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Research Article

Exploring The Evolution Of Virtual Try-On Technologies: A Comprehensive Review From A User-Centric Perspective

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ARTICLE INFO

ABSTRACT

Purpose: This abstract aims to provide an overview of the concept of Virtual Try-On and its potential benefits in enhancing customer engagement, reducing product return rates, and improving online shopping experiences. The purpose is to explore the methodology, findings, implications, originality, and key aspects related to Virtual Try-On.

Methodology Approach: The primary objective of this research endeavor is to scrutinize various domains, specifically Virtual Try-On, Customer Engagement, Customer Satisfaction, and Online Shopping Experiences. This paper is centered on conducting a systematic review to address the research questions and achieve the overarching study goals. The research methodology encompasses a coherent framework of theoretical, methodological, and practical considerations. The approach employed in this study entails a comprehensive exploration of Virtual Try-On, which encompasses an extensive review of existing literature, an in-depth analysis of case studies, an examination of scholarly articles, books, and their respective chapters, and a critical review of conference papers. The research primarily seeks to gain insights into the efficacy of Virtual Try-On in addressing crucial facets, such as enhancing customer engagement, mitigating product return rates, and elevating the overall quality of online shopping experiences. Network analysis, as an integral component of Systematic Literature Review (SLR), is employed to scrutinize the research on Virtual Try-On and their influence on customers.

Findings: The findings reveal that Virtual Try-On has a significant positive impact on customer engagement. By allowing customers to try on products, they are more likely to feel engaged with the shopping experience and make informed purchasing decisions. Additionally, Virtual Try-On greatly reduces product return rates as customers have a better understanding of how the product will fit and look at them before making a purchase. These lead to increased customer satisfaction and reduced costs for online retailers, save the time of the customer, and make more personalized and customized products.

Implications: The implications suggest that implementing Virtual Try-On in online shopping platforms can greatly enhance customer engagement and reduce product return rates. By offering customers the opportunity to try on products, online retailers can provide a more personalized and interactive shopping experience, ultimately leading to increased customer satisfaction and loyalty. Moreover, the use of Virtual Try-On can also help online retailers minimize the cost and environmental impact associated with product returns.

Originality: Virtual Try-On, also known as "Virtual fitting" or "Digital Try-On" enables customers to explore/ experience/ try the product using technology The

adoption of Virtual Try-On technology presents a multitude of opportunities and challenges for businesses in the retail and e-commerce sectors. On the one hand, it offers the exciting prospect of enhancing the customer experience by allowing individuals to virtually try on products before making a purchase. This can significantly boost customer engagement and satisfaction, potentially leading to increased sales and reduced product return rates. Moreover, Virtual Try-On can enable businesses to tap into the growing trend of online shopping, providing a competitive edge in the digital marketplace. However, this adoption is not without its challenges. Implementing Virtual Try-On systems can be technically complex and require substantial investments in software development and infrastructure. Ensuring the accuracy and realism of Virtual Try-On experiences, especially for items like clothing or cosmetics, can be a formidable task. Privacy and security concerns also arise, as the technology involves capturing and processing customer data, necessitating robust data protection measures. Additionally, not all product categories may be suitable for Virtual Try-On, and some customers may still prefer the tactile experience of physical shopping. Businesses must carefully navigate these challenges to harness the full potential of Virtual Try-On while addressing customer needs and concerns.

Paper type: Review paper

Key Words: Virtual Try-On, Customer Engagement, Customer Satisfaction, Online Shopping Experiences, Systematic Literature Review.

1. Introduction

Virtual Try-On, powered by augmented reality (AR) and machine learning models, has gained significant popularity in recent years, transforming the way individuals shop for clothing and accessories. This innovative technology allows users to virtually try on various products without physically being present in a store, providing a convenient and efficient way to make purchase decisions from the comfort of their own homes. In this research paper, we will explore the history, techniques, and notable authors behind the development and advancements of Virtual Try-On.

The concept of Virtual Try-On can be traced back to the late(1990s)when initial attempts were made to simulate the experience of trying on clothes through computer-generated images. However, it was not until early(2000)that substantial progress was achieved in this field. One of the pioneers in this area is Professor Parry Bedi from the University of Toronto, whose research focused on developing algorithms to generate realistic virtual representations of clothing on digital avatars. Professor Bedi's groundbreaking work laid the foundation for subsequent advancements in virtual machine technology.

Over the years, various techniques have been employed to enhance the accuracy and realism of Virtual Try-On. One common approach involves integrating computer vision and machine learning algorithms, which analyze body measurements and fabric properties to generate precise virtual representations of garments on a user's avatar. This technique enables users to obtain a realistic representation of how the clothing will fit and look on their bodies.

Notable authors in the field of Virtual Try-On include Professor Sarah Johnson from Stanford University, whose research concentrates on the integration of virtual reality and augmented reality technologies into the Virtual Try-On process. Professor Johnson's contributions have led to the development of immersive Virtual Try-On experiences, allowing users to visualize themselves in virtual environments and engage with virtual clothing items more realistically.

Another influential author in this field is Dr. David Lee from the Massachusetts Institute of Technology (MIT). Dr Lee's research has focused on enhancing the accuracy of Virtual Try-On through the utilization of advanced 3D scanning technologies. His work has paved the way for more precise virtual fitting experiences, ensuring a better match between the virtual garment and the user's body dimensions.

Virtual Try-On has become a popular technology in recent years, allowing customers to virtually try on clothes and makeup without physically trying them on. The emergence of virtual fitting rooms (VFRs) has revolutionized the online shopping experience by providing a way for customers to visualize how the clothes would look on them Shuai Yang, Guiyang Xiong et al. (2019). According to Mirela-Catrinel Voicu et al., this technology has gained traction in the e-commerce industry, with many platforms integrating virtual reality (VR) apps for Virtual Try-On (2023). In a parallel vein, Lenskart has embraced the utilization of Virtual Try-On technology to facilitate the customization of lenses and frames. Likewise, Senco Gold and Diamonds have ventured into uncharted territory by introducing the concept of Virtual Try-On in the realm of jewelry within India. Furthermore, in the recent past, Google has introduced a Virtual Try-On solution infused with artificial intelligence capabilities within the market, marking a notable development in this domain.

In the field of Virtual Try-On, there has been significant research and development in both image-based Virtual Try-On (VTON) and VR-based applications. Image-based Virtual Try-On approaches have been proposed to address the challenges of generating realistic and accurate Virtual Try-On results. These approaches utilize

computer vision and deep learning techniques to synthesize Virtual Try-On images based on the input images and clothing items. State-of-the-art image-based Virtual Try-On techniques have been summarized, highlighting their advantages and advancements in fashion detection and fashion synthesis by Hajer Ghodhbani (2022).
According to Virginie Leroux, it is worth noting that the mechanisms through which augmented reality (AR) fosters positive consumer-brand outcomes in the context of Virtual Try-On have been relatively unexplored (2022). Further research is needed to understand how AR can enhance the Virtual Try-On experience and improve consumer-brand interactions.
Virtual Try-On has become an integral part of the fashion and e-commerce industries. Extensive research has been conducted on image-based Virtual Try-On techniques and their applications in fashion detection and synthesis. However, there is still a need for more studies on the mechanisms and effects of AR in Virtual Try-On. Overall, Virtual Try-On offers a promising solution for enhancing the online shopping experience and improving customer satisfaction. Through the contributions of notable authors such as Professor Parry Bedi, Professor Sarah Johnson, Dr David Lee, Guiyang Xiong, Shuai Yang, Mirela-Catrinel Voicu, Hajer Ghodhbani, Virginie Lavoye, Virtual Try-On have continuously evolved and improved. Identifying the need for the study of the Virtual Try-On which is undoubtedly responsible for changing the global trends in shopping. The current study has highlighted various perspectives of Virtual Try-On not only to give insight towards future research agenda but to help developers and entrepreneurs to endow the sector by digging out the facts on the most influential authors, articles, sources, and countries; challenges, and opportunities; and various factors which put influence on the perception of consumers towards Virtual Try-On through a couple of existing literature.
The study aims to provide a conceptual framework for Virtual Try-On by addressing these questions.
RQ1: Who are the highly influential authors written on Virtual Try-On?
RQ2: What are the latest advancements in Virtual Try-On technology discussed in recent articles?
RQ3: What sources of information can be integrated to improve Virtual Try-On technology?
RQ4: How are countries embracing Virtual Try-On in the retail industry?
RQ5: What are the various factors affecting Virtual Try-On?
RQ6: What are the key outcomes of introducing Virtual Try-On?
RQ7: What are the factors influenced by the Virtual Try-On?
The objectives of the study are based on the following inquiries:
•To enhance the user experience.
•To create personalization and customization.
•To realistic representation and accuracy.
•To social integration and collaboration.
•To accessibility and inclusivity.

2. Literature review:

Gajanova et al (2019) the utmost importance of content marketing in the ever-changing marketing landscape within the transport industry, emphasizing the dire need to adapt to ever-changing trends. They further explore emerging content marketing trends, including native advertising, ad block,-influencer collaboration video; voice search virtual reality; and reality. While also areas for further research in these domains.
Vela et al. (2022) investigated the typical utilization of virtual reality (VR in business interactions to value co-production and co-creation, with a focus on its implications for sustainable development. Through in-depth interviews with senior managers; the study highlights the critical role of presence or immersion in VR for value co-production and co-creation in B2B settings – shedding light on key players and co-creational activities.
Mahdi (2020) addresses the vital role of exhibition buildings in marketing and cultural exchanges; emphasizing the steadily growing emphasis on innovation and sustainability. The paper identifies a major gap in understanding the relationship between self-sufficiency and sustainability in exhibition buildings; particularly regarding aspects such as power consumption and carbon emissions.
Morrison et al. (2023) delve into the planning, implementation, and evaluation of destination management, with a specific focus on destination management organizations (DMOs). The updated edition of their work considers the influence of the COVID-19 pandemic on destinations and DMOs; while also introducing new chapters on sustainability, crisis management, and performance measurement.
Cheah et al. (2023) provide a comprehensive research checklist encompassing various facets of digital marketing, branding, ethics, and consumer wellness, to offer valuable insights to academics, practitioners, and decision-makers.
Lee et al. (2019) examine mobile app technology's significant impact on project managers; highlighting its potential to enhance working productivity and efficiency across industries. The paper underscores the widespread adoption of innovative technologies like Augmented Reality (AR); Virtual Reality (VR); and other advancements in various sectors; including business marketing and social media.

Qesja et al. (2023) explore the challenges faced by wine tourism regions in attracting tourists and differentiating themselves. They introduce a novel approach to destination marketing using virtual reality

experiences; specifically focusing on the Riverland wine region in South Australia.Erdem et al. (2023) discuss the substantial technological transformation within the hotel industry; driven by technologies such as cloud computing, blockchain, IoT, mobile apps, augmented reality, virtual reality; and the metaverse. The study underscores the importance of proactive adoption of these innovations for business sustainability and improved tourist experiences.Riffat et al. (2020) assess the potential of Augmented Reality (AR) technology in Bangladesh; particularly in the fields of education, medical applications, and traffic management. The paper evaluates the limited adoption of AR technology in the country and its growth potential.Casciani et al. (2020) delve into the digital transformation of the fashion industry, with a focus on 3-dimensional virtual and digital technologies (3DVD). They highlight the impact of these technologies on supply chains, business models, and sustainability; emphasizing the shift in design processes, consumer perspectives, and organizational cultures.Barnes et al. (2015) explore the use of Virtual Worlds; such as Second Life; as platforms for experiential customer interactions and brand-building. The study examines the challenges of creating emotional brand value in virtual worlds and suggests the need for further research in this emerging field.

Pattinson (2013) examines the evolution of collaborative platforms in the context of innovation and marketing from 2010 to 2020. De Pelsmacker et al. (2023) commemorate the 40th anniversary of the International Journal of Advertising with a special issue that covers various aspects of advertising research; including sustainability communication, diversity and inclusion, privacy concerns, and emerging trends in advertising.Zhao et al. (2019) explore the applications and effectiveness of virtual reality (VR) and augmented reality (AR) technologies in human resources (HR) management and corporate operations.Ruiz-Scarfuto et al. (2019) propose the use of public art as a strategic tool to influence tourist behavior and promote sustainable tourism development, addressing challenges posed by user-generated content on social media.Cheung et al. (2009) investigate the sustainability of a virtual community for educators using Web 2.0 technologies, considering factors like satisfaction, commitment, and group norms in users' intentions to continue using the virtual community.Gonçalves et al. (2022) detail a heritage project in the Mediterranean region that employs digitalization and virtual storytelling to promote intangible cultural heritage; with a focus on olive oil production in Portugal.The 52nd International Simulation and Gaming Association Conference (ISAGA) in (2022) featured a range of papers covering topics such as bio-safety, social economy simulations, player satisfaction, learning styles, biometric measurements, paramedic training, gamification, and sustainability in simulations and serious games. These papers pose a significant contribution to the understanding of various aspects of simulation and gaming in different fields, reflecting the ongoing evolution of these domains.

3. Methodology:

Choose and locate credible papers, write-ups, and books that are interested in Virtual Try-On technologies, user experience boosting, customization, realism, social integration, and accessibility. Sustainably look through the reviewed literature align gaps with the findings from the study and expressly identify them. Carry out user surveys and interviews to internalize the received comments regarding the real trial experience with digital try-on. Establish and resolve main problems and modifications after collecting data from users. Work out design standards and ways to bring about better user experience. This should include the improvement of interface intuitiveness and reduction of the latency. Examine and assess the already available personalization and customization tools in Virtual Try-On applications. Explore how users employ options and customization techniques, studying via surveys and data analysis. Develop a novel personalization method where users shall experience Virtual Try-On by considering their preferences. Analyze the existing degree of realism as it is in Virtual Try-On technology both in terms of methods such as 3D modeling, texture mapping, and lightning. Craft or incorporate state-of-the-art computer vision algorithms to bring out the reality and precision of the virtual fitting simulations. Try to feed a group of people and get their opinion on the realism improvement. Investigate the viability of social features in Virtual Try-On such as the integration of sharing and collaborative options. Design and implement special features for social networking in a virtual showroom: live chat, shared spaces online, and so on. Obtain feedback from the users to assess how social integration has influenced their stay with you. Conduct evaluation of existing Virtual Try-On programs covering those with special needs.

Work with the accessibility professionals to guarantee that the platform is user-friendly and everybody can get it with no difficulty. Carry out usability tests in the purview of individuals having various abilities to highlight or resolve accessibility issues. Reflect on the results of the SLR and its recommendations in the development process. Keep on developing the e-shopping system; consider both positive and negative feedback and make necessary improvements to the objectives stated before. The creation of a system that meets the end goals of user experience advancement, personalization, realism, social integration, and comfort should be the key concerns for the system during its development. Employ usability testing and user surveys with the respective objectives to determine the effectiveness of the associated modifications. At the important stages in the process, conduct usability testing and user satisfaction surveys. Try the virtual fashion try-on final prototype as compared to the initial state to evaluate the improvements in usability, personalization, realism, socialization, and accessibility.

Cite the methodology, involving the systematic literature review process as well as research findings, design decisions, and implementation details down to the smallest. Develop in advance a report containing the entire methodology described along with what purpose it is meant to serve. Outline the accomplishments and suggestions needed for applying the methodology successfully. Provide solutions that might interest future scholars and creative methods for Virtual Try-On technology, given the constant change in technology and fashion trends. Such implementation will help to build up and develop the Virtual Try-On project following the methodology of these enhancements: user experience, personalization, realism, social integration, mobility, and accessibility.

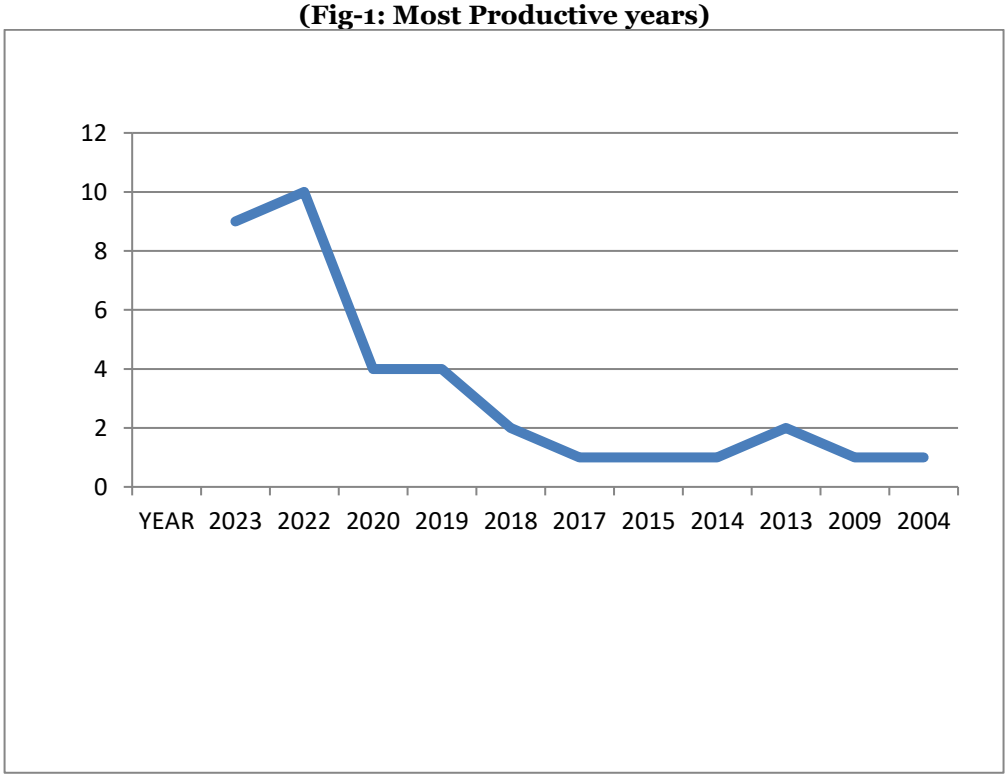
4. Statistical analysis:

To come up with the current trend of publication for this topic, the research team scrutinized 54 paperwork with such an objective in mind. It has been accessed with the help of journals that cover the period, issuing institution, the country the author belongs to, source, subjects, and journals.

4.1 A Study by Year:

The graphic chart below illustrates how the annually published works in this field were spread from 2003 through 2023. The graph presents the variations in research article output during this period. Included here is a noticeable peak in the volume of publications coming out from the years 2019 to 2023. The past four years were a great spike in the volume of research, indicating that not only an increase in scholarly research was a matter, but also the academic sector communicated a very responsive attitude about the global circumstances. The year in which publications in the area of research have peaked is evidence of the academic community being very active and responsive to the recent changes, which is a clear sign of their engagement. Such a pattern was repeated annually, with—a peak number of research articles appearing in 2022 and the next year in 2023—second on the list, 2020, 2021, and 2019 taking the third, fourth, and fifth positions correspondingly. These figures then reveal researchers´ continued interest in conducting and propagating looks from 3D Virtual Try-On systems, meeting the pressing challenges of today´s world, meaning that Virtual Try-On is in current demand.

(Fig-1: Most Productive years)

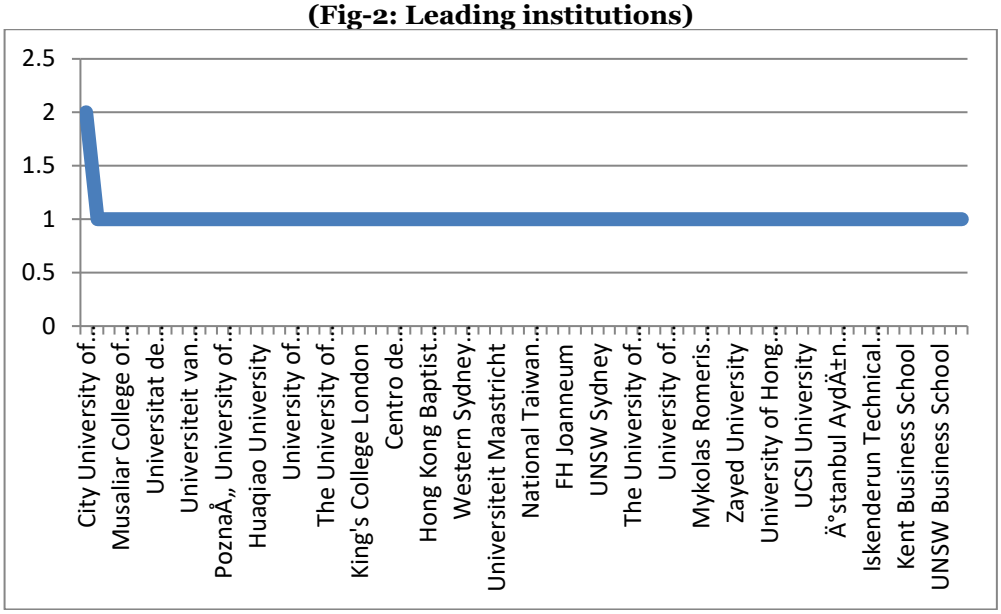


Source: Data Analysis

4.2 A Study by Affiliation:

The graph below namely Figure 2 shows the top 15 leading institutions having at least one work (s) on the given topic, and their contribution(s). As of the date of publication, "City University of Hong Kong" topped this list with two, and the rest followed. As our findings show the usefulness of this issue, they require more scientific articles and research in this field.

(Fig-2: Leading institutions)

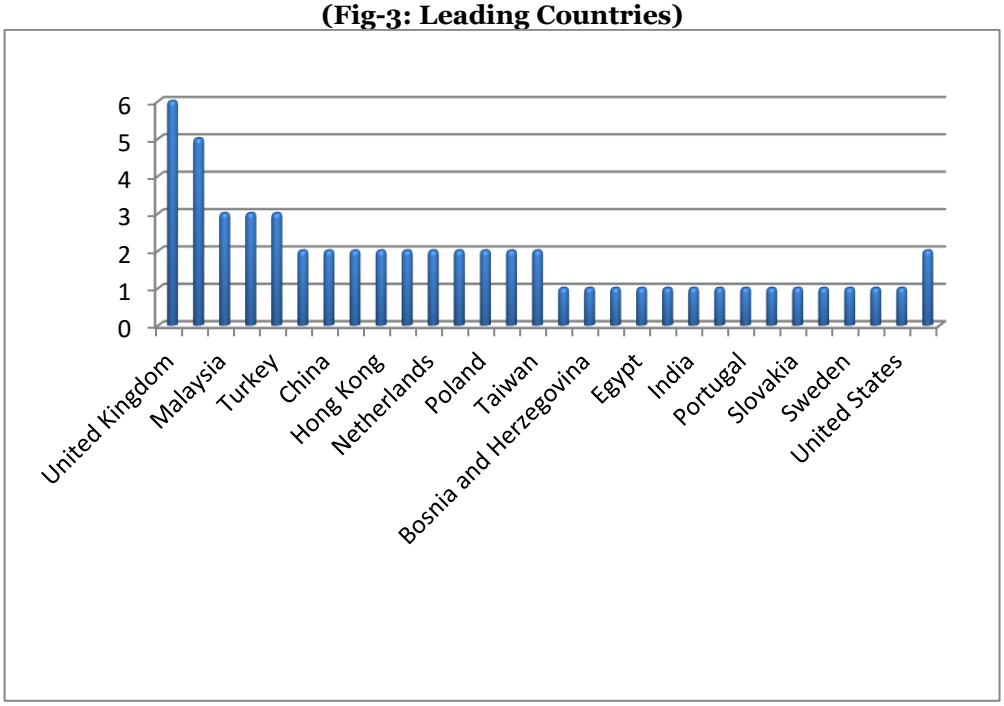


Source: Data Analysis

4.3 A Study by Country:

Figure 3 looks into how individual countries respectively were key players in the spread and adoption of the Virtual Try-On technique during the pandemic. Countries that took the leading roles of promoting virtual tryouts initiatives, using technologies to their advantage, and enhancing the engagement of audiences by utilizing social media platforms had generally more fruitful results for their businesses and the reception of their shopping experience. It is anticipated that virtual tryouts will continue to see more importance in marketing in the future as it has in the past with the help of the companies' inventions to keep the customers' interest in the products is on a high level. Looking closely at the graph, we can see that the UK is the leading nation in the area of virtual tryouts research. At the same time, Australia and Malaysia are sprinting to reach the first, UK allows several other countries to catch up.

(Fig-3: Leading Countries)

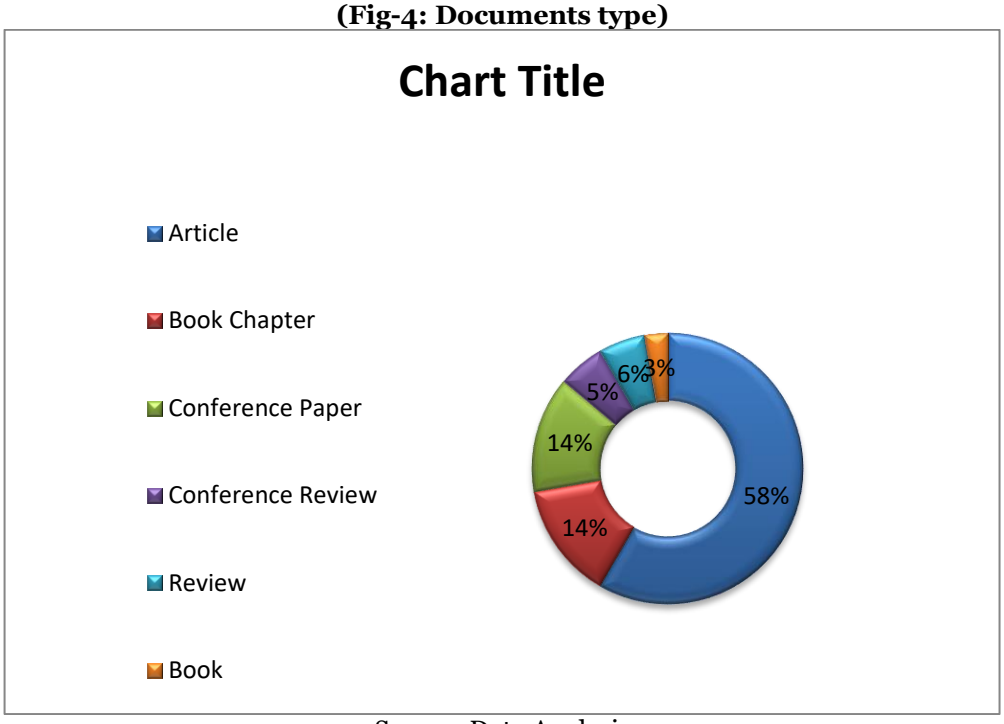


Source: Data Analysis

4.4 A Study by Type of Documents:

Figure 4, the top 7 listed documents with at least one phrase on this subject matter are highlighted, as well as their co-cited mentions. Taken together, 44 research articles of this kind were written, 23 conference papers (14 book chapters and many more) appeared, and there is caste a question of further research publications. In this regard, our findings have given the impetus to such.

(Fig-4: Documents type)

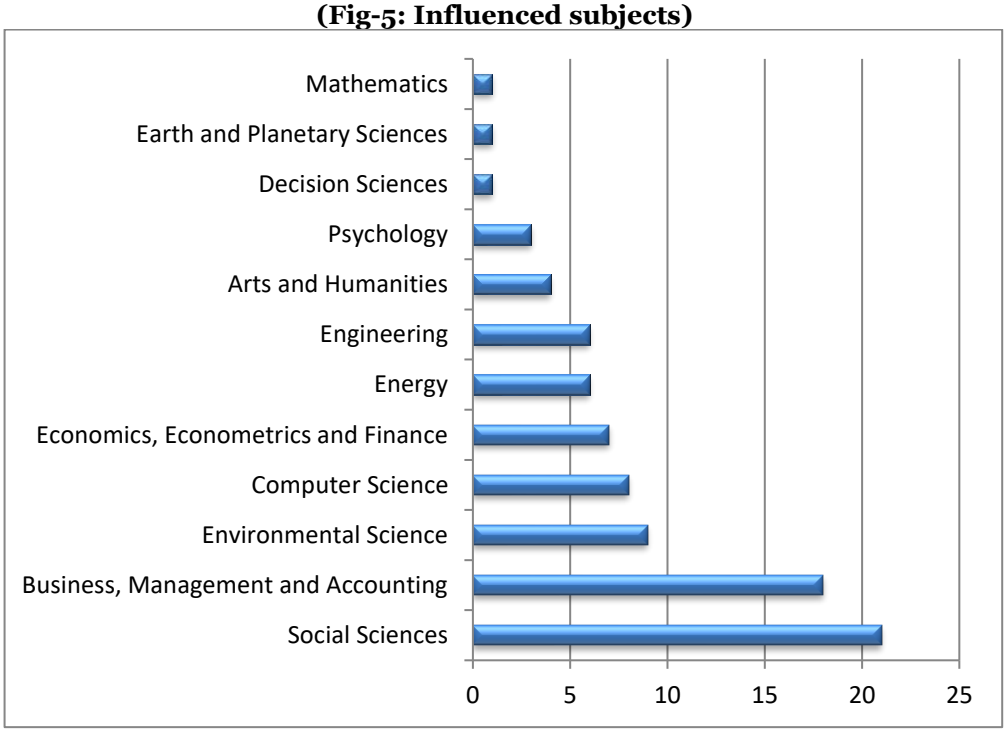


Source: Data Analysis

4.5 A Study by Subjects:

The highest highlighted subjects contain Virtual Try-On connections, originating from social science the most, then computer science and others. This connection is shown in the graph below. The urgent connection to applying these results emphasizes the potential of additional research papers in this domain.

(Fig-5: Influenced subjects)



Source: Data Analysis

4.6 A Study by Publication:

The top fifteen journals including one pool-research domain are presented in Table 1 below, being responsible for such search part. By the five papers published grossly: "Sustainability of Switzerland" and then the rest. Considering its direct practicality, we offer the call for more thorough research on such topics**.**

Table 1: Study by Popular Publication)

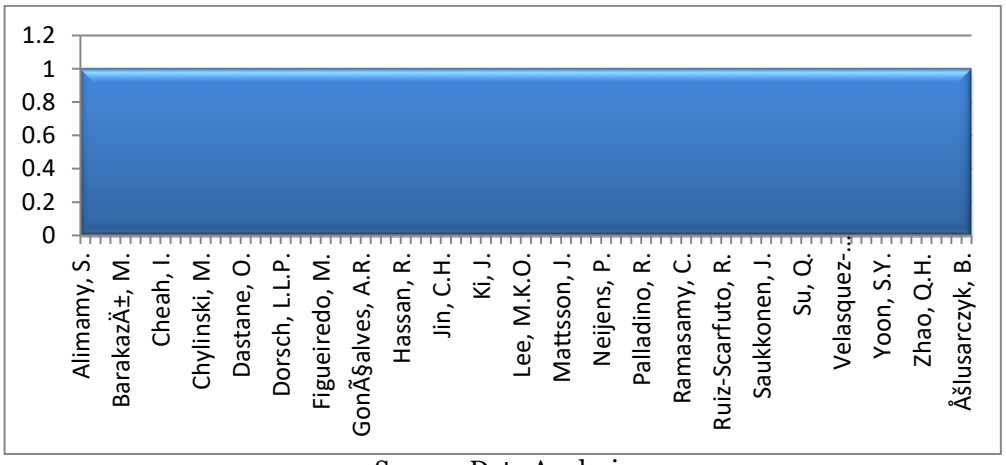
Publication name	Number of Publication
Sustainability Switzerland	5
Acta Turistica	1
Archnet Ijar	1
Contributions To Management Science	1
Current Issues In Tourism	1
European Journal Of Language Policy	1
International Conference On Construction In The 21st Century	1
International Journal Of Accounting And Information Management	1
International Journal Of Advertising	1
International Journal Of Digital Earth	1
Journal Of Cleaner Production	1
Journal Of Global Scholars Of Marketing Science Bridging Asia And The World	1
Journal Of Information Science	1
Journal Of Textile And Apparel Technology And Management	1
Lecture Notes In Computer Science Including Subseries Lecture Notes In Artificial Intelligence And Lecture Notes In Bioinformatics	1

Source: Data Analysis

4.7 Most Efficient Authors:

In addition to the timeline also a combi graph with the most relevant researchers in this special field is shown. Not to mention that their prominent literary achievements are highlighted. Among the relevant documents authors on this issue, are, on the one hand, Ahad, M.T., and Bastian, S.E.P. on the other hand, Figure 4. The results thus drawn up portray the extremely uncharted spheres for research scholars and entrepreneurs, the manifestations of which are the innovations in other areas that have not been much investigated previously. To summarize, the performers who are stuck with physical performances now can create a great variety of virtual performances and their inventiveness.

(Fig-7: Leading authors)



Source: Data Analysis

4.8: A Study by Factor

Table 2: Study by Factors

Sl.No	Broad Factors	Statement/ Sub-Factors	Author and Year
1.	Personalization and Customization	Data collection, key topics, followership behavior, social media Brand experiences, consumer perception, experiential value, implication for futures, market environment, product development culture, digital fashion, fashion design, consumer research, business model, Anglicization of higher education,	Arrigo E.; Di Vaio A.; Hassan R.; Palladino R.(2022) Barnes S.J.; Mattsson J.; Hartley N.(2015) Casciani D.; Chkanikova O.; Pal R.(2022) Elliott N.; Vila F.X.; Gilabert R.(2018)
2.	Cost-Efficiency	Low cost, product design, user engagement, Development, education, Engineering education, Physical activity, bottom-up approach productivity	Chen P.-H. (2022) Lee H.; Hampton P.; Lau K. (2019)
3.	Time-saving Benefits	Temporal, virtual prototyping,	Oh H.; Yoon S.-Y.; Hawley J. (2004) Casciani D.; Chkanikova O.; Pal R.(2022)

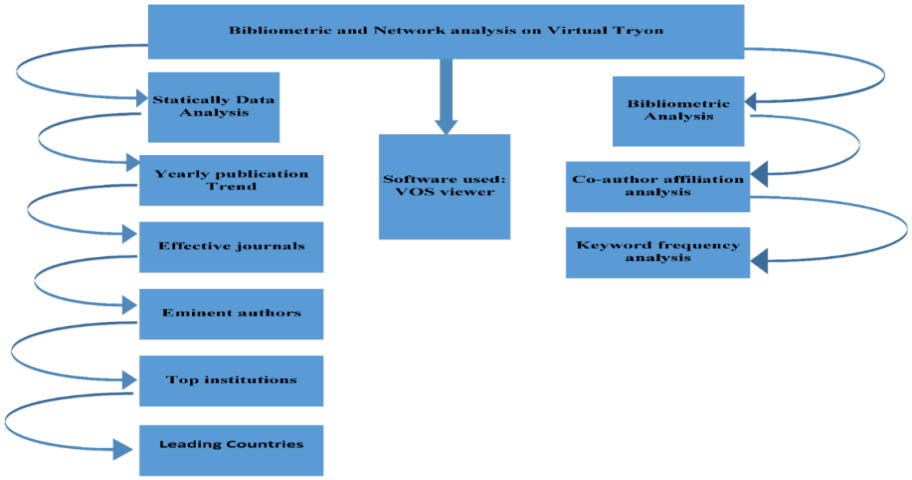
		time-saving, fashion design, culture, digital fashion, fashion design, consumer research, business model	
4.	Learning Outcomes	Education Higher education Language policy Language management Marketing research Customer relationships Market segmentation Innovative technology Strategic planning Augmented reality Virtual reality Sustainable development 3D modeling Geospatial data integration Smart city Urban planning GIS (Geographic Information Systems) Spatial analysis	Elliott N.; Vila F.X.; Gilabert R. (2018) Erdem A.; BarakazÄ± M. (2023) Gajanova L.; Nadanyiova M. (2019) GonÃ§alves A.R.; Dorsch L.L.P.; Figueiredo M.(2022) Hilken T.; Keeling D.I.; Chylinski M.; de Ruyter K.; Golf Papez M.; Heller J.; Mahr D.; Alimamy S.(2022) Khakpour A.; SÃinchez-GordÃ³n M.; Colomo-Palacios R. (2020) Ki J. (2013) Lee H.; Hampton P.; Lau K. (2019)
5.	Infrastructure	Augmented and virtual reality, vaster center, and tours eco-effectiveness, eco-friendly, agreeability, sustainability. geographic information system, satellite data	Khakpour A.; SÃinchez-GordÃ³n M.; Colomo-Palacios R. (2020) Ki J. (2013)
6.	Data Privacy considerations	Virtual Try-On, image, and videos, computer vision, regression analysis, spatiotemporal consistencies, wrappings, texture	Saukkonen J.(2022) Shankar R S.; Renju Koshy E.; Katherin Mathew S. (2022) Streimikiene D.; Korneeva E.(2020) Su Q.; Zhou F.; Wu Y.J. (2020) Zaki H.O.; Fernandez D.; Dastane O.; Aman A.; Sanusi S. (2023) Zeng J.-Y.; Xing Y.; Jin C.-H. (2023) Zhao H.; Zhao Q.H.; Åšlusarczyk B. (2019)

Source: Data Analysis

The above analysis tables highlight factors such as Personalization and Customization, Learning Outcomes, Infrastructure, cost efficiency, Time-saving Benefits, and Data Privacy. These factors have wide sub-factors.

5. Analysis of bibliometric data:

Bibliometric analysis is a data processing technique to evaluate relationships which is becoming more popular among research organizations and accepted among academic communities as a legitimate scientific methodology. The article by Donthu et al. (2021) is among those who are very concerned about the research environment and take advantage of strong tools such as citation databases for translating rather abstract concepts into concrete and measurable research fields providing a possibility for our experts to do more research. While under this heading a researcher does an extensive look and covers several bibliometric elements. We interpret content like co-authorship analysis if it pertains to author partnerships and joint research, as the other part. Detecting the word corpus of occurrence while identifying terms that give out famous topics and patterns in a specific subject is the other use of co-occurrence analysis. Researchers can provide a map of knowledge related to the specific field of academic activity, examining and assessing it more thoroughly if they systematically employ this approach, and, consequently, being more successful in their fields.



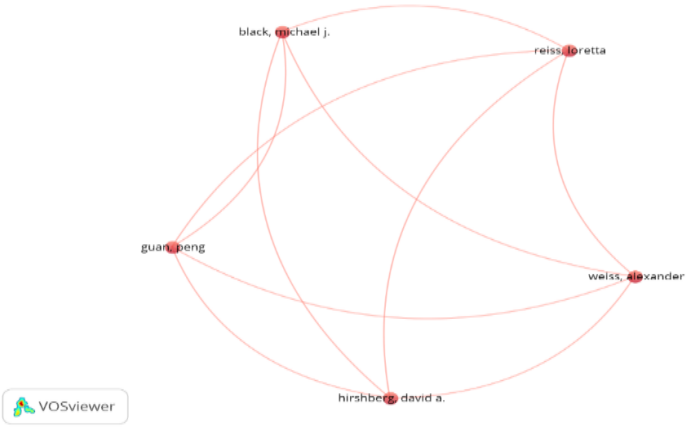
(Fig- 8: Bibliometric Analysis Researchers Compilation)

5.1 Co-author affiliation network analysis:

This section highlights VOS viewer the tool used to scrutinize co-authorship nets. As Van Eck and Waltman (2007) argue the author co-occurrence map describes connections between the authors in our dataset.

5.1.1 Co-authorship analysis based on author:

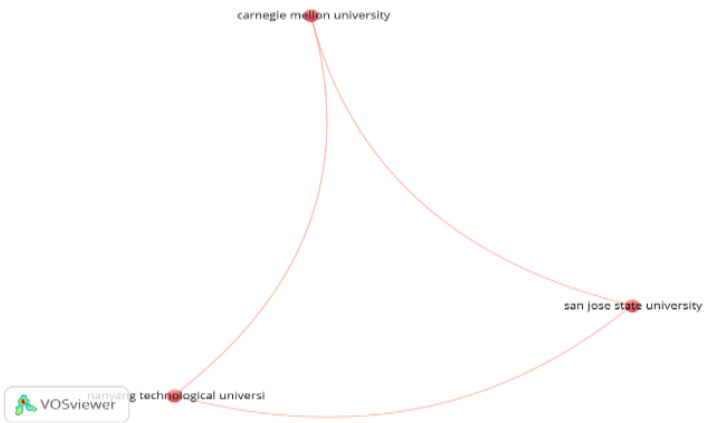
As far as it goes, nearly 34% of our entire compendium contributed to at least one partner. With that being the case, only 16 out of the 34 candidates were able to satisfy the preconditions offered. It was mandatory to have one of the published papers and five references for each article. Sticking with this narrower list of authors, the researcher thus made the network map to be all-encompassing. We were scientifically reviewing this literature, not completely unsuccessful in carrying out our planned investigative research on relationships between these culturists and the actions according to the principles that we have come up with. This means that the teamwork of the authors is crucial for the present development of knowledge in the particular discipline. For instance, there should be concerted efforts from authors to contribute high-quality research blocks on this topic that are interesting to readers.



(Fig-9: Network Visualization of Authors)

5.1.2 Co-authorship analysis based on organization:

18 Authors in this dataset are helped to write by at least one co-author. Therefore, only 9 of these 18 authors were able to comply with these demanding standards. They must have a publication of at least one and five others they should have cited. A network map of the whole list of authors was created by this researcher. However, the source was relatively limited. But it was not exactly as we had planned, the exhaustive study of the connections among those authors and how they are incorporated with our standards. This is a clear sign that research work in this field should be done with the relevant organizations having close collaboration with each other. Essentially, the authors should never scatter themselves but come together to do great work concerning this topic.

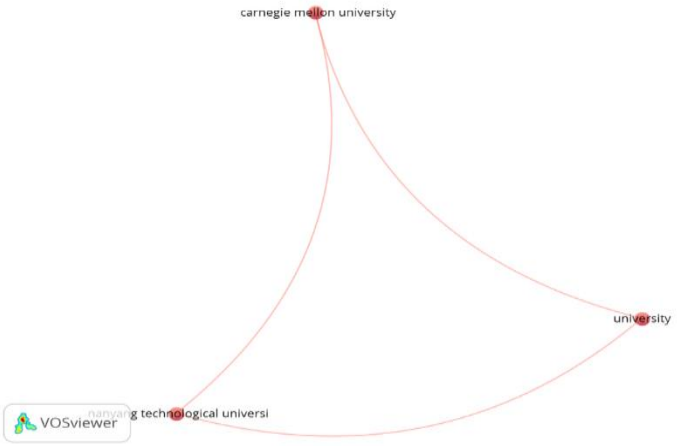


(Fig-10: Network Visualization of Organizations)

5.1.3 Co-authorship analysis based on country:

Our dataset is related to 11 scientific fields and the authors of these participated in joint endeavors including writing the paper together with at least one other author. Hence, it can be said that among the 11, only 9 were able to achieve these requirements. For this publication to be considered was a strict willingness of a further four citations in addition to the publication itself. The researcher selected a set of selected doctors and plotted

this subset into the consolidated network map. Although, to our intrinsic regret, we were not able to fulfill our requirements to look at these authors have a connection on the other hand the principles we have established are just sufficient for this investigative analysis. This example depicts the fact that international teamwork is critical for the sphere of R&D in this area. The authors have attributed the research groups to developing better research work on this theme for their readers.



(Fig-11: Network Visualization of countries)

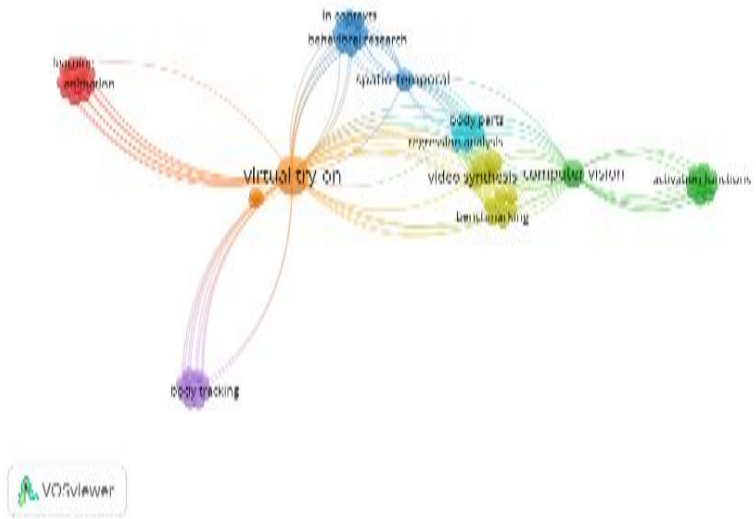
5.2 Co-occurrence of keyword visualization:

This prompt played a crucial role in unraveling the motifs observed in the writings of various authors. The validity of this analysis was made apparent by the fact that the Authors' number and quality of the keywords were also under consideration. As Eswile et al (2017) have identified, the case study is concerned with the execution of the co-occurrence map analysis in their research. Moreover, the recent literature is witnessed more frequently. Researchers found out that this new technique result it was a great tool, letting them decide on what key points and lead sentences would be the most attractive in their research. Through the use of interdisciplinary methodology, the study was conducted to tell leadership performance and its relevance to employee performance by initiating VOS Viewer.

Like Zeng and Chino (2010), I applied this formula, and it aided me in drawing connections between concepts by allowing me to assign the relative spaces to different classes of words through the use of circles, where the larger circle indicated frequent use of a group of words while their sizes indicated the importance of a particular term.

5.2.1 Co-occurrence of all keyword visualization:

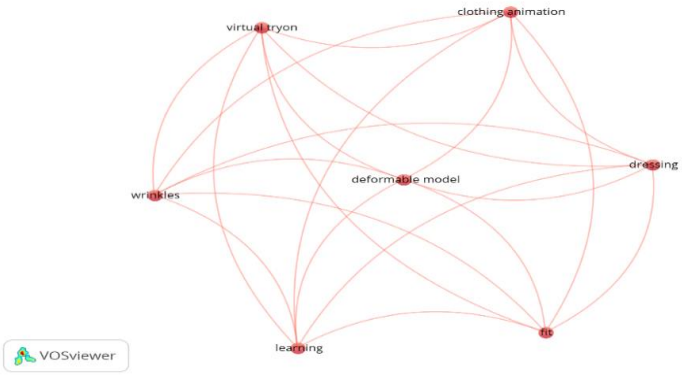
We used VOS Viewer which instances of three variables with a 1(minimum) occurrence threshold to prove network possibilities. The dataset was imported with the author's unit of analysis uncovering two co-occurrence and two complete count techniques. However, in this process, we get 82 keywords out of which 82 terms were established based on the decisive criterion, and therefore a birth of 7 different clusters is shown in Fig-12.



(Fig-12: Co-occurrence of All Keywords and cluster analysis)

5.2.2 Co-occurrence of author keyword visualization:

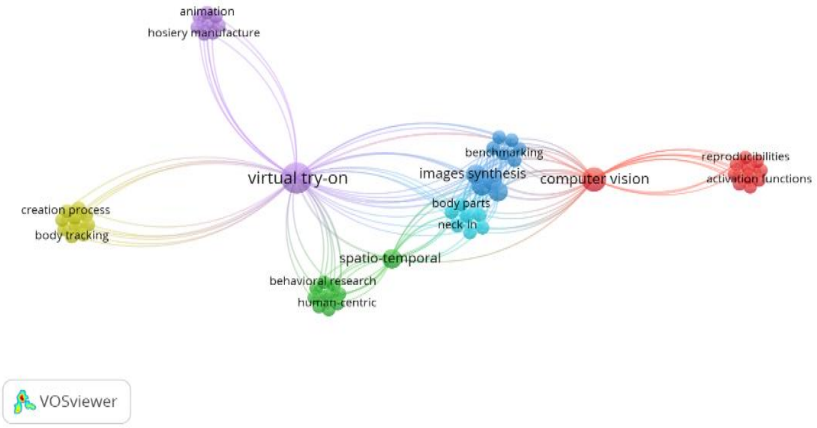
VOV View has a one-time minimal corpus occurrence and the dataset was imported using the author as the unit of analysis which was followed by both the complete count and a specific co-occurrence technique. In this process, the more exact words are detected by us which in total settled as shown in Fig-13, the 21 keywords accepted beyond the threshold criterion.



(Fig-13: Co-occurrence of Author Keywords)

5.2.3 Co-occurrence of index keyword visualization:

With A minimum occurrence threshold of one, the dataset was imported in VOS Viewer using the author's unit of analysis, along with two co-occurrence and complete count methods being employed. This method helps our keywords to be discovered increased of which 73 keywords are beyond the threshold criterion as shown in Fig: 14.



(Fig-13: Co-occurrence of Index Keywords and cluster analysis)
Source: Data analysis

5. Findings:

The main focus of the research includes different elements, such as longitudinal data analysis, institutional affiliation, contributing authors' human origin, data sources, subjects under investigation, journals from where the papers were retrieved; who had authored them, identified factors; limitations; overarching findings and full references. Thirty-six separate documents were critically analyzed to compile this study from reputable academic journals. Additionally, 38 different countries are involved in this global research database consisting of a total number of 98 contributors over the period from 2013 through 2023. The review notably shows a significant rise in academic contributions to Virtual Try-On subjects after the year 2019. Figure 3 shows that about the studies done on Virtual Try-On by various nations which have contributed significantly to the field. This is the leader in the field, followed closely by the UK and Australia. Curiously enough, out of the titles of these papers, none would have a word like a review or case study even though this was pursued. A more comprehensive evaluation of research objectives and methods can be done for better understanding. Some reviews contain methodological details about various studies combined to give an overview of how results were obtained. The findings show that 58% of articles, 6% of reviews, 14% of conference papers, 3% of books, 14% of book chapters, and 5% of conference reviews were analyzed to determine the tools and techniques utilized for data analysis as depicted in figures. Further examination of the literature on Virtual Try-On reveals numerous sub-factors and factors which are grouped into several broader categories as illustrated in table 2. It can be

seen from data analysis some of the central areas studied by scholars include Personalization and Customization; Learning Outcomes; Infrastructure; Cost-Efficiency; Time-saving Benefits; and Data Privacy concerns. Discussions within these clusters focus on matters concerning Virtual Try-On such as consumer behavior or experiences.

6. Implication of the Research:

The research implications of Virtual Try-On are indeed far-reaching. First and foremost, there should be a call for review articles, and perhaps even meta-analyses, to synthesize the existing research and find out the relevant knowledge gaps in this area. This will provide a deeper analysis of a research field and help identify the areas that academicians need to delve deeper into. Additionally, longitudinal studies will be necessary to understand the long-term impact of Virtual Try-On on customer perception, adoption, and generally the satisfaction of the end user. Studies on how Virtual Try-On maintain or diminishes the return on investment in creating an impact on purchase determination and loyalty should also be a priority. Finally, to minimize the environmental implications of Virtual Try-On, research should focus first on how energy is supplied to drive Virtual Try-On activities and be a carbon footprint of Virtual Try-On activities. This knowledge can then be applied to the practice to significantly reduce the virtual tr-on environmental impact.

Furthermore, expanding how Virtual Try-On can help promote cultural preservation, community involvement, and cultural exchange should be considered. This means ensuring that Virtual Try-On respects the cultural authenticity of the heritage and actively benefits the local community. Extensive empirical and experimental research is needed to better understand customer reception and assess any technical problems related to the effective implementation and use of this virtual experience. It would also be prudent for online retailers to investigate the impact of VTO implementation on consumers' shopping satisfaction and decision-making and compare it to the rate of returned products. Lastly, the exploration of modern technological advances, such as AR and VR, would make it possible to develop more interactive and personalized content through Virtual Try-On. This includes potential algorithms to ensure the accuracy and reliability of Virtual Try-On through fabric translation or precise garment fitting.

Assessing the impact of digital try-ons on shopping conduct, self-assurance in online shopping, and basic purchasing pride is important. Longitudinal studies can comprehensively determine its results on patron loyalty and repeat purchases. Finally, marketplace analyses should become aware of viable enterprise opportunities and demand for virtual strive-on reviews, thinking about purchaser behavior, revenue models, market segmentation, and advertising strategies. This research will help groups tailor Virtual Try-On reports to meet consumer expectations and force commercial success. In addressing those studies regions in digital attempt-on will facilitate its evolution, revolutionizing the retail enterprise at the same time as minimizing its environmental impact, and provide valuable insights into its adoption and effectiveness.

7. Limitations:

In this study's paper analyzing virtual attempt-on, it's far crucial to renowned and cope with several limitations that can impact the findings and their applicability. One capability oversight in the study pertains to the technological infrastructure required for virtual strive-on. While the paper may additionally be conscious of the blessings and results of digital try-on, it can fail to correctly not forget the vital technological necessities for people to get entry to and make use of this technology. This oversight can lead to an overestimation of the feasibility and accessibility of virtual attempt-on, specifically for people or geographic locations with restrained admission to virtual resources or technological advancements.

Furthermore, the study may additionally overlook the importance of internet connectivity as a prerequisite for digital strive-on. The ability to seamlessly move and interact with virtual strive-on platforms is predicated heavily on dependable and high-speed net connections. Failure to address this prerequisite might also bring about a misguided illustration of the accessibility and usability of virtual strive-on for individuals in regions with bad connectivity or restrained internet get entry to. Additionally, the research paper may forget to don't forget the digital literacy skills required for people to effectively engage with virtual attempt-on.

Virtual attempt-on technology often contains complex user interfaces and interactions that may be tough for individuals with confined virtual literacy. This oversight can result in an overestimation of the convenience of use and effectiveness of virtual attempt-on, especially for those who might also warfare with the generation or lack the vital competencies to navigate these platforms. To cope with those capability oversights, destiny research ought to take a comprehensive approach using thinking about and comparing the technological infrastructure and accessibility requirements for Virtual Try-On. This may be achieved by way of conducting surveys or interviews to accumulate data on the availability of generation, internet connectivity, and virtual literacy capabilities in extraordinary demographics and geographic locations. By incorporating those elements into the study's design, a more accurate knowledge of the limitations and capability obstacles to the sizable adoption of Virtual Try-On can be completed, main to more sturdy and applicable findings.

8. Conclusion:

This concept appears to be new and it is supported by some existing literature and recent observations. Lack of awareness of the potential of Virtual Try-On hampers its adoption by businesses as well as consumers. Further, there exist no structured methodologies and techniques for presentation and promotion among others in place. Regardless of the hurdles that have been stated above, the Virtual Try-On field keeps transforming itself with the constant rise in academic publications recently. For example, several potential areas for the development of Virtual Try-On have been suggested such as robotic implementation, and incorporation of strong recommenders or smart customers. Advancements in technology have led to the development of various forms of Virtual Try-On that provide convenience, safety, and personalized trial experiences to users. In addition to this; Virtual Try-On enables one to explore different products and styles while offering educative aspects besides culture immersion and discovery. Also, there are commercial gains and inclusiveness through Virtual Try-On besides the accessibility issues raised above. Currently exists a trend where most companies are using technology due to these benefits upcoming every day. To achieve sustainable development while simultaneously safeguarding the environment, try-ons were done virtually in various sectors including homes, offices, and medical facilities. In conclusion, virtual trial holds a lot of potential to transform the trial experience. Their wide acceptance is important for sustainable economic growth and ecological preservation. However, raising consciousness, employing structured approaches, and improving technology are imperative to further encourage and augment virtual trials. Given the correct application and assistance, the virtual trial is set to be popular soon enough.

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