots in the 1950s), it only recently became affordable and accessible, with US$6.1 billion of investment between 2012 and 2015 (Llamas and Ngai 2016) triggering an influx of VR devices and content flowing onto the consumer market. Consumers now have a range of choices, from the high-end HTC Vive and Oculus Rift, to more affordable or even free Google Cardboard implementations. This affordability for adoption has led to the sudden interest of how immersive VR can be used for online shopping. eBay and Myer launched what they called the world's first virtual reality department store app. Using their app on a mobile phone with their free (or any cardboard Virtual reality) headset, allows consumers to visit a personalised VR department. Following this, another e-commerce giant, Alibaba, launched their Buy+ VR store app that promotes the shopping experience of foreign stores which do not have a physical presence in China. Two papers, Choi and Kim (2017) and Guttentag (2010), suggest possible promising application of AR and VR in exhibition and tourism. Future research can conduct studies to examine the feasibility of VR technologies for e-commerce purposes in those contexts.

5.3   Choice of Research Method

It is interesting to note that 35 of 45 identified studies (78%) used an experiment approach to investigate the impact of different presentation formats or different characteristics of presentation formats. Another 8 papers (18%) used a survey technique to collection data while only one paper used protocol analysis to collect participants' opinion. Among these 45 studies, 39 (87%) used university students as participants. There appears to be a strong preference for controlled quantitative studies with convenience sampling of participants. Future work could explore aspects such as the experience of presence or immersion through interpretative phenomenological analysis (IPA).

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