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SYSTEMATIC MAPPING STUDY: APPLICATION OF AUGMENTED REALITY IN MARKETING

ABSTRACT

Purpose: The aim of this paper is to provide an overview and analysis of literature dealing with the possibilities for applying augmented reality (AR) in marketing and the impact of AR on marketing in the era of digital transformation of business. Though attractive, this topic is still insufficiently explored.

Methodology: The paper uses a bibliometric method - citation and co-citation analysis in the Web of Science and Scopus citation databases. Data analysis was performed using the VOSviewer software tool for information construction, analysis and visualization.

Results: The conducted research revealed that there is an increasing trend in the number of research papers dealing with the AR and marketing topics. The specific topics dealt with in the papers are primarily related to the impact of AR on business, creating customer loyalty, sales increase and other marketing activities.

Conclusion: AR is a powerful and influential tool the use of which improves communication with customers and, at the same time, sales strategies and processes. AR is based on immersing customers into a new experience, by showing virtual objects in the users' real-world environment and creating harmony between the digital and the real-world environment so that the boundaries between them disappear. It is manifested as a form of experiential marketing, since it focuses both on a product and a service, and on the entire experience created for customers.

Keywords: Augmented reality, marketing, bibliographic analysis

1. Introduction

Digital transformation leads to significant changes in all segments of business, including marketing. Immersive technologies appear, which allow increased customer satisfaction by means of a new and more innovative approach to products and services. Augmented reality (AR), which creates an interactive experience, is one of them.

AR is an innovative media format that integrates virtual content into the user's real-world environment (Rauschnabel et al., 2019). The concept of AR is also defined as an artificial environment which complements the real-world environment with virtual elements, though it also allows the user to see the real world (Azuma, 1997).

Karakus et al. (2019) point out that AR has three important dimensions:

1. combination of both virtual and real items in the environment,
2. being able to interact with these items in real time, and
3. accurate registration of those virtual and real items. In other words, AR is positioned between the virtual and the real world, as

defined in Milgram's reality-virtuality (Milgram, 1994). The following figure presents the differences between the virtual environment (where all objects are virtual), augmented virtuality (where a virtual environment is augmented with real objects), augmented reality (real-world objects augmented with a virtual environment) and the real environment.

Figure 1 Presentation of the reality-virtuality continuum



Source: Milgram et al. (1994)

The concept of AR began to develop in the 1960s, after Ivan Sutherland invented the first 3D optic head-mounted display (HMD), which was then used for watching objects which are part of AR (Rabbi & Ullah, 2013). Feiner et al. (1993) published the paper “Knowledge-Based Augmented Reality”, which was fully focused on the AR system. The paper claims that the AR system is supported by HMD technology synchronized with people’s movement and their orientation, which can easily manipulate virtual objects shown in real space.

AR enhances a user’s perception and their interaction with the real world, since virtual objects display information that the user cannot directly detect with their own senses and make a task easier to perform (Mekni & Lemieux, 2014). The ways of application vary depending on the type of AR technology used, devices and applications; however, their common characteristic is that they can allow synchronization of virtual objects in real time (Javornik, 2015).

AR was initially used in military and medicine, while at present it has a widespread application in tourism, sports, education, marketing and architecture (Rabbi & Ullah, 2013). AR has led to significant changes in various areas, including marketing, where the emphasis is on its impact on a user’s brand perception, and on the change in user experience when making a purchasing decision (Javornik, 2015). The use of AR in marketing provides

the organization with the advantage in promoting a product or a service through interactive experience in a real-time environment, by means of changing the entire concept of product presentation and transforming user experience (Ching & Ramasamy, 2018). Experiences in the use of AR are exploited for gathering data on customers and customer relationship management (CRM), which in turn allows companies to gain advantage in further development of products and services, which will be modified by AR application (Nanda, 2012).

Though attractive, this topic is still insufficiently explored. Therefore, the aim of this paper is to provide an overview and analysis of literature dealing with the possibilities for applying AR in marketing and the impact of AR on marketing in the era of digital transformation of business.

2. Augmented reality and application in marketing

In recent years, digital information and communication technologies have significantly affected marketing, and therefore we describe the concept of digital marketing, which can be defined as an “adaptive, technology-enabled process by which firms collaborate with customers and partners to jointly create, communicate, deliver and sustain value for all stakeholders” (Kannan & Li, 2017). Together with continuous advances in technology, a need arises for communication with customers

through new and interactive ways to make marketing content more attractive (Yuksel & Tolon, 2017; Foster & Yaoyuneyong, 2014). Since the emergence of more sophisticated technologies allows synchronization of the environment, objects and persons, marketers thus perceive AR technology as a very promising technological tool that can produce satisfactory consumer experience resembling the experience in the physical environment (Alcañiz Raya et al., 2019). AR allows marketers to combine the traditional and the digital methods to create an exciting interaction between customers and a brand (Al-Modwahi et al., 2012). Bulearca & Tamarjan (2010) conclude that the use of AR technology has a positive impact on brand sustainability, and that building a relationship has become an important marketing tool for owners of small enterprises in their ability to cope with competition (Foster & Yaoyuneyong, 2014). Most mobile applications using AR focus on interactive marketing campaigns. The second way of using AR is based on placing 3D models or holograms around, and changing their position. Undoubtedly, these applications offer a unique experience for customers (Yuksel & Tolon, 2017).

Javornik (2014) defines three assumptions related to AR in marketing. First, the advanced AR tools are able to establish interaction in real time between products, brands, consumers and physical space. Secondly, AR simulation ability allows managers to digitally promote and present their products in a far more efficient way than before. Thirdly, advanced visual presentations in AR create a superb user experience. Due to its relatively new emergence, AR also often creates the wow effect for customers.

From a user's perspective, AR is entertaining, while from a marketing manager's perspective, it can increase brand awareness and trigger consumer engagement. AR provides marketers with important data on campaign effects (Feng & Mueller, 2018). In relation to AR advantages, Matta & Gupta (2019) mention real-time interaction, momentary feedback, personalization, attraction by means of games and tracking the return on investment (ROI).

In terms of shortcomings of AR, Feng & Mueller (2018) claim that marketing practices supported by AR increase an individual's curiosity about new experiences, but that curiosity typically diminishes after repeated or prolonged interaction. Furthermore, consumers who are not innovative will perhaps not have the pleasure of learning how to use new technology and media formats offered by AR, while some consumers may consider the steps nec-

essary for installing AR application on their phones as fairly difficult and boring. For consumers who prefer the actual shopping experiences, virtual experiences offered by AR do not allow them to judge what a product actually looks like. One should also take into account a frequent need for linking with a PC due to the power of a processor, the inability to fully recognize 3D objects, a lack of actual spatial awareness, and the ability of devices to recognize 3D objects only from a certain angle. In addition, it is also necessary to develop hardware - devices should be improved so as to be lighter, more compact and easy to use (Mekni & Lemieux, 2014). For example, many headphones and glasses are bulky and have a limited visual field, contrast and resolution (Mariani et al., 2017).

AR has a powerful potential for contributing to integrated marketing programs. However, to reach its full potential, marketers must focus on the ways to maximize the function of contextual integration of AR for virtual content to perfectly fit in a user's real world and to develop a truly immersive consumer experience. In AR experiences based on mobile devices, marketers can offer users a greater freedom to manipulate AR content which is integrated into their real world, so that these users can gain a feeling of independence and self-containment. Through such consumer-brand interaction, consumers can better understand characteristics and advantages of a product (Feng & Mueller, 2018).

Scholz & Smith (2016) list important elements necessary for the design and optimization of AR campaigns: defining the target group, defining communication goals, determining the way in which AR will be implemented, creating contents that will be part of AR, and planning the possibility for integrating AR content with the physical world. Poushneh (2018) lists the following assumptions that marketers should keep in mind when it comes to using AR:

1. If customers are satisfied with the purchase, they are less likely to return the product and the repeat purchase will occur.
2. The better customer experiences, the more convinced they would be to use AR, and better experiences are achieved when customers trust technology.
3. Although the entertainment aspect is important, people will trust AR only if the application can display a product as accurate, correct and with all the information.

- AR can display the current product promotion. For example, when customers visit a store, they can use their phones to see virtual product information and current promotions and discounts.

AR helps customers by simplifying the purchase. To increase customer satisfaction, it is possible to effectively use AR applications. For example, retail

stores can be equipped with a *Magic Mirror* so that customers can virtually try on the clothes to see how they looks on them. Using AR technology in the store both entertains customers and encourages them to stay there longer. Accordingly, AR increases in-store traffic (Haumer et al., 2019).

The table below shows several examples of the use of AR in marketing campaigns.

Table 1 Examples of the application of AR

BRAND	WAY OF APPLICATION	RESULT
Volvo Cars Source: Håkansson (2018)	<ul style="list-style-type: none"> WebAR Promotion of the new S60 model 	<ul style="list-style-type: none"> Positive user experience Registered an increase of 293% in traffic
Pepsi & Co Source: Jin & Yazdanifard (2015)	<ul style="list-style-type: none"> An LED screen at a bus stop in London Unusual appearances such as aliens or cheetah 	<ul style="list-style-type: none"> Positive reactions of passers-by Millions of views on YouTube Generated the WOM effect
Samsung Source: Watson (2020)	<ul style="list-style-type: none"> WebAR and scanning QR code Presence at virtual events Presentation of new products 	<ul style="list-style-type: none"> Attracting user attention Positive experience Appearance in all media as an example of creating innovative content
Strava - fitness application Source: Becker (2017)	<ul style="list-style-type: none"> <i>FitnessAR</i> Application 3D image of maps that display hiking, cycling and running routes The image is projected onto a table or a flat surface which can be managed 	<ul style="list-style-type: none"> User satisfaction Novelty in the area of fitness applications Users' interest in the application
Kinder Source: Cambosa (2021)	<ul style="list-style-type: none"> <i>Applaydu</i> Application For children Animated animals, games, interactive stories 	<ul style="list-style-type: none"> Entertainment for children Increased product sales
Hyundai Source: Håkansson (2018)	<ul style="list-style-type: none"> <i>Virtual Guide</i> Application Car interior display Information on how to use certain functions 	<ul style="list-style-type: none"> Makes things easier for car owners Satisfaction Fast acceptance of the application

Source: Adapted according to Håkansson (2018), Jin & Yazdanifard (2015), Watson (2020), Becker (2017), Cambosa (2021)

It can be concluded that experience with AR results in user satisfaction and generated interest in products and services as well as increased sales and fast acceptance of new technology.

3. Presentation of research findings

Methodology

The paper is aimed at studying the connection between concepts of AR and marketing, i.e., the extent of the tendency to write academic papers on AR in marketing. Research questions to which answers will be provided are as follows:

- To what extent is the domain “augmented reality in marketing” present in academic papers and what is the trend in research?, and
- What is the strength of linkage between the most cited papers?

The study will use bibliometric methods, analysis of bibliographic pairs and co-citation analysis of the data from two citation databases – Web of Science and Scopus. Co-citation analysis allows an overview of conditions and structure, and the stages of the development of individual areas over a given time period (Bušelić, 2018). In terms of co-citation analysis, the frequency of co-citation represents the

measure of linkage between/similarity of two papers, and in this case, the relationship is dynamic, since the papers have been cited for a long time after their publication. In terms of measuring co-citation power, the degree of relationship or linkage between papers is measured by the perception of citing authors. Based on the analysis of common citations, clusters are generated that make up sets of linked papers (Marić, 2019).

The study used the VOSviewer software tool, by means of which data from citation databases can be analyzed and visualized. Data were extracted in March 2021 from the Web of Science and Scopus citation databases. All types of records were extracted and analyzed, which were searched in both databases by the following keywords: “augmented reality” AND “marketing”. The search was conducted in English, since most academic papers are written in English.

After the academic areas had been selected in both databases, a total of 70 papers and 1,730 papers were extracted from the Web of Science and the Scopus database, respectively. The following areas were selected for the analysis of the Scopus database: *Business, management and accounting* and *Economics, econometrics and finance*, while the analysis of the Web of Science database encompassed the following areas: *Business* and *Management*. Evidently, the Scopus database includes far more papers than WoS, although the paper will not examine the reasons for such variance. Consequently, data analysis

will be conducted separately for both citation databases, since they differ in nature and cannot be merged in the analysis, primarily due to coverage in terms of the number of papers. Furthermore, the results will be compared, which highlights the complexity of the research.

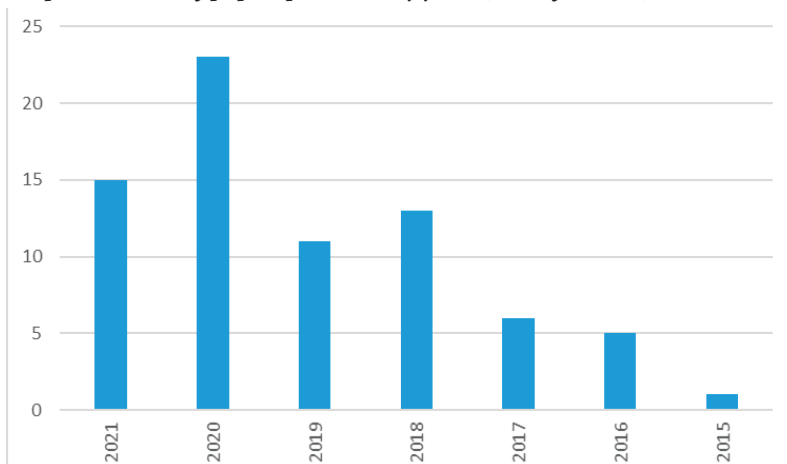
Presentation and discussion of findings

RQ1: To what extent is the domain “augmented reality in marketing” present in academic papers and what is the trend in research?

The analysis was conducted of data extracted from Scopus and WoS databases and a significant disproportion between them was observed. It should be noted that the Scopus database has broader coverage, which can be decisive for the multiple difference between the databases. Due to the assumption that variances can occur, it was previously determined that the analysis will be conducted in both citation databases.

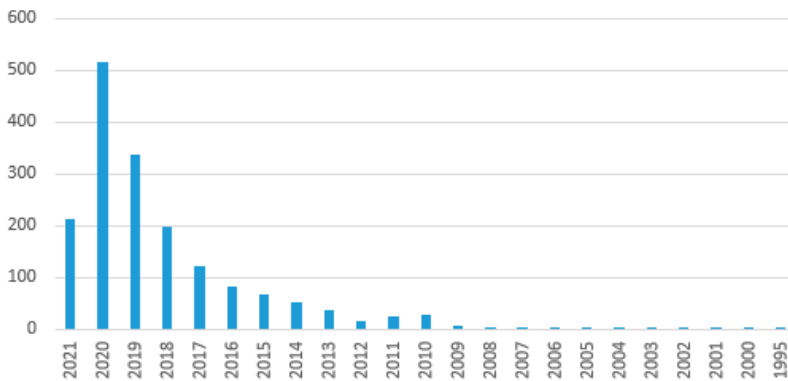
Graphs 1 and 2 describe the trend in this area; most papers in the WoS database were published in 2020. Since 2010, an increasing trend in the number of published papers can be observed, which suggests increasing interest in the area of AR and marketing. Similar results were obtained in the Scopus database, where a positive increasing trend was also observed. The year 2020 witnessed an exponential increase, and it is assumed that 2021 will witness more published papers compared to previous years.

Graph 1 Number of papers published by years (Web of Science)



Source: Authors

Graph 2 Number of papers published by years (Scopus)



Source: Authors

Although there are variances in the number of papers between the databases, with respect to the countries with the most research papers published in the area of AR and marketing, both databases reveal the same results, i.e., there is correspondence

for the first four countries. An overview reveals the prevalence of papers by authors from the United States of America followed by England (WoS)/ Great Britain (Scopus), Australia and Germany.

Table 2 Overview by countries for both databases

SCOPUS		WOS	
Country	Number of papers	Country	Number of papers
USA	376	USA	25
Great Britain	277	England	17
Australia	143	Australia	11
Germany	137	Germany	8
China	123	The Netherlands	6
Italy	116	Italy	5
India	99	France	4
Spain	96	India	4
South Korea	79	South Korea	3
France	71	Portugal	3

Source: Authors

In addition to a significant variance in the number of papers between the databases, both databases show the same most relevant journals in this area by the number of published papers and the number of citations. In both databases we found correspondence of two most relevant journals. The *Journal of Retailing and Consumer Services* has 90 papers published in the Scopus database in the area

of AR and marketing, while the WoS database has seven papers, thus it ranks first in both databases. The *Journal of Business Research* ranks second, with 57 papers published in the Scopus database, and six papers in the WoS database.

With the aim of examining the research trend in the target area, the occurrence and the importance of key terms were analyzed over the time period from

2015 to 2020. The goal was to describe the structure of research papers and their correlation within the area based on keywords and to show the trend present in the studies. In the Scopus database, 6,438 words were extracted from titles, keywords and abstracts; and adding a minimum threshold of 17 occurrences, a total of 63 most frequent keywords

were extracted. In the WoS database, a total of 509 words were extracted from titles, keywords and abstracts; and adding a minimum threshold of three occurrences, a total of 62 most frequent keywords were extracted.

The table below shows keywords that occur most frequently, i.e., the most frequent topics.

Table 3 Overview of keywords

SCOPUS		WoS	
KEYWORDS	OCCURENCE	KEYWORDS	OCCURENCE
augmented reality	177	augmented reality	43
virtual reality	172	technology	19
retailing	92	impact	17
marketing	75	interactivity	14
innovation	71	model	11
consumption behavior	68	e-commerce	9
tourism	66	acceptance	9
technology adoption	60	experience	9
Industry 4.0	57	information	8
electronic commerce	54	adoption	8
technology	45	virtual reality	8
social media	44	consumers	8
e-commerce	42	framework	7
artificial intelligence	42	environments	6
sales	39	responses	6
costumer experience	38	technology acceptance model	6
internet	37	online	6
literature review	37	retail	6
tourist destination	35	information-technology	6
perception	33	decision-making	6

Source: Authors

Analysis results revealed that *augmented reality* is the most frequent term in both databases. The term *marketing* ranks fourth in the Scopus database, while in the WoS database it is not present among the first twenty most frequently occurring keywords. Figure 2 shows the linkage between the term AR and other terms, and the total strength of

mutual relationships amounts to 213. AR is linked with all keywords in different periods. In the Scopus database, the strength of mutual links between AR and other terms amounts to 312. Figure 3 reveals that the frequency of keywords linked to AR is greater starting from 2018.

Results related to WoS show that studies in this area are significantly linked with the following terms: technology, impact, interactivity, model and e-commerce. Consequently, it can be concluded that studies focus on investigating AR technology itself, its impact, creating interactions with the real and the virtual world, use in online sales and acceptable models. The most frequently used keywords in 2019 and 2020 were experience, customer satisfaction, sensory marketing and context, which suggests that studies continue to investigate how AR in marketing creates a new experience, how it affects customer satisfaction and what the importance of sensory marketing is. Since AR in marketing is a relatively new area, it is understandable that these keywords occur, because numerous possibilities offered by AR in marketing are still being studied.

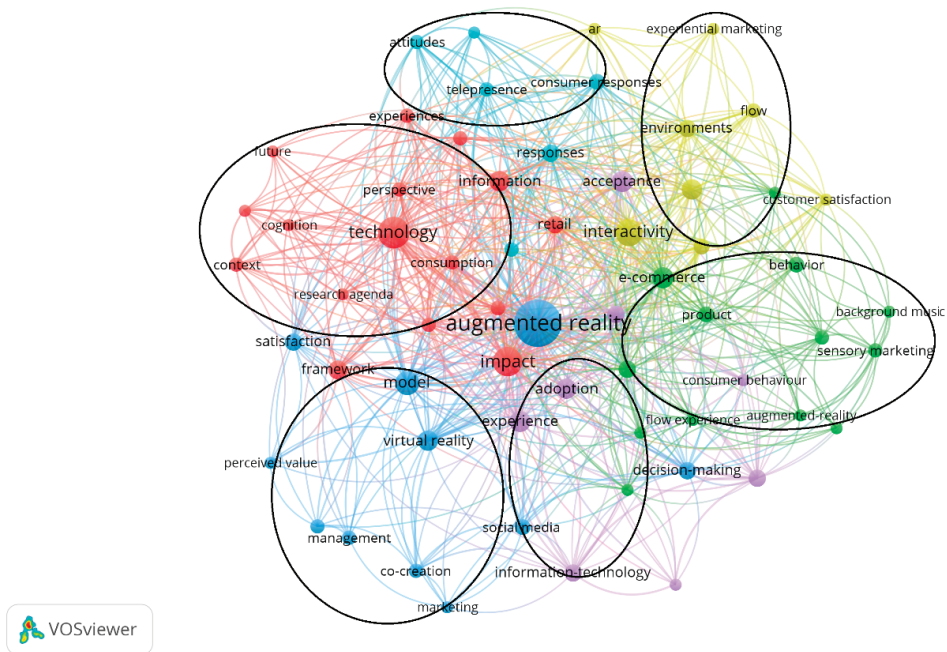
The Scopus database shows somewhat different results for the most frequent keywords. The most frequent keywords typically occur starting from 2019 onwards. With the exception of terms AR and VR (virtual reality), which have the highest degree of

occurrence and links with other terms, keywords occurring from 2019 are loyalty, sales, tourism management, smart tourism, artificial intelligence, combined reality, and digital transformation. Notably, studies focus on investigating new technologies and finding all the possibilities and advantages provided by digital transformation.

Cluster analysis of keywords was conducted. The VOSviewer software algorithm determines the number of clusters by defining and grouping them based on mutual links. Clusters are ordered hierarchically, from the most significant to less significant ones. The clusters are assigned different colors for easier identification. Thus, there are six clusters for the WoS database and five for the Scopus database. Creating clusters of keywords results in a better insight into the structure of academic papers in the observed area, and they can serve as an instrument for monitoring the development of the academic field in the future.

Identification of six clusters in the WoS database is shown in Figure 4.

Figure 4 Map of keywords with identified clusters - WoS



Source: Authors

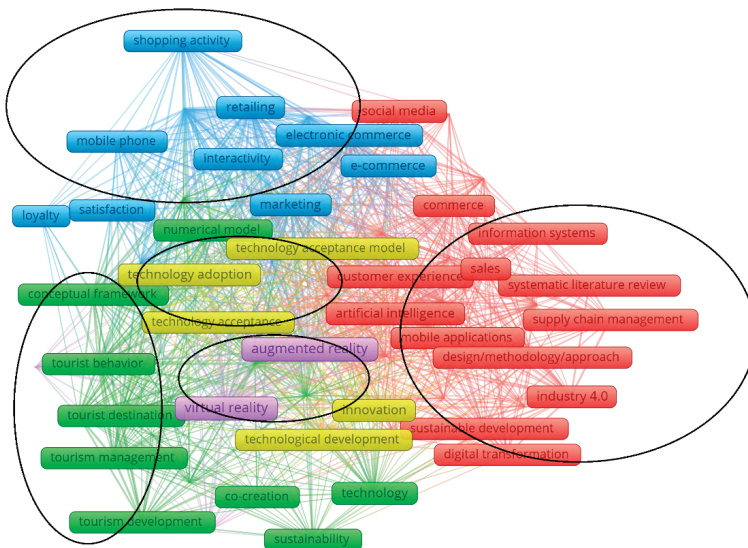
- a) The first cluster (marked in red) includes 16 keywords. They form the basis for the conclusion that papers in this cluster focus on technology and its impact on customer satisfaction, sales and consumption, context creation and provision of information.
- b) The second cluster (marked in green) represents papers dealing with the psychological impact of AR. The keywords include perception, trust, *word-of-mouth*, sensory marketing and behavior.
- c) The third cluster (marked in blue) includes papers focusing on studying AR in marketing and management, as well as in tourism, and on the application of AR in social media.
- d) The fourth cluster (marked in yellow) represents papers that investigate how AR and VR create customer satisfaction, and how they encourage interaction and entertainment.
- e) The fifth cluster (marked in violet) includes papers that study the acceptance of AR technology, consumer behavior and creation of the positive AR experience.
- f) The sixth cluster (marked in light blue) represents papers dealing with consumer atti-

tudes toward AR, their responses and interaction with AR.

A total of five clusters related to keywords were identified in the Scopus database, which are shown in Figure 5.

- a) The first cluster (marked in red) includes papers focusing on digital transformation, information systems and artificial intelligence combined with AR.
- b) The second cluster (marked in green) includes papers on AR mostly related to the development and sustainability of tourism and tourist behavior.
- c) The third cluster (marked in blue) includes papers dealing with the creation of interaction, customer loyalty and satisfaction using AR, as well as with enhancement of sales and sales activities.
- d) The fourth cluster (marked in yellow) includes papers that study technological developments and innovation, as well as the acceptance of AR technology.
- e) The fifth cluster (marked in violet) includes papers that study AR and investigate the presence of virtual and combined reality.

Figure 5 Map of keywords with identified clusters - Scopus



Source: Authors

The most significant authors in the area of AR and marketing were analyzed using data in both databases. The results reveal that a greater representation of papers in the Scopus database does not

change the ranking of leading authors compared to the WoS database. The six leading authors are the same in both databases, with minimum differences.

Table 4 The most significant authors in Scopus and WoS citation databases

AUTHOR	Scopus		WoS	
	No. of papers	Mutual links	No. of papers	Mutual links
De Ruyter, K.	12	8,620	7	3,585
Keeling, D. I.	11	8,491	4	2,472
Chylinski, M.	10	8,297	5	2,992
Mahr, D.	9	7,801	5	3,096
Hilken, T.	8	7,079	6	3,542
Heller, J.	8	6,660	4	2,326

Source: Authors

In both databases, Ko de Ruyter is one of the most significant authors in the area of AR and marketing, with the greatest number of published papers and most mutual links. Mutual links signify the extent to which one author is linked with other authors. The VOSviewer software algorithm determines the authors' mutual links. According to the WoS database, his most cited paper in the given area is *Augmenting the eye of the beholder: exploring the strategic potential of augmented reality to enhance online service experiences*.

Co-citation analysis in the Scopus database reveals that Dimitrios Buhalis has most co-citation links with other authors and their papers. The strength of co-citation links amounts to 55,102 and it represents the degree of relations among the authors' papers that are cited together. In the WoS database, the author with the greatest strength of co-citation is Philipp Rauschnabel, who has 142 co-citation links, with the strength of 1,509.

RQ2: What is the strength of linkage between the most cited papers?

When taking into account results from the Scopus database, it can be observed that the most cited paper is *Information Privacy Research: An Interdisciplinary Review* by H. Jeff Smith, Tamara Dinev and Heng Xu, which was published in 2011. The strength of linkage between this paper and the other ones amounts to 74 mutual links. The paper titled *Privacy in the Digital Age: A Review of Information*

Privacy Research in Information Systems by France Bélanger and Robert E. Crossler ranks second. The paper was published in 2011 and has a negligibly smaller linkage strength, or more precisely, 70 mutual links. In addition, these two papers are linked in a way that they are part of one of the six generated clusters. The second most cited papers that have the strong linkage of mutual links are *A Typology of Technology -Enhanced Tourism Experiences* (65 mutual links), and *Virtual reality: Applications and implications for tourism* (46 mutual links with other papers). These two papers make up one of the clusters.

In the WoS database, the obtained results differ and there is no correspondence of papers with the Scopus database within the ten most cited papers in both databases, with the exception of one paper that is the most cited paper in the WoS database. It is the paper titled *Virtual reality: Applications and implications for tourism* published in 2010 by Daniel Guttentag; however, it does not have a significant number of mutual links with other papers. Furthermore, this paper ranks second in the Scopus database by the number of citations and mutual links. In the WoS database, the paper with the greatest number of links with other most cited papers is *Augmenting the eye of the beholder: exploring the strategic potential of augmented reality to enhance online service experiences*, published in 2017 by Tim Hilken, Ko de Ruyter, Mathew Chylinski, Dominik Mahr and Debbie I. Keeling. Its strength of linkage amounts to 120 mutual links. The next

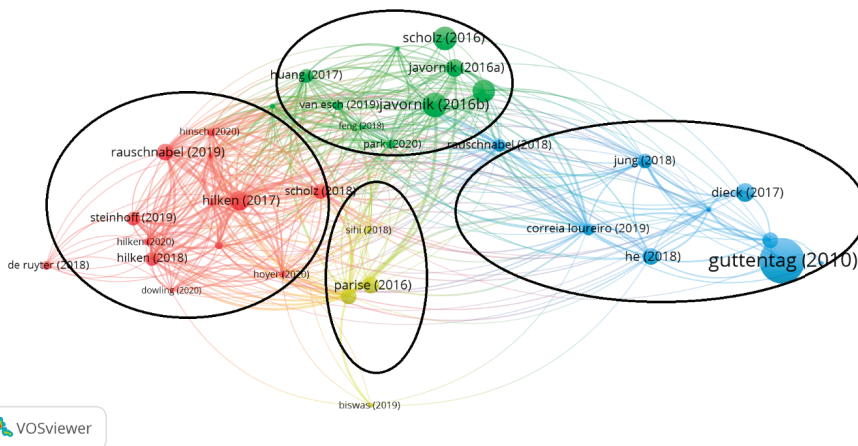
two papers have the strength of linkage with other most cited papers amounting to 113 and 112 mutual links, respectively. These are papers *'It's an illusion, but it looks real!' Consumer affective, cognitive and behavioral responses to augmented reality applications* and *Augmented reality: Research agenda for studying the impact of its media characteristics on consumer behavior*. It should be noted that the Scopus database has broader coverage than WoS. In terms of AR and marketing, the Scopus database published 1,730 papers, while the WoS database published only 70 papers. It was expected that a

variance in the number of papers would affect the category of the most cited papers.

Cluster analysis was conducted of the papers in both citation databases, with the aim of obtaining a better insight into the structure of papers. Clusters consist of sets of related papers based on the analysis of common citations. Four clusters were identified in the WoS database, while six clusters were identified in the Scopus database.

Cluster analysis - WoS database

Figure 6 Cluster visualization - WoS



Source: Authors

The first cluster (marked in red) mostly pertains to papers focused on customer perception and their motivation for the purchase. The most significant authors in this cluster, De Ruyter, Keeling, Hilken and Mahr, focus on customer experience and the entire shopping experience. The paper *Making omnichannel an augmented reality: the current and future state of the art* concludes that AR offers endless possibilities to provide users with the impeccable “journey”, while the authors of the paper *We ARE at home: How augmented reality reshapes mobile marketing and consumer-brand relationships* suggest that AR has the potential to completely reshape the purchase experience.

The second cluster (marked in green) consists of papers focused on studying the way in which augmented reality affects customers and their purchase. The authors of the paper *Anthropomorphism*

and augmented reality in the retail environment (Esch et al., 2019) conclude that brands benefit when managers make AR a crucial part of the retail experience. The fourth industrial revolution is making augmented reality (AR) possible, which has the potential, among other things, to profoundly alter the ways in which individuals purchase and consume goods. Furthermore, the papers conclude that innovative marketing experts can now make use of augmented reality to generate impressive brand experiences, create interactive advertising and allow consumers to experience products and spaces in new ways.

The third cluster (marked in blue) is most closely related to the topic of the application of augmented reality in tourism and for the purpose of preserving cultural heritage. User experience is still the most important factor. Besides augmented reality, the

authors also study the influence of virtual reality. Dieck & Jung (2017) claim that augmented reality is considered as a way to preserve history, improve visitor satisfaction, generate a positive word-of-mouth story, attract new target markets and contribute to the positive experience.

The fourth cluster (marked in yellow) also deals with customer experience, and additionally studies sensory marketing. Sensory elements are an important aspect of both offline and online retail stores, and can unconsciously affect consumer judgements and behavior when purchasing. People are increasingly

purchasing (e.g., food, clothes) and consuming (e.g., movies, courses) online, where sensory interaction has traditionally mostly been limited to visual, and to a lesser extent, auditory inputs. However, other sensory interfaces (e.g., including touch screens, together with a range of virtual and augmented solutions) are increasingly being made available to people to interact online (Petit et al., 2019).

For a better insight into the papers which make up the clusters, a tabular overview of papers with the largest number of citations by clusters is presented.

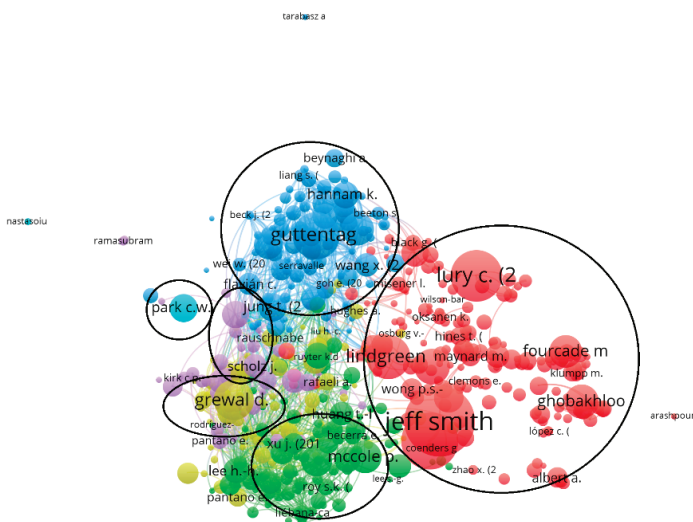
Table 5 Overview of papers by clusters - WoS database

CLUSTER 1	<ul style="list-style-type: none"> Augmenting the eye of the beholder: exploring the strategic potential of augmented reality to enhance online service experiences Augmented reality marketing: How mobile AR-apps can improve brands through inspiration
CLUSTER 2	<ul style="list-style-type: none"> Augmented reality: Research agenda for studying the impact of its media characteristics on consumer behavior Augmented reality: Designing immersive experiences that maximize consumer engagement
CLUSTER 3	<ul style="list-style-type: none"> Virtual reality: Applications and implications for tourism Value of augmented reality at cultural heritage sites: A stakeholder approach
CLUSTER 4	<ul style="list-style-type: none"> Solving the crisis of immediacy: How digital technology can transform the customer experience Digital Sensory Marketing: Integrating New Technologies into Multisensory Online Experience

Source: Authors

Cluster analysis - Scopus database

Figure 7 Cluster visualization - Scopus database



Source: Authors

The first cluster (marked in red) mostly pertains to earlier studies which focused on information security (Smith et al., 2011) and business transformation. Terms such as innovation, digitalization, and Industry 4.0 are more frequently used in the papers. In addition, they also research forging links between customers and brands.

The second cluster (marked in green) consists of the papers which primarily study consumer satisfaction. Hedonism, TAM (the technology acceptance model), customer behavior, and motivation for purchasing are frequent topics in this cluster. Lee et al. (2006) conclude that hedonic shopping orientation had a significant effect on one aspect of TAM (perceived enjoyment), whereas utilitarian shopping orientation had a significant effect on two TAM aspects (perceived usefulness and perceived ease of use). The results presented in the paper *The Impact of Website Quality Dimensions on Customer Satisfaction in the B2C E-commerce Context* (Hsiu-Fen, 2007) revealed that website design, interactivity, informativeness, security responsiveness and trust affect customer satisfaction. Furthermore, an increasing number of studies deal with topics related to VR, IoT and AR, as well as to e-sales. The authors of the paper *Predictors of customer acceptance of and resistance to smart technologies in the retail sector* (Roy et al., 2018) conclude that retail stores should focus on smart technologies that are simple, yet offer enhanced customer value through improved shopping efficiency. Findings also suggest that retail stores can engage in brand management strategies to improve customer acceptance of smart technologies. Besides, the authors focus on system quality, information quality and service quality as factors important for customer satisfaction.

The third cluster (marked in blue) is based on papers dealing with the use of augmented reality in tourism. The papers study the overall understanding of technologies and mobile applications to allow the development of e-tourism. VR and AR technologies are in focus in the case of tourism. Jung et al. (2015) point out that increased availability of smartphone

and mobile gadgets has transformed the tourism industry and will continue to enhance the ways in which tourists access information while traveling. It should be noted that the authors believe that the aim of enhancing tourism services is user satisfaction and interaction with them, typically via social networks (Minazzi, 2015).

The fourth cluster (marked in yellow) includes papers which study the impact of technologies on retail and online sales, with the focus on augmented reality. Retailers have embraced a variety of technologies to engage their customers (Grewa et al., 2017). This group of papers focuses on the customer and the experience arising from shopping (Dacko, 2017). An increasingly recognized approach that has the potential to enable smart retail is mobile augmented reality (MAR) apps. MAR apps are seen as changing consumer behavior and are associated with increasingly high user valuations of retailers offering them. It should be noted that some papers study new topics such as blockchain technology and artificial intelligence.

The fifth cluster (marked in violet) is mostly related to the previous ones. There are more topics which are studied. The focus is on the topics of virtual reality, e-commerce retail and user satisfaction. The authors of the paper *Does "Being There" Matter? The Impact of Web-Based and Virtual World's Shopping Experiences on Consumer Purchase Attitudes* (Baker et al., 2019) claim that the use of virtual worlds as an emerging technology has a significant impact on business-to-consumer commerce and on corporate Internet retail strategies.

The sixth cluster (marked in light blue) is composed of three papers. The link between the papers is research into consumer behavior and their satisfaction. The papers are only weakly related to other papers.

For a better insight into the papers making up the clusters, a tabular overview is provided for the Scopus database as well. Papers with the largest number of citations by clusters are presented.

Table 6 Overview of papers by clusters - Scopus database

CLUSTER 1	<ul style="list-style-type: none"> • <i>Information Privacy Research: An Interdisciplinary Review</i> • <i>Privacy in the Digital Age: A Review of Information Privacy Research in Information Systems</i>
CLUSTER 2	<ul style="list-style-type: none"> • <i>Privacy in the Digital Age: A Review of Information Privacy Research in Information Systems</i> • <i>The Impact of Website Quality Dimensions on Customer Satisfaction in the B2C E-commerce Context</i>
CLUSTER 3	<ul style="list-style-type: none"> • <i>Virtual reality: Applications and implications for tourism</i> • <i>A Typology of Technology-Enhanced Tourism Experiences</i>
CLUSTER 4	<ul style="list-style-type: none"> • <i>The Future of Retailing</i> • <i>Enabling smart retail settings via mobile augmented reality shopping apps</i>
CLUSTER 5	<ul style="list-style-type: none"> • <i>Virtual reality, presence, and attitude change: Empirical evidence from tourism</i> • <i>Augmented reality: Research agenda for studying the impact of its media characteristics on consumer behavior</i>
CLUSTER 6	<ul style="list-style-type: none"> • <i>Choosing what I want versus rejecting what I do not want: An application of decision framing to product option choice decisions</i> • <i>Competing with loyalty: How to design successful customer loyalty reward programs</i>

Source: Authors

4. Conclusion

The paper was focused on investigating the application of AR in marketing. Research findings reveal that, starting from 2010, one can observe the tendency of an increase of interest in research and writing academic papers in the area of AR and marketing, with the papers predominantly coming from the USA. The number of published papers increased every year, and 2020 witnessed the largest number of papers published on the given topic. Cluster analysis conducted in both databases reveals that the papers focus on technology, digital transformation, and artificial intelligence combined with AR, as well as on the impact of AR on customer experience and enhancement of sales. Ultimately, papers on AR in marketing correlated with papers related to the topic of modern technologies.

Bibliographic analysis illustrated the structure of papers in the given area. On the basis of the above, it can be concluded that studies focus on investigating AR technology itself, on its impact, creating interactions with the real and the virtual world, on how it can be used in online sales, and on investigating new technologies and their capabilities.

A review of relevant literature leads to the conclusion that AR technology provides marketing managers with the advantage when promoting products and services, by creating interactive experiences with customers and stakeholders. It creates a strong interaction between the customer and the brand and allows a personalized experience, which cus-

tomers want to experience again. The application of AR results in customer satisfaction, and therefore in a greater interest in products and services, which is accompanied with the increased sales and ultimately an increase in market shares.

A limitation of this research is the fact that it did not encompass more papers. Both citation databases include a small number of papers for the observed areas; it is particularly true for the Web of Science database and its 70 papers. The papers certainly deal with the topic that is growing in popularity. In our opinion, if the same analysis were conducted at this moment, there would be deviations in results, precisely because of the papers published after our analysis.

The paper reviewed relevant literature to clearly define the research area. In the future, the analysis should be conducted with more rigorously defined domains of marketing and augmented reality as the subject of research. We propose expanding the analysis with the customer/user domain, aimed at defining the impact of augmented reality on the customer/user more clearly through marketing activities. In addition, the area of marketing could be narrowed down so that the focus is only on digital marketing.

We believe that the paper can be used as a signpost in future research studies of this topic, which would be more comprehensive and use different techniques of bibliographic research.

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