Augmented reality and virtual reality on digital marketing effectiveness: Basis for manufacturing digital marketing framework

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Abstract

This study's aim was to determine the Augmented Reality (AR) and Virtual Reality (VR) on the digital marketing performance of manufacturing companies in Jiangsu Province of China. The respondents include 300 CEOs, managers, and supervisors of selected manufacturing companies located in Jiangsu Province. It is based on a descriptive-correlational research design whose sample was purposively selected. Based on the study findings, there was a high-level usage of augmented reality in manufacturing companies for product creation, brand awareness, and for customer engagement. The findings also indicate a high-level usage of virtual reality in manufacturing companies for enhanced customer experience, saving costs, and for human resource and talent management, and there was a high-level effectiveness of digital marketing for brand growth and recognition, customer loyalty, and traffic generation. There was a statistically significant relationship between customer engagement and sub variables of virtual reality namely human resource and talent management and enhanced customer experience. Likewise, a statistically significant relationship between brand awareness and brand growth and recognition.

Keywords: augmented reality, digital marketing, virtual reality, product creation, customer experience

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1. Introduction

With the advancement of science and technology, as well as the expansion of digital applications, China has fully entered the big data age in recent years. With this backdrop, the marketing method in all industries has shifted dramatically. The manufacturing business is one of China's fastest expanding traditional industries. When confronted with the digital marketing paradigm, the traditional manufacturing business has seen tremendous disruption. The competitive edge of traditional marketing ideas has increasingly eroded. If the country do not adapt advanced marketing concepts and continue to use traditional marketing tactics, the local manufacturing businesses will be unable to compete in the market. As a result, in order to establish core competitiveness, it is vital to examine the digital marketing effectiveness of manufacturing businesses.

According to Geng et al., (2019), new technologies like big data and augmented reality (AR) are critical in promoting digital innovation in organizations. According to Zhao (2018), the digitization of industrial firms and the intellectualization of retail business processes are critical to improving corporate performance. According to Fabin (2016), the number of consumers purchasing using mobile intelligent terminals is increasing due to the advancement of broadband, wireless, and mobile Internet. In light of the changing consumer experience and demand, manufacturing firms must undergo a digital transformation in order to better serve customers; otherwise, they will be removed in an increasingly competitive market.

Objectives of the Study - This study aims to determine the impact of Augmented Reality (AR) and Virtual Reality (VR) on the digital marketing performance of manufacturing companies in Jiangsu Province of China. Specifically, this study aimed to determine the extent Augmented Reality (AR) is used in the marketing of manufacturing companies in terms of Product Creation; Brand Awareness; and Customer Engagement; and determine the extent Virtual Reality (VR) is used in the marketing of manufacturing companies in terms of Human Resource and Talent Management, Cost Savings, and Enhanced Customer Experience; assess the Digital Marketing Effectiveness of the manufacturing companies in terms of Traffic Generation; Customer Loyalty; and Brand Growth and Recognition; determine the relationship between the use of AR, VR for Marketing and the digital marketing effectiveness of the manufacturing companies. develop a framework to enhance the digital marketing effectiveness of manufacturing companies in Jiangsu Province.

2. Methods

Research Design - A descriptive correlational design was employed in the study to correctly and methodically characterize a population, circumstance, or phenomena that is being tested. This sort of study seeks to provide answers to the what, where, when, and how questions. Descriptive correlational research designs are a combination of descriptive designs and correlation designs in which the variables are described based on significant differences and mean assessment of each dimension and variable, and the relationship between the assessment of the variables are tested using correlational method. D'Sousa et al. (2017) explained this kind of research design as involving not only the description of the variables but also the systematic investigation of the nature of relationships and associations between and among the variables rather than a direct cause-effect relationship. Furthermore, according to Aggarwal & Ranganathan, (2019), to investigate one or more variables, a descriptive research design can employ a wide range of research methods. The researcher does not alter or change any of the variables in this sort of research, but just observes and measures them. When the goal of the research is to identify characteristics, frequencies, trends, and categories, descriptive research is an excellent choice.

In research investigations, descriptive correlational design is utilized to present static depictions of events while also establishing the link between distinct variables. Two variables are researched in correlational research to determine their connection. The research questionnaire was the primary data collection instrument in the present study. The questionnaire, which was designed by the researcher, underwent and passed the reliability test. The questionnaire was distributed to the respondents on the online distribution platform after final authorization to share the questionnaire was obtained from the companies involved in the study.

Participants of the Study - The respondents of the study were 300 managers, CEOs, and supervisors and team leaders who were employed in the five selected companies. There were 66 respondents from Weiwei Group Co., Ltd; 65 respondents from XCMG Construction Machinery Co., Ltd.; 68 from Bosden Co., Ltd.; 50 from Jiangsu Hengrui Pharmaceutical Co., Ltd.; and 51 respondents from Hengli Group Co., Ltd.

Data Gathering Instrument - In this study, a questionnaire was utilized as a data collecting method to analyze the link between – Extent of Augmented Reality (AR) Application in terms of product creation, brand awareness, and customer engagement; – Extent of Virtual Reality (VR) Application in marketing of the selected companies in terms of human resource and talent management, cost savings, and enhanced customer experience; and the extent of digital marketing effectiveness of the companies in terms of traffic generation, customer loyalty, and brand growth and recognition in the selected manufacturing companies in Jiangsu Province of China. As a supplement to the data collection instrument, the researcher spent the majority of his time in this study reading information from journals, papers, the internet, theses, and books. Furthermore, the researcher created appropriate questionnaire items based on personal and professional experiences and observations.

The primary data gathering tool in this study was a four-section questionnaire. The questionnaire was fully evaluated by subject-matter experts as well as the dissertation supervisor. In the first part, the demographic profile of the respondents were assessed, including five questions on age, gender, position, nature of business, and years of operation. This section generally provided the demographics of the participants, which helped the researcher monitor any changes among these key factors. In the second part, the respondents' extent of usage of augmented reality (AR) was assessed, including three (3) dimensions of product creation, brand awareness, and customer engagement. In the third part, the extent of virtual reality (VR) usage for marketing was assessed with three (3) dimensions, including human resource and talent management, cost savings, and enhanced customer experience. The researcher constructed all parts of the questionnaire based on the literature studied, which provided insights on concepts related to the variables being investigated.

In this study, Likert scale questions were employed, which was a psychometric scale that was thought to be vital in gauging a respondent's opinion or attitude toward a certain issue. This survey format condensed complicated concepts, opinions, and inquiries. The survey instrument consisted of 4-Likert scale questions with response options of "Strongly Agree," "Agree," "Disagree," and "Strongly Disagree." The data collected from the respondents was weighted on a scale of 1-4, with 1 being the lowest and 4 being the highest value, which quantitatively measured the extent of the use of AR and VR in manufacturing companies towards a more effective digital marketing strategy. The Likert Scale grading for this study was 3.5-4 for Strongly Agree, 2.5-3.49 for Agree, 1.5-2.49 for Disagree, and 1.00-1.49 for Strongly Disagree. The questionnaire was validated after the research adviser had reviewed it. The validation comments and suggestions will be taken into account when revising the instrument. The researcher will present the draft for content validation to ensure the item's content was clear and comprehensive.

The questionnaire was tested in a pilot study to determine its validity and reliability using the Cronbach's Alpha Index of Reliability. The results of the pilot test were required to ensure the survey instrument's integrity, consistency, and reliability. At least 20 respondents from the research locale will be given copies of the approved draft and will be asked to provide responses to determine whether the contents of the questionnaire are clear, concise, accurate, reliable, and comprehensible for content validation. For the instrument's improvement, suggestions from experts were incorporated. A final copy was produced by the researcher after the instrument is

approved for reproduction. Reliability results showed that the Cronbach's alpha for augmented reality (0.872), virtual reality (0.860), and digital marketing (0.840) suggesting that the items have a good level of internal consistency.

Data Gathering Procedure - The approved final questionnaire after incorporation of suggestions and recommendations was used by the researcher as his tool in data gathering. After passing the reliability test, the result was encoded and sent to the respondents online. Prior to questionnaire administration, a formal letter was sent to the directors of the company for the researcher to obtain authorization to administer the questionnaire to the research participants of the respective manufacturing companies. It is important to note, that prior to sending the formal letter the researcher established communication links with the five manufacturing companies (XCMG Construction Machinery Co., Ltd., Weiwei Group Co., Ltd., Bosden Co., Ltd., Jiangsu Hengrui Pharmaceutical Co., Ltd., and Hengli Group Co., Ltd.), and indicated if they were all willing to allow participation. After final approval for participation was obtained from the study locales, the questionnaire was sent online to 136 respondents through their emails as provided by the company upon approval. Subsequently, the data collected was summarized, analyzed and interpreted by the researcher.

Ethical Considerations - Ethical considerations was applied in the performance of the research effort to ensure that any information acquired is used solely for research purposes in order to maintain the quality and integrity of the research. From the outset, the researcher's professional judgment, financial or personal concerns were not jeopardized. Instead, the study's main purpose was to give important knowledge to the profession while simultaneously enhancing digital marketing prospects of manufacturing industries in Jiangsu Province. Before conducting the survey, all necessary permissions were obtained. The research and its goals were described to the participants. They were assured that the research would be carried out purely for academic objectives and would not risk their safety or privacy. The researcher also sought the approval of the employee respondents (CEOs, managers, supervisors, and team leaders) by letter and correspondence to ensure that the target respondents are willing to answer the study questions. It also protected the respondents' confidentiality and identity by not asking for their names as they completed the questionnaires. The researcher also guaranteed that the respondents answer the surveys willingly and in accordance with their wishes. Finally, it guaranteed that none of the study's participants are wounded or harmed, and that their safety and security is a major concern.

Data Analysis - Several statistical methods were used to count, encode, and evaluate the necessary documents and figures. This study employed frequency distribution, weighted mean, Pearson - Product Moment Correlation, t-test or Mann Whitney test, and analysis of variance (ANOVA) based on the study goals. Furthermore, every data was processed using statistical software. The SPSS 25.0 program was used in this study to assess the reliability and validity of the obtained data.

3. Results and discussion

Table 1 shows the assessment on augmented reality used in the marketing of manufacturing companies. As gleaned from the table, the highest assessed indicator is brand awareness, with a composite mean of 2.81; this is followed by customer engagement, with a composite mean of 2.70, and product creation, with a composite mean of 2.66. The respondents' assessment indicates a high level of usage of augmented reality in manufacturing companies for product creation, brand awareness, and customer engagement.

By visually exposing the relationships between products and services in the context in which they are supposed to be used and externalizing inter-concept networks, it is contended that AR fosters customer creativity. Customers may immediately visualize these relationships with the help of AR, increasing the number of relationships beyond what is possible with mental images alone (Heller et al., 2019). On the other hand, augmentation influences alterations in consumers' opinions toward brands via inspiration (Rauschnabel et al., 2019). Also, AR elements like goal and location have an impact on how customers perceive a brand's personality. The influence is regulated by consumer traits like IT innovation and retail orientation and mediated by how users

perceive their AR app experiences and attitudes toward the AR app (Plotkina et al., 2021).

Table 1

Augmented Reality Used in the Marketing of Manufacturing Companies

Key Result Areas	Weighted Mean	Verbal Interpretation	Rank
Product Creation	2.66	Agree	3
Brand Awareness	2.81	Agree	1
Customer Engagement	2.70	Agree	2
Grand Composite Mean	2.72	Agree	

Legend:3.50-4.00=Strongly Agree;2.50-3.49=Agree;1.50-2.49=Disagree;1.00-1.49=Strongly Disagree

Table 2

Virtual Reality Used in the Marketing of Manufacturing Companies

Key Result Areas	Weighted Mean	Verbal Interpretation	Rank
Human Resource and Talent Management	2.52	Agree	3
Cost Savings	2.69	Agree	2
Enhanced Customer Experience	2.81	Agree	1
Grand Composite Mean	2.67	Agree	

Legend: 3.50-4.00=Strongly Agree;2.50-3.49=Agree;1.50-2.49=Disagree;1.00-1.49=Strongly Disagree

Table 2 shows the assessment of virtual reality used in the marketing of manufacturing companies. As gleaned from the table, the highest assessed indicator is enhanced customer experience with a composite mean of 2.81, this is followed by cost savings with a composite mean of 2.69, and human resource and talent management with a composite mean of 2.52. The respondents' assessment indicates a high-level usage of virtual reality in manufacturing companies for enhanced customer experience, saving costs, and for human resource and talent management. A highly sophisticated VR experience influences how consumers rate hedonistic products —but not utilitarian—products (Peukert et al., 2019). Furthermore, the majority of earlier studies on VR commerce were unduly concerned with how VR technological experiences affected customers' perceptions regarding products and stores (Han et al., 2020).

Table 3

Digital Marketing Effectiveness of the Manufacturing Companies

Key Result Areas	Weighted Mean	Verbal Interpretation	Rank
Traffic Generation	2.70	Agree	3
Customer Loyalty	2.94	Agree	2
Brand Growth and Recognition	3.27	Agree	1
Composite Mean	2.97	Agree	

Legend: 3.50-4.00=Strongly Agree;2.50-3.49=Agree;1.50-2.49=Disagree;1.00-1.49=Strongly Disagree

Table 3 shows the assessment on digital marketing effectiveness of manufacturing companies. As gleaned from the table, the highest assessed indicator is brand growth and recognition, with a composite mean of 3.27; this is followed by customer loyalty with a composite mean of 2.94 and traffic generation with a composite mean of 2.70. The respondents' assessment indicates a high level effectiveness of digital marketing for brand growth and recognition, customer loyalty, and traffic generation. Manufacturing companies have resorted to following emerging digital marketing trends that are gradually phasing out traditional marketing. Digital marketing is the practice of promoting goods and services online to increase client reach. Digital marketing aims to advertise brands using all forms of digital media (Kusumawati et al., 2019). The China Internet Network Information Center (CNNIC) reported that as of December 2020, there were nearly 1 billion internet users in China, with an internet penetration rate (the proportion of internet users to the total population) of 70.4%. 99.7% of internet users do so via a mobile device. This opens up limitless possibilities for digital marketing (Poon, 2021). Digital marketing strategies include web marketing, web-based video content creation, search engine optimization, pay-per-click, and television advertising (Low et al., 2020).

Table 4

Relationship Between Augmented Reality and Virtual Reality

Variables	rho	p-value	Interpretation
Product Creation			
Human Resource and Talent Management	0.148*	0.010	Significant
Cost Savings	0.067	0.245	Not Significant
Enhanced Customer Experience	0.082	0.155	Not Significant
Brand Awareness			
Human Resource and Talent Management	0.126*	0.029	Significant
Cost Savings	0.133*	0.021	Significant
Enhanced Customer Experience	0.072	0.216	Not Significant
Customer Engagement			
Human Resource and Talent Management	0.157**	0.006	Significant
Cost Savings	-0.003	0.965	Not Significant
Enhanced Customer Experience	0.153**	0.008	Significant

**. Correlation is significant at the 0.01 level

As seen in the table, the computed rho-values ranging from 0.067 to 0.148 indicate a very weak direct relationship between product creation and sub-variables of virtual reality. The computed rho-values ranging from 0.072 to 0.133 indicate a very weak direct relationship between brand awareness and sub-variables of virtual reality. The computed rho-values ranging from 0.152 to 0.157 indicate a very weak direct relationship between customer engagement and sub-variables of virtual reality, namely human resource and talent management and enhanced customer experience, while the computed rho-value of -0.003 indicates a very weak indirect relationship between customer engagement and cost savings. There was a statistically significant relationship between product creation and human resource and talent management because the obtained p-value was less than 0.05. This suggests that the use of augmented and virtual reality for product creation may significantly impact the human resource and talent management department towards upskilling and other areas for improvement in the company's human resource ad talent management department. The ergonomics of extensive use of VR headsets in the workplace are still being worked out by the VR industry. Older individuals might develop motion sickness, fatigue, and other difficulties that prevent prolonged use, whereas younger workers could usually spend hours in virtual worlds (Lawton, 2021).

There was a statistically significant relationship between brand awareness and sub variables of virtual reality namely human resource and talent management and cost savings because the obtained p-values were less than 0.05. This suggests that the use of virtual reality in the company aids in the improvement of brand awareness, cost savings, and talent management. According to Jenkins (2019), VR provides fresh opportunities for skill and knowledge development. Although VR may initially cost more than conventional research and development technologies, its long-term benefits cannot be disregarded. The expense of flying a thousand workers anywhere in the world can be reduced significantly by using VR to deliver the needed value. By potentially being more effective, economical, and lowering training-related risks, this technology can be used to improve how we teach and train professionals.

There was a statistically significant relationship between customer engagement and sub variables of virtual reality namely human resource and talent management and enhanced customer experience because the obtained p-values were less than 0.01. This suggests that AR and VR technology may improve engagement, talent management, and enhanced customer experiences. The most significant indicator of customer loyalty among Customers and consumers is a marketing plan that uses a variety of online media platforms, which is followed by a variety of good and negative customer replies. The higher the rank and good comment response rates, the more loyal customers are. Hence, social media's digital supply chain is indeed important to effectively manage media, particularly when it comes to product reviews and reactions to critical comments (Liang et al., 2019).

Table 5

Relationship Between Augmented Reality and Digital Marketing

Variables	rho	p-value	Interpretation
Product Creation			
Traffic Generation	0.077	0.184	Not Significant
Customer Loyalty	-0.003	0.963	Not Significant
Brand Growth and Recognition	0.099	0.087	Not Significant
Brand Awareness			
Traffic Generation	0.077	0.184	Not Significant
Customer Loyalty	0.075	0.193	Not Significant
Brand Growth and Recognition	0.170**	0.003	Significant
Customer Engagement			
Traffic Generation	0.030	0.600	Not Significant
Customer Loyalty	-0.034	0.557	Not Significant
Brand Growth and Recognition	0.060	0.300	Not Significant

**. Correlation is significant at the 0.01 level

As seen in the table, the computed rho-values ranging from 0.077 to 0.099 indicate a very weak direct relationship between product creation and sub-variables of digital marketing, namely traffic generation and brand growth and recognition, while the computed rho-value of -0.003 indicates a very weak indirect relationship between product generation and customer loyalty. The computed rho-values ranging from 0.075 to 0.170 indicate a very weak direct relationship between brand awareness and sub-variables of digital marketing. The computed rho-values ranging from 0.030 to 0.060 indicate a very weak direct relationship between customer engagement and sub-variables of digital marketing, namely traffic generation and brand growth and recognition, while the computed rho-value of -0.034 indicates a very weak indirect relationship between customer engagement and customer loyalty.

It shows only a statistically significant relationship between brand awareness and brand growth and recognition because the obtained p-value was less than 0.01. This implies that the use of digital marketing technology will impact the brand awareness of the companies, which will significantly increase the brand growth and recognition. Digital marketing has a good correlation with consumer loyalty and satisfaction. (Adam et al., 2020). Consumer views regarding online buying have been positively impacted by the growing usage of digital marketing and social media, which has increased market share for businesses focused on eCommerce (Sarwar-A Alam et al., 2019).

Table 6

Relationship Between Virtual Reality and Digital Marketing

Variables	rho	p-value	Interpretation
Human Resource and Talent Management			
Traffic Generation	0.003	0.964	Not Significant
Customer Loyalty	0.006	0.921	Not Significant
Brand Growth and Recognition	0.020	0.726	Not Significant
Cost Savings			
Traffic Generation	0.061	0.292	Not Significant
Customer Loyalty	-0.034	0.560	Not Significant
Brand Growth and Recognition	0.082	0.158	Not Significant
Enhanced Customer Experience			
Traffic Generation	0.206**	0.000	Highly Significant
Customer Loyalty	0.014	0.804	Not Significant
Brand Growth and Recognition	0.000	0.996	Not Significant

**. Correlation is significant at the 0.01 level

As seen in the table, the computed rho-values ranging from 0.003 to 0.020 indicate a very weak direct relationship between human resource and talent management and sub-variables of digital marketing. The computed rho-values ranging from 0.061 to 0.082 indicate a very weak direct relationship between cost savings and sub-variables of digital marketing, namely traffic generation and brand growth and recognition, while the computed rho-value of -0.034 indicates a very weak indirect relationship between cost savings and customer

loyalty.

The computed rho-values ranging from 0.014 to 0.206 indicate a very weak to weak direct relationship between enhanced customer experience and sub-variables of digital marketing, namely traffic generation and customer loyalty, while the computed rho-value of 0.000 indicates no relationship between enhanced customer experience and brand growth and recognition. It only shows a significant relationship between enhanced customer experience and traffic generation because the obtained p-value was less than 0.01. This implies that the use of digital marketing to boost customer experience also impacts traffic generation to the social media platforms of the manufacturing companies. It further shows that digital marketing may be used to improve customer loyalty. El-Adly (2019) employed customer attitudinal loyalty to gauge respondents' likelihood to repurchase and likelihood to make favorable recommendations. Overall consumer pleasure leads to increased customer loyalty. Hence, devoted Customers feel satisfied and are encouraged to buy goods and services (Al-Dmour et al., 2019).

Proposed Framework

The digital marketing framework proposed by the researcher includes the use of virtual reality, augmented reality, and social media platforms for an effective marketing among manufacturing companies.

Virtual Reality Marketing – The model suggests the use of virtual reality for human resource and talent management, cost savings, and enhanced customers experience. In human resource and talent management, VR will be used to overcome challenges on time and distance, enable workers to learn about tasks and the procedures on how to do them beforehand, equip workers with the necessary skills to apply in their workplace, train quality workers for their future careers, and to clarify and predict the risks and dangers involved in their work process. When it comes to cost savings, VR could be used to detect defects in products before they're released, fast learning and training, understanding future demand and supply, planning, designing, and machining, and for improving product and process development. And to enhance customer experience, VR could be used in creating product design for interactive customer experience, increasing visual appeal of products and services, providing customer service with education, interactive simulations, and for easing transaction processes.
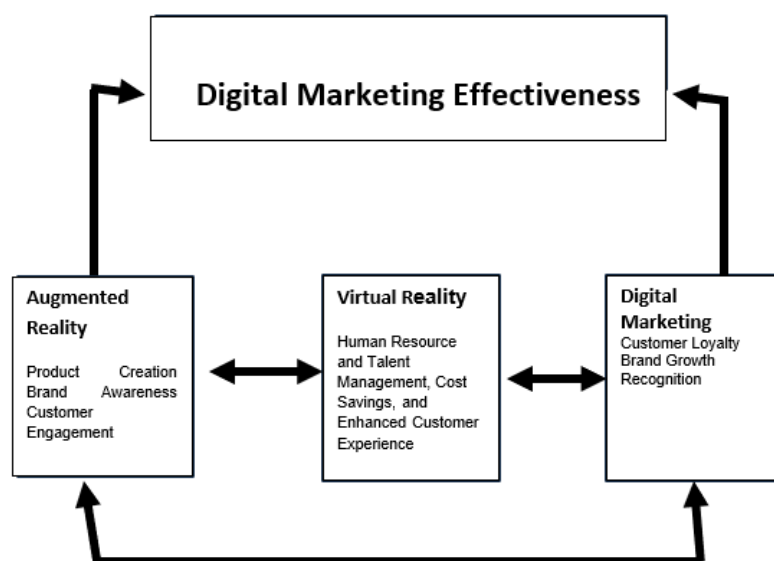

Figure 1. Manufacturing Digital Marketing Framework

Augmented Reality Marketing – This includes the use of augmented reality for product creation, brand awareness, and customer engagement. In product creation, the manufacturing companies will make use of augmented reality to reduce operation cost, facilitate mechanical assembly processes, track and register products, obtain virtual information related to needed products in the real world, and to improve manufacturing operations. In brand awareness, AR will be used for creating campaigns for advertising, for creating demos and prototypes that will be used to garner awareness before the product is launched, to increase the consumers' buying intention, and to enhance brand recall and increase interactivity of consumers with marketing materials. And when it comes to customer engagement, AR will be used to interact directly with the manufacturing information associated with the manufacturing processes, enhance the immersive sensation of customers, address human-robot interaction, experiment with different features of the product such as color and interfaces, and to provide users with an intuitive way to interact directly with product design and manufacturing information.

Digitized (Social Media) Marketing – In digitized marketing, social media platforms could be used to generate traffic, boost customer loyalty, and brand growth and recognition. For traffic generation, social media platforms could be used in increasing interaction such as views and visits on company websites and products, for enhancing traffic growth with search engine optimization, up-to-date content creation that follows trends, for increasing customer engagement, and for collaborative marketing with celebrities. In order to boost customer loyalty, social media platforms could be used in maintaining customer interest and communication, relating products with the needs and wants of the target market, increasing buying intentions of customers, repurchasing chosen brands, and enhancing customer relationships. And for brand growth and recognition, the social media platforms could be used in reaching target markets and gaining new customers, personalized and unique customer experiences that are specific to brands, improving the return-of-investment (ROI) of manufacturing companies, supplementing brand awareness and increasing customer loyalty, and effectively reducing costs for reaching global audiences through the use of social media platforms, SEO tools, and many others.

4. Conclusions and recommendations

The respondents' assessment indicates a high-level usage of augmented reality in manufacturing companies for product creation, brand awareness, and for customer engagement. The assessment also indicates a high-level usage of virtual reality in manufacturing companies for enhanced customer experience, saving costs, and for human resource and talent management. The assessment indicates high-level effectiveness of digital marketing for brand growth and recognition, customer loyalty, and traffic generation. There was a statistically significant relationship between customer engagement and sub-variables of virtual reality, namely human resource and talent management and enhanced customer experience. The study's proposed framework is aimed at enhancing digital marketing effectiveness, and it includes the use of virtual reality, augmented reality, and social media platforms for effective marketing among manufacturing companies in Jiangsu Province.

Manufacturing companies in Jiangsu province may make more use of augmented reality to interact directly with the manufacturing information associated with the manufacturing processes, to enhance the immersive sensation of customers. Virtually reality may be used in manufacturing companies to overcome challenges on time and distance for improved human resource development and enable workers to learn about tasks and the procedures on how to do them beforehand. Digital marketing may be used by companies in Jiangsu Province to easily reach target markets and gain new customers, and to effectively reduce costs for reaching global audiences through the use of social media platforms, SEO tools, and many others. The companies may also adopt the proposed model to enhance the effectiveness of digital marketing in manufacturing companies in Jiangsu Province.

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