

Augmented and Virtual Reality in Retail: A Bibliometric Analysis

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Abstract. *In the past years the topics of augmented and virtual reality gained importance as they start to have several applications in domains, such as technology, healthcare, retail, education and many more. It is well known that augmented and virtual reality, and other technologies derived from them, have the potential to boost efficiency, economy and well-being in the domains in which they are applied. In this article, we use a bibliometric approach in order to determine the current research status of these topics, highlighting interesting findings and analyzed applications. The paper focuses on finding, analyzing and discussing the main topics and key words that researchers used in their published articles. The results show that there are not many published papers related to virtual and augmented realities applied for the retail sector. However, the bibliometric analysis shows an increasing interest in these topics and reveal. Most of the published articles focus on theoretical approaches and less on their implementation in practice. The results of the bibliometric also emphasize the main key words and research direction used in recent articles.*

Keywords: virtual reality, augmented reality, retail, applications, behavior, effectiveness, metaverse.

Introduction

The global economy heavily relies on some key industries to function properly, and most of the time those are relative sensitive to changes. This is also the case for the retail industry, being one of those key industries that influences the worldwide economy. This industry has seen some major changes in the last 20 to 30 years. One change refers to the ever-increasing internet usage and the implementation of e-commerce platforms, considered the „industrial revolution” of the 21st century. Another change refers to the development of new technologies such as virtual reality (VR), augmented reality (AR) and similar technologies.

Recent years have shown a strong improvement of these type of technologies, therefore becoming more attractive and affordable to companies. Studies regarding the possible implementation of VR and AR into different business models began to emerge, and reached a point where users might be aware of the possibility that they interact with applications developed with VR and AR technology. However, since we are currently in a ramp up phase regarding the research and implementation of such technologies, it is necessary to determine the current state of research papers and implementation case studies. This paper aims to shed some light regarding this topic, analyzing various aspects regarding the papers published until the time of writing of this article. In order to further analyze the particularities of virtual reality and augmented reality we will focus on each topic individually by discussing some aspects regarding the number of papers published per

year, country of origin of the published papers and the publications in which they were published. Finally, we will show for virtual reality, as well as for augmented reality, a visualization map that shows the network of key words mostly used when searching these 2 topics and analyze those words.

Literature review

Augmented and virtual reality are terms that began to be recently discovered and to possibly offer advantages in different sectors ranging from commercial and gaming to education or healthcare. Although there is a difference between these 2 terms, often they are used in an intertwined manner. Augmented reality refers to the overlapping of specific digital components in the real world, while virtual reality refers to a whole new simulated world (Jung-Hwan et al., 2023). They are considered to be the two core reality-virtuality technologies (Xi N. et al, 2023). Implementation of augmented reality and virtual reality can already be seen in some domains, but people are not necessarily aware of that. For instance, in the gaming industry, Pokémon Go is an application that uses augmented reality to combine elements from the metaverse, like Pokémons, and by creating an environment which allows users to hunt them in the real world (Dhruv et al, 2017). Another implementation of both AR and VR can be seen in the automotive industry, where dealers use AR technology to project and show some specific components or features on a car that ultimately enhance the perception of the end users. AR applications in retail needs to facilitate the assessment of products, before being purchased (Tan et al., 2022). Another example is IKEA that allows customers to plan and arrange the products for their homes in a virtual environment. Other companies such as Ray-Ban and Sephora use augmented reality technology, in form of so-called magic mirrors to show customers how they look by wearing their products (Kowalczyk, 2021).

The implementation of AR has a positive effect on the purchase intention of customers and can boost short-term sales (Hilken et al, 2022; Tiutiutiu et al., 2025). A study conducted on 2 groups, from Italy and Germany, shows that the implementation of virtual try-on feature based on AR, enhances the online decision-making process (Pantano et al, 2017). Both groups showed support for such a tool, considering it powerful in the decision making process, due to its technical capabilities. In fact, they even showed a positive attitude towards using virtual try-on products, which promises to be a deal breaker for companies, since around 90% of both samples didn't use to buy glasses via internet (Pantano et al, 2017). The study also revealed that for the Italian sample, it is important to have a level of entertainment when using this technology and are willing to try this new technology, while the German sample is more prudent towards changes and is negatively more affected by the loading time. It is also shown that AR has a stronger positive influence on the user experience, by providing more information and enabling users to better visualize and analyze the product (Poushneh & Vasquez-Parraga, 2017). However not all information available on usual websites are presented in AR applications. For example, the rating of products or user reviews are not presented (Riar et al., 2023). This information might be valuable for the purchase decision of users. Since the research on this topic is still limited, companies are still hesitant to invest in AR (Parekh et al. 2020).

AR can be classified based on their local presence from 1 to 4 (Kumar et al, 2024). If the user recognizes that the objects are artificial in the AR reality, the local presence is considered to be low and it is called „assisted reality” (Kumar et al, 2024). If the user doesn't recognize any difference, than the local presence is considered to be high and it is called „mixed reality“. Special equipment is needed for this mixed reality to be achieved. (Kumar et al, 2024).

Kiwoong et al (2023), point out the fact that the challenges and importance of AR technologies can be compared to that of e-commerce two decades ago (Kiwoong et al, 2023). According to the authors, retailers that establish a successful metaverse, will be able to gain advantages by expanding their reach to customers that are located at long distances from them. By the implementation of AR they allow long-distance customers the possibility to visit their shops virtually. This leads to an increased flow of customers on their websites, leading to increased revenues by having higher rates of purchased goods and higher number of viewed ads on their platforms. It is also easier for retailers to design their environment since they don't have the physical restrictions of choosing a location and adapting the store according to its layout (Kiwoong et al, 2023; Pelau et al., 2023). Studies have also shown that shopping orientations can be influenced by the virtual channel that can lead to both utilitarian and hedonic experiences, thus increasing store satisfaction (Pizzi et al., 2019).

An important aspect of virtual reality is the so called „vicarious haptic effect” that refers to the active touching of products in the metaverse (Luangrath et al, 2022). The study shows that it is not sufficient just to show products and a human hand in advertisements, but that it is needs to actually touch product making VR stores to be more likely to generate cognitive responses (Jesus et al., 2019). In this way the end user is tricked into thinking that the displayed hand is his actual hand, which leads to an increased sensation of psychological ownership and an increased product valuation, therefore making him more prone to buy that product. This applies to VR, where this effect is higher for people that become stimulated by this experience due to the fact that the heart rate rises (Luangrath et al, 2022).

Virtual realities can be classified in 3 subcategories: simulations (defined as virtual interactions with virtual objects in realistic settings), automated virtual environments (AVEs – environments where users are alone and interact only with objects in that environment, excluding therefore everything from the real world) and Virtual Worlds (environments in which users create an avatar to communicate with the avatars of other users) (Cowan & Ketron, 2019). VR technology doesn't require only specific hardware and software, but it requires from the end user to have a good eyesight, to show appropriate operating skills and to have flexible body movement. Only when these conditions are fulfilled, then an efficient VR system is considered (Xi & Hamari, 2021). According to different studies, the peak effectiveness of VR is reached only at high engagement stages (Farah et al 2019). It is also important to mention that VR technology is more expensive to implement than AR. For this reason, it played a less important role in the development of retail environment compared to AR (Kim et al., 2021).

Rese et al. (2017) analyzed the acceptance of augmented reality based on the Technology Acceptance Model (TAM) proposed by Davis & Bagozzi (1986). According to this model, perceived usefulness and the perceived ease of use are still the main factors that determine the acceptance of AR (Rese et al., 2017) and can be used to analyze the acceptance of new emerging technologies.

Methodology

The objective of our research is to determine the scientific interest in virtual and augmented reality applied in retail from a managerial and business perspective. In order to achieve this objective a comparative bibliometric analysis for the key terms “virtual reality”, “augmented reality” and “retail” was performed based on articles indexed in Web of Science. The first search was based on the key terms “virtual reality” and “retail”. The results showed a total of 410 articles in general and 186 articles for the field business and management. The same procedure was applied for the key

terms “augmented reality” and “retail” and the results showed a total number of 386 articles and 205 articles for the business and management field.

The interpretation of results consisted of the steps. In the first step a descriptive statistics of journal articles was performed. There was analyzed the evolution of number of articles in time, the distribution per country and per publication. The second part of the interpretation consisted of the creation of key word clouds with the help of VOS Viewer based only on articles from the business and management field. Considering that articles about virtual and augmented reality frequently refer to technological issues, we included in the key word clouds only papers from the business and management fields. The selected articles were introduced in the VOS Viewer and main key were identified based on the grouping of key words.

Results and discussions

The first analyzed aspect is the magnitude and evolution of research papers containing the topics virtual reality and augmented reality in relation to retail. We analyzed the number of research papers for a 14-year period, from 2010 up to 2014 in order to determine the preoccupation and interest towards this topic.

The results show that in the last 7 years, there was an exponential growth of published papers for both virtual reality and augmented reality combined with retail. Although we can see a constant positive tendency, the biggest period of growth for both virtual reality and augmented reality, combined with retail, was between the years 2020 and 2021. One major influence factor for this interest can be the global crisis caused by the Covid-19 pandemic, during which businesses needed to adapt their operating models to the online field. This created new opportunities for the two domains. Both topics, virtual reality & retail, and augmented reality & retail, tend to have a similar pattern when considering the published papers, although augmented reality & retail does have an advantage over virtual reality & retail. This is due to the fact that it is easier to implement. The comparative analysis between the research interest towards virtual reality and augmented reality can be seen in figure 1.

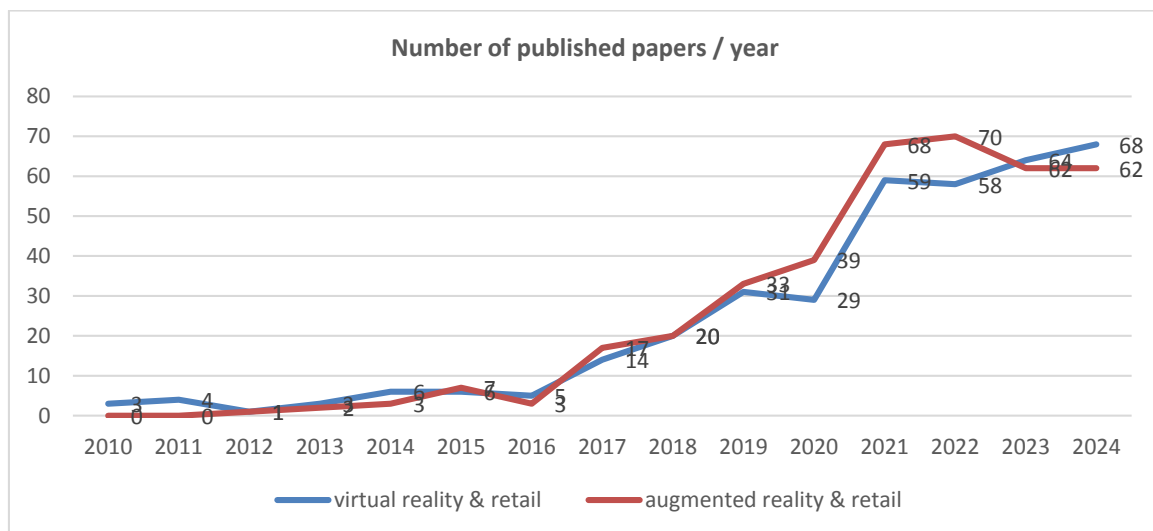


Figure 1. Number of published papers per year

Source: Authors' own research results/contribution.

Possible causes are vast and can vary either from technological breakthroughs such as better performing microchips, the launch of different software programs that better integrate virtual reality into the metaverse, new advances or products for the implementation of augmented reality such as glasses or phone applications, the improvements in natural language models, and artificial intelligence. In addition to this, social factors such as generating awareness about specific topics using virtual and augmented reality tools, or business-related factors, such as gaining key advantage against competition can enhance the increased interest in tools such as augmented or virtual reality.

Considering that virtual and augmented reality are topics that are discussed in papers across many branches and areas of knowledge, such as computer science or engineering, for our study we will focus only on the business and management field. The number of journal articles written in this field and its evolution, can be seen in figure 2.

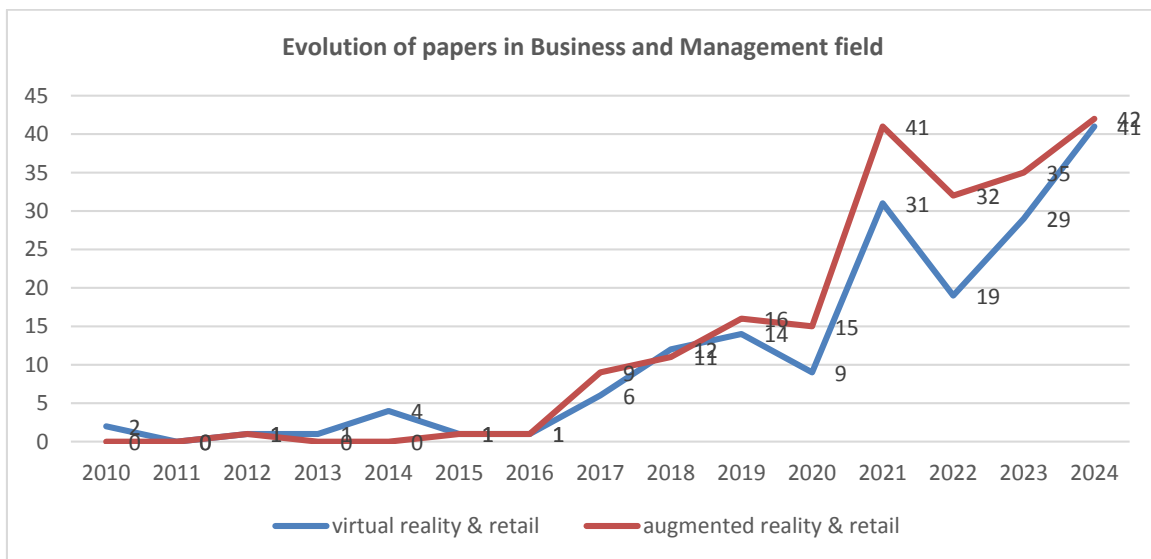


Figure 2. Evolution of papers in areas: Business and Management

Source: Authors' own research results/contribution.

Similar to the general evolution of number of articles, the same tendency can be observed in this case. There is a significant increase in research interest in the past 7 years, with an exponential growth between the years 2020 and 2021. During this time there was almost a 160% increase for research papers related to “augmented reality” and “retail”, and an even bigger increase of about 230% for papers containing the key words “virtual reality” and “retail”. The causes are similar to the ones mentioned for the general evolution of articles, with emphasize on the fact that people became more aware of the impact and opportunities provided by these technologies for companies. This means that currently we are still in an emerging period or phase for the research interest towards virtual and augmented reality technologies and their implementation in the business models of companies.

Analyzing the country of origin of authors researching “virtual reality” and “retail”, as it can be seen in figure 3, the top 5 countries are U.S.A., China, England, India and Germany. There are more than 20 papers with authors from these countries that have already published on this topic. It is not surprising to see the U.S.A. on the first place with 75 published papers, followed by China with 56 published papers. This can happen because many technology companies have their headquarters in these countries and there is also an advanced research infrastructure that allows

researchers to focus on these topics. They are followed by England with 46 published papers, India with 36 published papers and Germany with 28 published papers. Countries with less than 4 published papers were not included in figure 3.

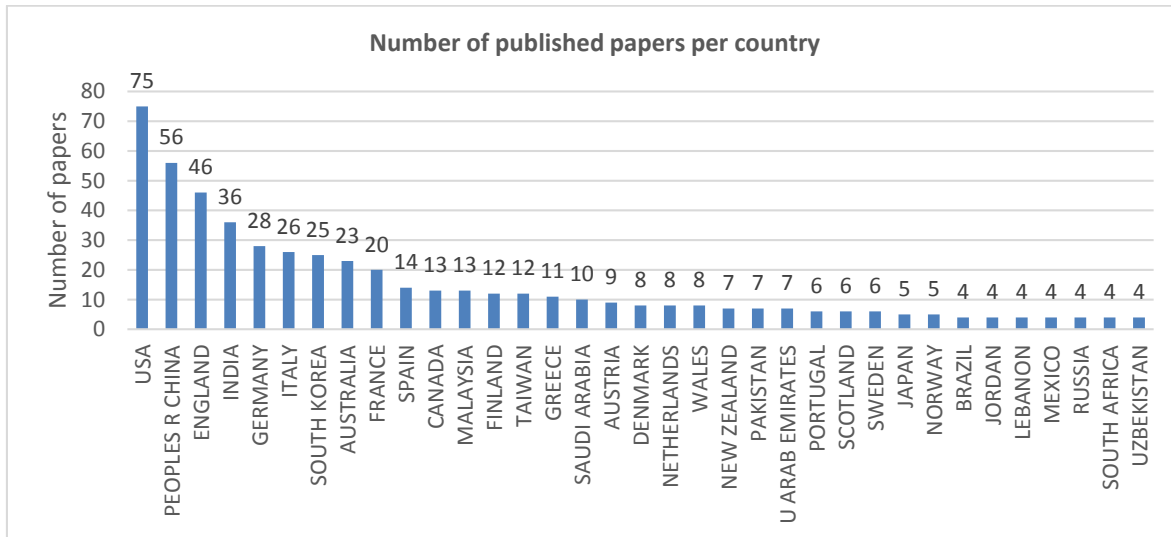


Figure 3. Number of published papers on virtual reality, retail / country

Source: Authors' own research results/contribution.

Analyzing the country of origin interested in “augmented reality” and “retail”, it can be seen that U.S.A. is again on the first place with 64 published papers, followed by India with 54 published papers, England and China with 50 published papers and Germany with 36 papers. Interesting to remark is the fact that the same figure but for virtual reality shows China to be on the second position while India is on the fourth. This means that the 2 countries focus on two different perspectives. China focuses on virtual reality, and therefore on possible applications of the metaverse in retail, while India focuses more on augmented reality, trying to incorporate aspects of the metaverse in retail, but not necessarily creating one itself. This means that in the near future, there is a higher likelihood to see more implementation of AR originating from India, than implementation of VR originating from China, regarding retail experiences. This is just an assumption and it excludes geographical, social and political constraints that have an impact. It just shows a possible outcome based on the current position of each country. Furthermore, this means that the most applications for both VR and AR originate from the U.S.A. In this case countries that have number of published papers lower than 4, were excluded. These results can be observed in figure 4.

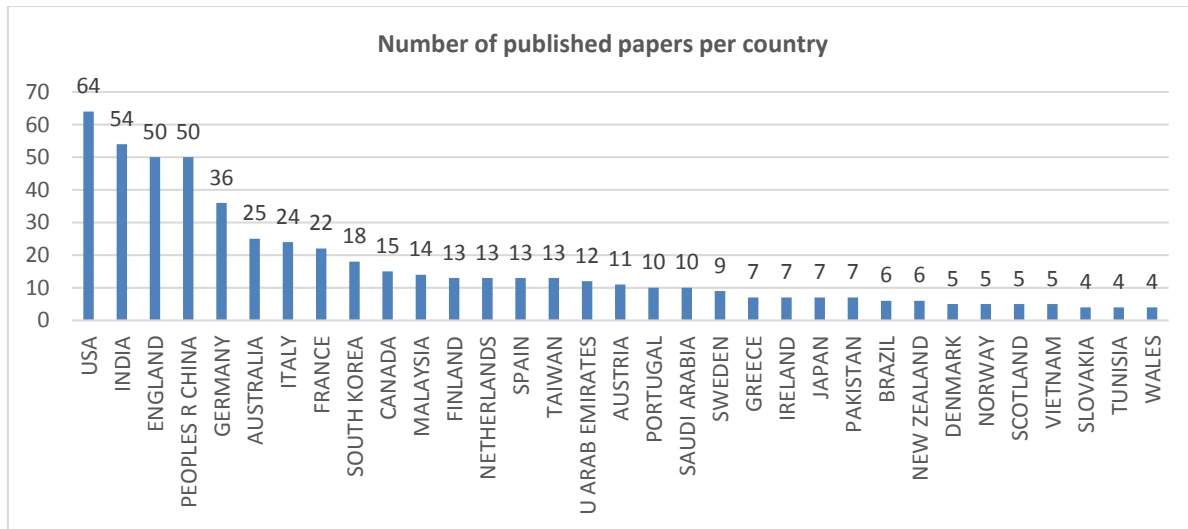


Figure 4. Number of published papers on augmented reality, retail / country

Source: Authors' own research results/contribution.

The journal that publishes most articles with topics related to “virtual reality” and “retail” is “Journal of Retailing and Consumer Services” with 28 published papers. It is followed by “International Journal of Retail Distribution Management” with 14 published papers, and “Journal of Business Research” with 10 published papers. The rest of publications have a number of papers lower than 10. There were some publications that were excluded from the figure, due to the fact that they had a number lower of 4 published papers on topic virtual reality and retail.

The results are similar for the key words “augmented reality” and “retail”. The journal that publishes most frequently these topics is “Journal of Retailing and Consumer Services” with 32 papers. This is a slightly higher number of published papers compared to the key words “virtual reality” and “retail”. It is followed by the “International Journal of Retail Distribution Management” with 25 published papers and “Lecture Notes in Computer Science” with 14 published papers. In order to further analyze this topic and shift the focus to the publications that the papers were published in, we need to examine the table 1

Table 1. Total number of published papers on virtual reality, retail and augmented reality, retail / business management journal

Rank	Virtual reality in business and management journals	Number of published papers	Rank	Augmented reality in business and management journals	Number of published papers
1	Journal of Retailing and Consumer Services	28	1	Journal of Retailing and Consumer Services	32
2	International Journal of Retail Distribution Management	14	2	International Journal of Retail Distribution Management	25
3	Journal of Business Research	10	3	Lecture Notes in Computer Science	14
4	Lecture Notes in Computer Science	8	4	Journal of Business Research	9
5	Virtual Reality	8	5	Computers in Human Behavior	8

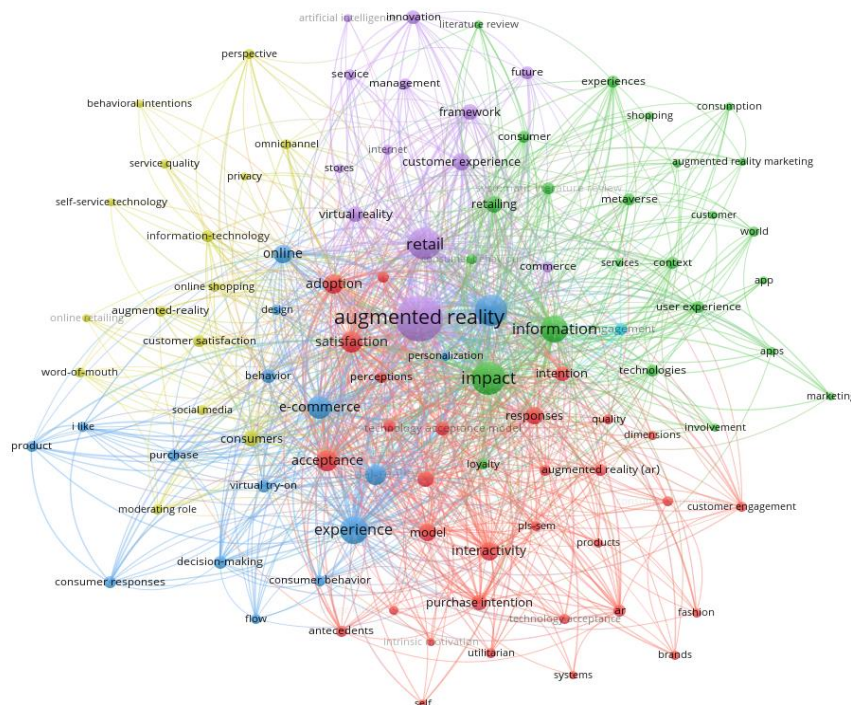
Rank	Virtual reality in business and management journals	Number of published papers	Rank	Augmented reality in business and management journals	Number of published papers
6	Computers in Human Behavior	7	6	Technological forecast and social change	8
7	Applied Sciences Basel	6	7	Journal of Retailing	7
8	International Journal of Human Computer Interaction	6	8	International Journal of Consumer Studies	6
9	International Journal of Information Management	6	9	International Journal of Information Management	6
10	International Journal of Consumer Studies	5	10	Internet Research	5
11	Journal of Consumer Behaviour	5	11	Journal of Consumer Behaviour	5
12	Journal of Global Fashion Marketing	5	12	Journal of Research in Interactive Marketing	5
13	Journal of Retailing	5	13	Sustainability	5
14	Sustainability	5	14	Communications in Computer and Information Science	4

Source: Authors' own research results/contribution.

To better understand how the search engine is used and what are the most used key words and combination of key words, we need to create a graphically representation, in form of a mind map, of the frequency of appearance regarding the key words. We will build one mind map for the combination focusing on “virtual reality” and “retail”, and the other one for “augmented reality” and “retail”. For this we will use 2 maps generated by VOS Viewer, and their cluster of words, based on their frequency of appearance. The results for the key words “virtual reality” and “retail” can be seen in figure 5. In order to understand the figure 5, it needs to be specified that the nodes are bigger if the words appear more often. Therefore, the biggest nodes show the most associated words when writing papers and even thinking about virtual reality and retail. Words like impact, virtual reality, augmented reality, technology, retail, impact, behavior, experience and interactivity seem to be the most frequently used by the authors. When applying the same technique using VOS Viewer, in generating a mind map for augmented reality and retail in business, we obtain the results from figure 6.

Although it looks similar, the mind map created for “augmented reality” and “retail” is different from the one created for “virtual reality” and “retail”, there are some key elements that are different. For instance, we see more clearly that the most representative words are augmented reality, information, impact, experience, e-commerce and retail. It is also important to note the fact that the clusters are more defined in comparison to the ones from earlier, and tend to gravitate each in one direction. In comparison to the earlier mind map, we saw that cluster 4 – yellow – and 6 – turquoise – were plotted in between other clusters, signifying that they had influences from both neighbors. This trend seems not to be so heavily present in this case. Again there were 6 clusters identified, according to the frequency they appeared either by itself, or in a combination with other words. This can also be seen in the clusters described in the figure down below.

Source: Authors' own research results/contribution.



Source: Authors' own research results/contribution.

Beyond the fact that the application categorizes the words itself, it also creates clusters in a descending order based on the words, their combination and their frequency of appearance. The colors represent a classification of the words used together in context, in form of clusters. The clusters and their items can be seen in the table 2.

Table 2. VOS Viewer cluster words for „virtual reality, retail” and „augmented reality, retail” in business

	VR	AR
Cluster 1	(21 items) adoption, augmented-reality, behavior, consumers, customer satisfaction, experiences, extended reality, framework, internet, metaverse, moderating role, online shopping, perceptions, purchase, purchase intentions, quality, reality, satisfaction, social presence, trust, word-of-mouth	(30 items) acceptance, adoption, antecedents, ar, augmented reality (ar), brands, consumer experiences, customer engagement, determinants, dimensions, fashion, image interactivity technology, intention, interactivity, intrinsic motivation, model, perceived usefulness, perceptions, pls-sem, products, purchase intentions, quality, responses, satisfaction, self, systems, technology acceptance, trust, user acceptance, utilitarian
Cluster 2	(20 items) ar, augmented reality (ar), brands, consumer, consumer behaviour, consumption, customer engagement, customer experience, engagement, impact, information, innovation, intention, retail, roles, service, systematic literature review, technologies, user experience, world	(24 items) app, apps, augmented reality, consumer, consumer behaviour, consumption, context, consumer, digital marketing, experiences, impact, information, involvement, literature review, loyalty, marketing, metaverse, retailing, services, shopping, systematic literature review, technologies, user experience, world
Cluster 3	(14 items) consumer experience, context, dimensions, environments, experience, involvement, loyalty, model, online retailing, responses, store, telepresence, touch, virtual reality	(16 items) behavior, consumer behavior, consumer responses, decision-making, design, e-commerce, experience, flow, i like, online, personalization, product, purchase, technology, virtual try-on, virtual-reality
Cluster 4	(12 items) acceptance, antecedents, atmospherics, commerce, consumer behavior, environment, future, intentions, online, perceived ease, retailing, stores	(15 items) augmented-reality, behavioral intentions, consumers, customer satisfaction, information-technology, moderating role, omnichannel, online retailing, online shopping, perspective, privacy, self-service technology, service quality, social media, word-of-mouth
Cluster 5	(11 items) augmented reality, consumer responses, decision-making, design, e-commerce, flow, i like, immersion, product, technology, virtual try-on	(13 items) artificial intelligence, augmented reality, commerce, customer experience, framework, future, innovation, internet, management, retail, service, stores, virtual reality
Cluster 6	(8 items) image interactivity technology, information-technology, interactivity, intrinsic motivation, purchase intention, technology acceptance, user acceptance, virtual-reality	(1 item) engagement

Source: Authors' own research results/contribution.

If we take for example the words: virtual reality, model, consumer experience and telepresence. These words have the same color, meaning that they frequently appear in similar research contexts. This means that several papers use them as key words in a specific order or combination. They appear to be categorized in cluster 3, among other items such as consumer experience, context dimensions, store and others. The first cluster for virtual reality has the most items, counting 21, followed by the second cluster with 20 items, the third with 14, and so on. The

first cluster for augmented reality has 30 items, followed by cluster 2 with 24 and cluster 3 with 16 and so on.

Both the visual representation and the classification in clusters help identify combinations, patterns and possible directions in which researchers may go in the future. For instance, when analyzing the keywords identified in relation to virtual reality from table 2 and figure 5, we identify that, cluster 1 has the color red and highlights words like extended reality, behavior, adoption, online shopping, trust, metaverse. Those are some general terms in relation to VR, though satisfaction, metaverse, behavior and adoption seem to be most connected to each other, signifying that researchers focuses on the utility of VR, through satisfaction, and VR implementations, through behavior and adoption. Cluster 2 is represented by the color green and underlines words like retail, impact, information and engagement. This seems also to be focused on the effect the implementation of VR has, through impact, information and engagement. Cluster 3 has the color blue and emphasizes on words like experience, telepresence, model and environments. This leads to a slightly more technical analysis and approach of VR in retail. Cluster 4 has the color yellow and points out words like acceptance, online and retailing. This means that researchers tend to focus on finding ways to implement VR into specific business domains, similar to cluster 1, and cluster 5, described next. It is also important to notice that this cluster is roughly in between cluster 1 and 5, signifying that it is influenced by both clusters, and therefore share similar directions. Cluster 5 has the color purple and highlights words like augmented reality, technology, e-commerce and consumer responses. This can also lead to a technical point of view regarding the VR, through words like, technology and consumer responses. Interesting to notice is the fact that augmented reality is mentioned here, and is represented by a relatively big node, meaning that researchers target both AR and VR topics in their papers, since they have some slightly similar aspects, like the need of an external device in order to use those technologies, and the fact that the target audience are younger and tech-savvy people. The last cluster, cluster 6 is represented by the color turquoise and underlines words like intrinsic motivation, purchase intention, interactivity and user acceptance. This means that researchers went in the direction to analyze the internal motivating factors, through words like intrinsic motivation and purchase intention, and the perception of the people, through words like interactivity and user acceptance, in adopting or using the VR and retail in business.

The results are identical to the ones in figure 5, but this figure shows better most used key words, when authors published papers related to VR and retail in business. These words are virtual reality, augmented reality, technology, e-commerce, retail, information and interactivity. Other relatively frequent used words or combinations are shown with the color green, with some having a brighter and others having a darker shade of green. The least used words have the color blue and tend to be shown on the outside of the map, indicating that they are likely to be some outliers.

Referring back to table 2 and figure 6 and focusing on the augmented reality keywords, we determine that Cluster 1 is represented by the red color and has most items compared to other clusters. From the 31 items, the following words are represented by bigger nodes: adoption, satisfaction, interactivity, and acceptance. This means that the research papers that include these words, tend to analyze the perception and integration of AR technologies in specific business domains. Cluster 2, having 24 items, is represented by green color. Words like impact, information, retailing and metaverse, lead to the assumption that papers, that used these key words, take a more pragmatic approach and try to assess the results and utility of the implementation of AR technologies in different business areas. Cluster 3 is represented by the color blue and highlights words like e-commerce, experience, online, purchase and virtual try-on. This means that these

papers tend to approach the practicality of AR technologies in business models, through words like e-commerce, purchase, virtual try-on. Cluster 4 is represented by the yellow color and emphasizes words like consumers, online shopping, perspective and service quality. This leads to papers focusing more on the quantitative analysis of AR technologies perception in different businesses. Therefore, these papers tend to be more socially oriented. Cluster 5 has the color purple and highlights words like augmented reality, retail, virtual reality, framework and customer experience. Those are some general terms regarding AR technology and have a broader direction of approaching this topic. Interesting to remark is the fact that AR is approached together with VR. The motives are similar to the ones mentioned when analyzing the clusters and mind map of VR and retail in business, the need of an external device and that they target a younger, more technology oriented generation. Cluster 6 is interesting due to the fact that it is represented by one single word. Having the color turquoise, it contains the word engagement. This cluster is inside of cluster 2 – green – meaning that it is influenced by the direction in which cluster 2 is going. Therefore the word engagement, means that papers also try to focus on analyzing the adoption of AR technologies in business applications.

It seems that there are similar results when comparing VR and AR and retail in business, therefore researchers try to include both technologies in their papers to better understand their effectiveness and impact on the current traditional and online business models. Researchers can also try to assess the behavioral and cognitive responses of end users, and their experience and interaction with the AR and VR technologies, in order to refine them, to maximize their effectiveness in the businesses.

Conclusion

Overall it can be seen that the terms of augmented reality and virtual reality are strongly related and used together when analyzing them in business and management context. It looks like the current situation tends to present a growing phase of the 2 technologies for both research and practical implementation. The trend and interest for such topics has significantly risen in the last years, and we can expect the same for the years to come. As far the applications of these technologies go, it is easier and faster to implement AR rather than VR aspects. This doesn't mean that VR should be less focused on, in comparison to AR. What it means is that, VR needs more resources such as time and money to be properly developed and implemented in a business model. There is another aspect or threat to take into consideration that is valid for both AR and VR technologies, but tends to have a bigger impact on VR due to the higher initial costs that are needed for its implementation. The threat comes from the consumers or users that are reluctant to try such technologies because of various motives. This also applies to AR, but due to its relatively smaller initial costs, it would have a smaller impact compared to VR. It will be interesting to follow how these 2 topics evolve in the near future, and to observe the challenges they might face. One limitation of this paper is the fact that it is a bibliometric analysis, according to the literature and the current situation found on Web of Science. Another limitation is the fact that there are many development directions for both AR and VR and since we are currently in a sort of ramp up phase, it is not clear in which direction other researchers or even companies will go. Therefore it is also relatively hard to suggest possible applications since there are still a lot of open directions. It would be interesting though to analyze the impact of AR and VR in relation to the purchase hesitation of users for various products, if it somehow influences or lowers it.

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