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Research Paper

Indirect Role of Metaverse in Vietnam: Transformation of Industry 4.0 to Industry 5.0 leading to Business Innovation

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Abstract

This study has aim to explore the indirect role of metaverse technology in the promotion of business innovation through the transformation of Industry 4.0 to Industry 5.0 in Vietnam. Despite the extensive research on Industry 4.0, the transformation of Industry 4.0 to Industry 5.0 is relatively less discussed in relation to the business innovation. Most importantly, the indirect role of metaverse was not discussed by previous studies in this transformation stage of technology. To fill this gap, this study examined the relationship between Industry 4.0, metaverse, Industry 5.0 and business innovation. A survey was carried out to examine the indirect role of metaverse by proposing four direct effect hypotheses and one indirect hypothesis. 170 responses from the technological experts of the marketing industry in Vietnam were used to examine the relationship by using a survey questionnaire. It was observed that metaverse is a crucial element in the transformation of Industry 4.0 to Industry 5.0, leading to higher business innovations.

Introduction

The transformation from Industry 4.0 to Industry 5.0, facilitated by metaverse technology, indicates a new era of the business innovation in Vietnam. Industry 4.0 directed on the automation, data exchange, and smart manufacturing, which also involve enhancing efficiency as well as productivity among various online businesses (Arromba et al., 2020; Haseeb et al., 2019; Jamshaid et al., 2022; Schmidt et al., 2015). On the other hand, Industry 5.0, however, stresses human-centric solutions, leveraging progressed technologies to advance collaboration between humans as well as machines (Jagatheesaperumal & Rahouti, 2022; Xu et al., 2021). Bother the Industry 4.0 to Industry 5.0 are interconnected. More interestingly, it is how these confronts, and perceived opportunities affect the progress of an organization's digital world. The promotion of Industry 5.0 requires the help of Industry 4.0 which is possible through metaverse technology.

However, promotion of Industry 5.0 is possible through metaverse technology. The metaverse, a junction of virtual as well as physical realities, plays a crucial role in this shift (Hwang & Lee, 2022; Lee et al., 2011; Zadorozhnyi et al., 2022). It facilitates immersive experiences, real-time simulations, and training about different virtual environments, driving creativity as well as innovation. Businesses can conduct experimentation through the use of prototypes, optimize the supply chains, and develop customer collaborations within virtual spaces, indicating to unprecedented levels of customization along with personalization (Dioniso et al., 2013). This progression not only augments the operational capabilities, however it also opens new avenues for market expansion and service delivery, placing companies related to business activities at the forefront of the technological advancement and growth related to financial performance. Figure 1 highlighted how the technology revolution shifted from one era to another era along with the emphasis of various operations.

The adaptability of the technology that can be customized has several benefits for the businesses because it can provide customized services (Barthe-Delanoë et al., 2018). Flexible marketing application architecture is enhanced by using technologies in the new era of industrialization. As a result, in a dynamic corporate environment, it is most feasible to implement a technology design that makes it anxious for a rapid application development methodology as a result of the need for organizational flexibility. This indicates that companies utilizing this technique create distinct capabilities for clients faster than their competitors. Furthermore, online payments, online logistics, and so on (Acheampong et al., 2017; Hameed et al., 2018; MahbubulHye et al., 2020; Nadeem et al., 2018) require the implementation of new technology. Companies, specifically those that are SMEs today combine offline and internet elements. The requirement for the business adaptation enables smaller businesses to rethink about opportunity with new technology.

However, there is doubt about how companies would use the augmented reality and the idea of the metaverse to changing

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marketing sectors (Kim & Kim, 2021). These shifts in trends could involve the utilized as a corporation approach or even as a central upgrade tool to help companies make the change from traditional to new frontier marketing. In this case, the shift of Industry 4.0 to Industry 5.0 is important which is possible through metaverse technology. Due to insufficient digital proficiency, knowledge and resources as well as capital, enterprises in developing nations are notably susceptible to the disturbance of supply chains and corporate networks (Ansong & Boateng, 2019; Golubev et al., 2020).

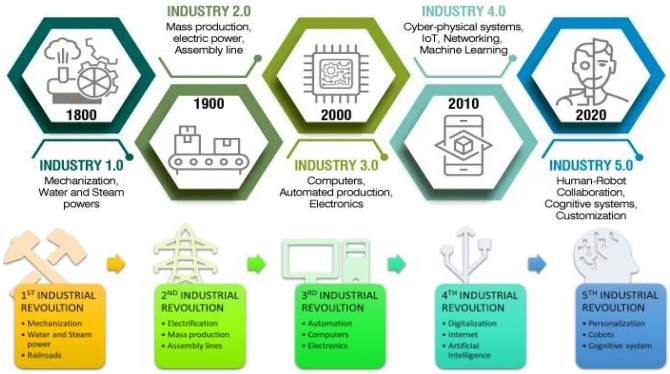

Figure 1: Industry Transformation Phases from Industry 1.0 to Industry 5.0.
Source: KnowHow, BofA Global Research.

Because the business enters the world of digital age, there are range of the issues to think through and the challenges along with various opportunities stated by such digital technologies. Digital marketing with augmented reality (AR) technologies as well as the metaverse idea forecasts and with a strong ability to give cost-cutting competitive advantage, improve coherence and efficiency between the company and its business parties involved in business. Therefore, digital marketing is important for businesses which require technology (Bakhtieva, 2017; Boonmalert et al., 2021; Gunawan & Sulaeman, 2020). Hence, this study is an attempt to highlight how metaverse increase business innovation in marketing through the conversion of Industry 4.0 to Industry 5.0 in online businesses of Vietnam. Hence, this study has aim to explore the indirect role of metaverse technology in the promotion of business innovation through the conversion of Industry 4.0 to Industry 5.0.

Literature Review

Framework of the Study

The model of the Industry 5.0 is centered on human being (Jagatheesaperumal et al., 2022). It's about people using all of the Industry 4.0 technologies to function better, faster, as well as with more productively, and economically. Manpower is restoring to factory in Industry 5.0 to improve operations, as we perceived in Industry 4.0. The humans will work along with robots which is another revolution. Industry 5.0 shifts the attention of importance from the shareholders to the stakeholders. Industry 5.0 is robust, sustainable, and focused on the requirements of people (Xu et al., 2021). In 2022, it got underway from fourth revolution to fifth revolution. Collaborative robots, virtual reality, computing, 6G, and 3D printing are few examples of Industry 5.0.

By considering the shift of the industry from one revolution to another revolution, this study attempted to highlight this transformation with the help of metaverse. Many business settings are unable to fully incorporate Industry 4.0 and Industry 5.0 in light of current industrial revolution. With very few Industry 4.0 assets, continue to live in the Industry 3.0 world. However, it is important to shift the technological revolution. Businesses are unable to implement Industry 5.0 since a large number of assets are not even network connected, much less intelligent, due to a lack of capabilities. In this case, the introduction of metaverse is important to make possible of this shift.

Therefore, this study introduced a framework showing the shift of Industry 4.0 to Industry 5.0 through metaverse in Figure 2. The few Industry 4.0 assets with system connectivity are repeatedly a part of large, dispersed, extremely complicated networks. Business operations present additional difficulties, such as IoT assets that have safety vulnerabilities of their own activities. The attack surface is growing more faster with those devices, and they can even be utilized as stepping stones into the network. Businesses witnessed numerous attacks on those networks during the past year. In this case, this study presented that transformation of technological era with the help of metaverse can foster the business operations by reducing the risks.

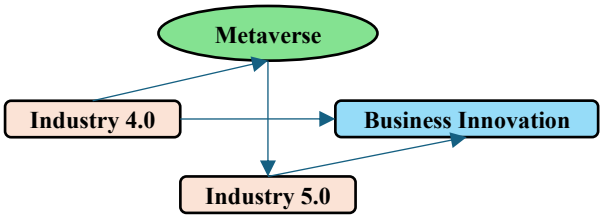

Figure 2: Framework of the current study showing the indirect role of metaverse in the transformation of Industry 4.0 to Industry 5.0.

Industry 4.0 to Industry 5.0: The Metaverse as a Catalyst for Transformation

The industrial landscape has observed outstanding advancements earlier few decades, evolving from mechanization of first industrial revolution to the cyber-physical systems of Industry 4.0. Industry 4.0, characterized by important integration of IoT, AI, big data, and automation, has significantly improved manufacturing processes, productivity, and effectiveness (Schmidt et al., 2015; Tortorella et al., 2018). However, as when we move towards Industry 5.0, the focus changes towards a more humanoid-centric approach, highlighting the collaboration between humans and machines (Jagatheesaperumal et al., 2022). One of the pivotal technologies steering this transition is metaverse. This essay investigates how metaverse technology is easing the move from Industry 4.0 to Industry 5.0, leading to exceptional business innovation.

Moreover, the role of this transformation has vital importance globally, especially for Vietnam. Industry 4.0, announced smart manufacturing and digitization of the industrial sector leading to sudden innovations. Central to this revolution were technologies including cloud computing (Müller et al., 2021). These technologies enabled real-time data collection as well as analysis, predictive maintenance, and autonomous decision-making processes (Nascimento et al., 2019). Industry 4.0 gave about significant improvements in the operational efficiency, reduced downtime, and developed product quality (Frank et al., 2019). However, the focus remained largely on optimizing production processes and increasing output, with limited emphasis on the role of human workers within these systems.

Moreover, Industry 5.0 signifies the paradigm shift, where the synergy between humans and machines is prioritized (Waheed et al., 2022). It has emphasize on the integration of human intelligence, creativity, and decision-making expertise with sophisticated technologies. Goal is not only to boost productivity but also to improve well-being as well as satisfaction of workers (Waheed et al., 2022). In Industry 5.0, humans as well as robots collaborate effortlessly, leveraging each other's powers to achieve greater outcomes. This human-centric methodology expects technologies that can assist the intuitive and immersive interactions, which is where the metaverse comes into play. In this way, metaverse has potential role to play. The metaverse is a sizable, interconnected virtual universe that mixes physical as well as digital realities. This technology holds massive potential for converting industries by providing new innovative ways of working, learning, and interacting.

The metaverse offers revolutionary approach to the training and skill development. Through VR and AR, employees of the organizations can undergo realistic models of complex tasks, increasing their skills in a risk-free environment. The promotion of metaverse thus have valuable potential of businesses (Setiawan & Anthony, 2022). This is remarkably helpful for businesses such as production, healthcare, and aerospace, where accuracy and expertise are more crucial. Workers can practice procedures, troubleshoot issues, and gain hands-on experience without the constraints of physical resources or safety concerns. The metaverse can revolutionize supply chain management (SCM) by providing end-to-end visibility and real-time monitoring for supply of goods (Chang et al., 2022). Companies can create simulated representations for SCM of their supply chains, track the passage of goods, as well as detect potential bottlenecks. This level of clearness enhances decision-making, lowers the delays, and ensures competent resource allocation. However, it requires integration of Industry 5.0 which is possible with the help of different ways.

Different ways involve resilient operations, sustainable practices, empowered workforce and innovative business models. Virtual simulations and the digital twins enable rapid response to changing market conditions (Schluse & Rossmann, 2016), supply chain disruptions, and unforeseen challenges. This agility enhances the company's ability to adapt and thrive in dynamic environments. Virtual prototyping, remote collaboration, and the digital simulations decrease the reliance on physical prototypes, travel, and additional inventory, contributing to a more sustainable industrial ecosystem. Industry 5.0, fueled by the metaverse, empowers the workforce by providing tools for continuous learning, skill enhancement, and creative problem-solving. Companies can search the virtual marketplaces, offer subscription-based services, and create immersive brand experiences. These new revenue streams differentiate business portfolios and create opportunities for growth. Finally, it is evident from the conversation, the shift from Industry 4.0 to Industry 5.0, facilitated by metaverse technology, marks a substantial evolution in the industrial landscape. Hence, following hypotheses are proposed:

Hypothesis 1: *Industry 4.0 promotes metaverse technology.*
Hypothesis 2: *Industry 4.0 promotes business innovation.*
Hypothesis 3: *Metaverse technology promotes Industry 5.0.*

Promotion of Business Innovation in Marketing through the Transition from Industry 4.0 to Industry 5.0 with Metaverse Technology

The transformation of Industry 4.0 to Industry 5.0 is one of the complex and challenging process. Because it requires several innovative ideas and implementation is also crucial. Metaverse technology, a communicated virtual universe combining physical and digital realities, plays a pivotal role in the process of transformation. This study investigated how the metaverse, within the framework of Industry 5.0, can handle business innovation in the marketing, enhancing customer commitment, personalization, and experiential marketing. Although, number of studies work on the metaverse technology (Aburbeian et al., 2022; Setiawan et al., 2022), however,

A significant impact of metaverse on marketing is the ability to create immersive and participating customer experiences. Unlike traditional digital marketing activities, the metaverse offers a wholly interactive environment where

customers can investigate virtual storefronts, interact with products, and engage with brand councils in real time. It has the ability to enhance personalized marketing. Personalized marketing is most important for the business activities because it engage the customer (Chandra et al., 2022; de Oña et al., 2016; Sunikka et al., 2011; Tang et al., 2013).

Industry 5.0 emphasizes personalization, and metaverse specifies the perfect platform for serving tailored experiences to customers. By leveraging data analytics as well as AI, businesses can gather thorough insights into customer inclinations and behaviors within the metaverse. This information can be used to create highly personalized marketing canvasses that resonate with individual clients. For instance, a virtual shopping mall (Van Kerrebroeck et al., 2017; Zhao et al., 2004) in the metaverse can recommend products based on a customer's previous interactions and preferences, creating a unique shopping experience for each user.

Experiential marketing is another important from of marketing which help to boost the business activities and this marketing is using by several business (Liao et al., 2017; Wulandari, 2019; Xu et al., 2016). The metaverse facilitates brands to create experiential marketing campaigns that go outside traditional advertisements. Experiential marketing aims on creating memorable experiences that engage customers warmly and physically. Within the metaverse, brands can host virtual events, and product launches that customers can serve from anywhere in the globe. The trend of virtual marketing is important which has several benefits for the business activities (Curras-Perez et al., 2017; Naylor et al., 2012; Ong et al., 2017; Yuce, 2021).

Industry 5.0 promotes collaboration, and metaverse enables collaborative marketing efforts between brands, customers, and influencers. This is collaborative marketing which is beneficial for the companies (Najafi-Tavani et al., 2018; Porcu et al., 2019; Saura et al., 2019; Tinoco & Ambrose, 2017). Brands can co-create content with clienteles, leveraging user-generated content to build legitimacy as well as trust. Moreover, businesses can partner with other brands or influencers within metaverse to originate joint marketing campaigns that reach broader audiences. Finally, according to the discussion, shift from Industry 4.0 to Industry 5.0, steered by metaverse technology, has the capability to revolutionize marketing by supporting business innovation. The metaverse augments customer engagement, permits personalized marketing, and creates immersive experiential marketing opportunities. It also establishes virtual influencers, facilitates data-driven decision-making, and helps joint marketing efforts. Hence, metaverse works like a bridge to convert Industry 4.0 to Industry 5.0 leading to higher business innovation. Therefore, this study proposed indirect effect of metaverse between Industry 4.0 and Industry 5.0. Thus, following hypotheses are proposed:

Hypothesis 4. *Industry 5.0 promotes business innovation.*

Hypothesis 5. *Metaverse mediates the relationship between Industry 4.0 and Industry 5.0.*

Methodology

Methodology has vital importance to achieve the objective of the study. This study has aim to explore the indirect role of metaverse technology in the promotion of business innovation in Vietnam through the transformation of Industry 4.0 to Industry 5.0. To achieve this objective, the current study employed a quantitative approach. A questionnaire was developed to examine the relationship between Industry 4.0, Metaverse, Industry 5.0 and business innovation. The relationship tested in this study are new, therefore, this study preferred to develop new scale to measure Industry 4.0, metaverse, Industry 5.0 and business innovation.

This study developed a systematic process to develop scale items for the measurement of the relationship between Industry 4.0, metaverse, Industry 5.0 and business innovation. Initially, the scale items are extracted through the extensive review of literature of relevant studies. 20 scale items were developed from literature. After that these items were presented in the focus group discussion among various experts. 15 scale items were approved by the experts which were brough for pilot study by using statistical tools. A small sample of 70 respondents were used and Exploratory Factor Analysis (EFA) was carried out. In this process, two scale items were deleted and 13 scale items were retained which are as follows:

Scale items of Industry 4.0

1. The use of IoT devices and sensors are very common in marketing.
2. Integrated artificial intelligence and machine learning is important in marketing.
3. A highly automated system requires the latest devices for marketing.

Scale items of Industry 5.0

1. Collaboration between human workers and robots is important for marketing.
2. Decision making in marketing can be enhanced through robots.
3. Robots can help to speed up the marketing process.

Metaverse

1. Virtual reality (VR) and augmented reality (AR) are important to transform Industry 4.0 to Industry 5.0.
2. Virtual platforms are important for the transformation.
3. Digital customer engagement is important for transformation.

Business Innovation

1. Organizations should develop new and innovative products in marketing.
2. Prioritizing innovation in marketing is important for business.
3. Flexibility and adaptation to changes in marketing should be encouraged.
4. The emerging technologies should be introduced in marketing.

After the development of scale items, data were collected by distributing the questionnaires. 600 questionnaires were

decided to distribute among the respondents of the study. Respondents of the study were technological experts of the marketing industry. Finally, 170 valid responses from the technological experts of the marketing industry from Vietnam were used to examine the relationship by using a survey questionnaire. The response rate was 28.33% which is low due to the reason that questionnaires were distributed through online platforms. Finally, RStudio was used for data analysis.

Results

The current study employed RStudio, a prominent data analysis tool in social sciences studies (Guleria & Kaur, 2021; Horton & Kleinman, 2015). While using RStudio, this study employed structural equation modeling which is popular data analysis technique used by several previous studies and recommended by the prominent authors (Hair Jr et al., 2020). In this process of data analysis, the individual item's reliability was confirmed by using factor loadings reported in Table 1. Factor loadings must be higher than 0.7 which is recommended by latest studies (Hair & Alamer, 2022; Hair Jr et al., 2020; Hair Jr et al., 2022). In this study, items have loading higher than 0.7 which confirmed the reliability of all scale items.

Table 1: Individual Item Reliability.

Construct	Items	Loading
Industry 4.0	1. The use of IoT devices and sensors are very common in marketing.	0.855
	2. Integrated artificial intelligence and machine learning is important in marketing.	0.785
	3. A highly automated system requires the latest devices for marketing.	0.700
Metaverse	1. Virtual reality (VR) and augmented reality (AR) are important to transform Industry 4.0 to Industry 5.0.	0.799
	2. Virtual platforms are important for the transformation.	0.802
	3. Digital customer engagement is important for transformation.	0.725
Industry 5.0	1. Collaboration between human workers and robots is important for marketing.	0.854
	2. Decision making in marketing can be enhanced through robots.	0.789
	3. Robots can help to speed up the marketing process.	0.878
Business Innovation	1. Organizations should develop new and innovative products in marketing.	0.896
	2. Prioritizing innovation in marketing is important for business.	0.841
	3. Flexibility and adaptation to changes in marketing should be encouraged.	0.741
	4. The emerging technologies should be introduced in marketing.	0.703

Table 2: Constrcut Reliability and Convergent Validity.

Construct	Composite Reliability (CR)
Industry 4.0	0.798
Metaverse	0.742
Industry 5.0	0.802
Business Innovation	0.811
Construct	**Average Variance Extracted (AVE)**
Industry 4.0	0.708
Metaverse	0.825
Industry 5.0	0.732
Business Innovation	0.842

Table 3: Heterotrait-monotrait ratio of correlations (HTMT).

	Business Innovation	Industry 5.0	Metaverse	Industry 4.0
Business Innovation				
Industry 5.0	0.521			
Metaverse	0.652	0.714		
Industry 4.0	0.458	0.654	0.502	

After the assessment of individual items reliability, construct reliability was confirmed by using composite reliability (CR). It is observed through previous studies, CR must be higher than 0.7 to achieve the satisfactory level of construct reliability. It can be observed from Table 2 and Figure 3, all constructs have CR higher than 0.7. Thus, all the constructs found a satisfactory level of reliability. Additionally, convergent validity was assessed through average variance extracted (AVE) (Alarcón et al., 2015; Anis et al., 2020; Cheah et al., 2018; Cowin et al., 2008) which is shown in Table 2 and Figure 3. All the constructs have AVE higher than 0.5 which proven the convergent validity. Additionally, discriminant validity is given in Table 3 by using Heterotrait-monotrait ratio of correlations (HTMT) (Alarcón et al., 2015; Hafkesbrink, 2021).

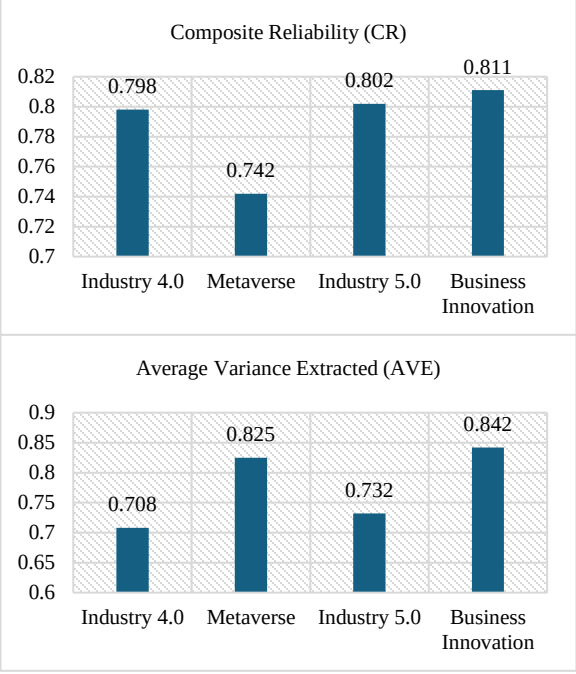

Figure 3: Composite Reliability (CR) and Average Variance Extracted (AVE).

Results of the study addressed by using recommended

values. According to previous studies, beta value, t-value and p-values are the measures to test the study hypothesis. Beta value shows the direction of the relationship, t-value and p-value show the significance of the relationship. In this study, t-value 1.96 and p-value 0.05 were considered. All the relationship shaving t-value higher than 1.96 and p-value less than 0.05 was considered supported. In this study, as stated in Table 4 and Figure 4, all the relationships have t-value higher than 1.96 and p-value less than 0.05 which confirmed that all the hypotheses are supported.

Table 4: Results (Direct Effect and Indirect Effect).

Relationship	Beta Value	T-Value	P-Value
Industry 4.0 -> Metaverse	0.251	5.091	0
Industry 4.0 -> Business Innovation	0.085	3.399	0.001
Metaverse -> Industry 5.0	0.124	3.881	0
Industry 5.0 -> Business Innovation	0.201	6.691	0
Industry 4.0 -> Metaverse -> Industry 5.0	0.109	0.335	0.001

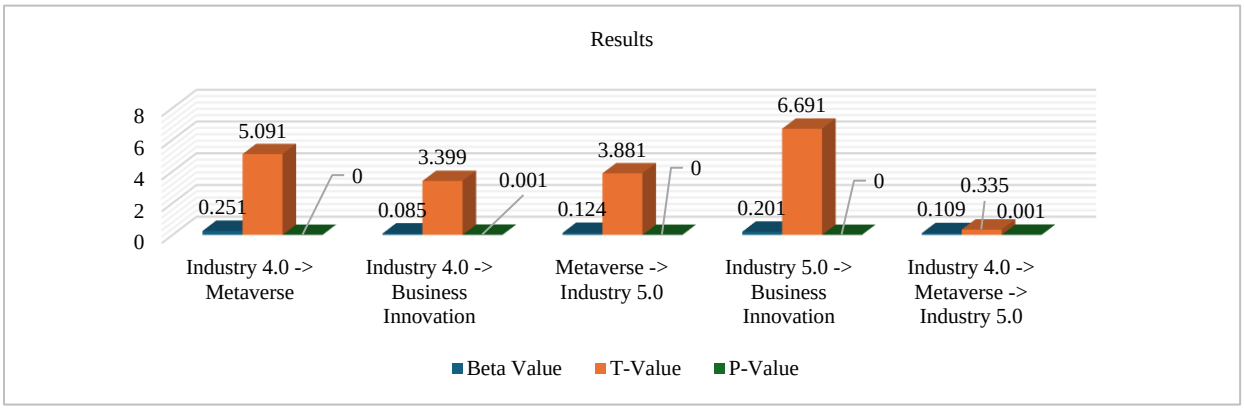

Figure 4: Results.

Discussion

The aim of this study was to explore the indirect role of metaverse technology in the promotion of business innovation in Vietnam through the transformation of Industry 4.0 to Industry 5.0. To address these objectives, five hypotheses were proposed based on the relationship between Industry 4.0, metaverse, Industry 5.0 and business innovation. After the development of hypotheses, data were collected through survey and analyzed by using RStudio, a statistical tool.

The analysis demonstrates that Industry 4.0 positively affects the adoption and development of metaverse technology in Vietnam. Because this study found that Industry 4.0 has positive effect on metaverse technology. This relationship is fastened in the technological advancements as well as digital infrastructure essential in Industry 4.0 (Hsu, 2012; Scheuermann et al., 2015), as well as the IoT, AI, big data related analytics, and cloud computing as well. These technologies grant a robust foundation for the metaverse, authorizing creation of immersive and the interactive virtual environments. For instance, IoT machines collect real-time data that can be used to improve virtual experiences, while AI set of rules can facilitate more personalized and participating the interactions within the metaverse.

Furthermore, results also imply that metaverse technology significantly promotes to the transformation from the Industry 4.0 to the Industry 5.0. Industry 5.0 is characterized by a human-centric approach, highlighting synergy between humans along with machines such as robots. The metaverse plays a most critical role in this shift by providing programs that boost human-machine collaboration related to important interaction (Bhavana & Vijayalakshmi, 2022; Lee et al., 2021). Therefore, it is very useful in marketing activities of different business activities. Hence, metaverse technology is critical in businesses. Virtual as well as augmented reality which is also known as VR and AR equipment, key components of the metaverse, facilitate immersive training and skill expansion, allowing workers to relate with the digital twins of machinery and developments. This leads to more intuitive and efficient workflows, improved safety, and higher worker satisfaction.

Additionally, it is found that transformation of Industry 4.0 to Industry 5.0 lead to valuable addition in innovation of marketing activities in Vietnam. The transition helped by the metaverse technology significantly raises business innovation in marketing. As reported in other studies that business innovation requires metaverse (Gao, 2022; Lee et al., 2011; Yawised et al., 2022). The metaverse proposes novel ways for the brands to engage with consumers, create identified experiences, and foster deeper associations. Thus, metaverse is critical which is like a bridge between Industry 4.0 and Industry 5.0. Immersive virtual environments admit for the interactive product demonstrations, virtual try-ons, and personalized shopping experiences that is not possible in the traditional digital marketing channels. These improvements not only enhance customer engagement level but also provide significant insights into consumer behavior as well as preferences, assisting more targeted and efficient marketing strategies. Hence, from the aforementioned discussion, it is very clear that metaverse is most important in industry transformation.

The indirect impression of the metaverse in the transforming from Industry 4.0 to Industry 5.0 is a critical observing of this important research. The metaverse plays as a bridge, leveraging the technological developments of Industry 4.0 (Cali et al., 2022; Jagatheesaperumal et al., 2022) to the facilitation of the human-centric approach of Industry 5.0. This middle role is essential for realizing full capability of both the industrial paradigms. Finally, by considering the results, this study proposed a framework leading to convert Industry 4.0 into Industry 5.0 which is reported in Figure 5. By permitting enhanced human-machine interactions, immersive training, and remote collaboration, the metaverse guarantees a seamless as well as efficient transition, thereby driving continuous innovation and improvement in business processes.

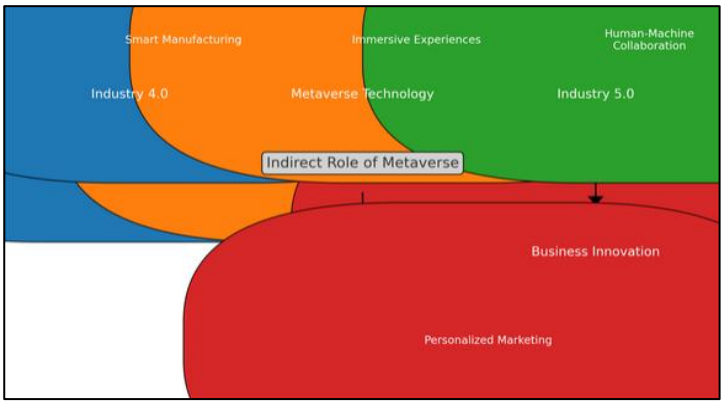

Figure 5: Indirect role of Metaverse in the Transformation of Industry 4.0 to Industry 5.0 leading to Business Innovation.

Conclusion

This study observed the most significant role of metaverse in the transformation of industry 4.0 to Industry 5.0 in the current era of industrialization. The positive effects of the Industry 4.0 on metaverse technology, and consequently the metaverse's impact on transformation to Industry 5.0, emphasize on interconnected nature of these industrial revolutions. In this advanced era of industrialization, metaverse is most important for industry transformation in Vietnam. The metaverse not only assists as a technological bridge, however, also as a catalyst for business innovation in marketing. By providing immersive and personalized as well as engaging experiences, the metaverse increases customer relationships and leads competitive advantage. These outcomes underscore the importance of participating in metaverse technologies and incorporating them to business strategies to stay ahead in the rapidly advancing industrial landscape. Therefore, to advance the business marketing, metaverse is important because it is one of the most important part of Industry transformation and requirement of the introduction of new technology.

Implications, Limitations and Future Directions

The study has valuable insights for businesses, particularly businesses which are operating online in Vietnam. This study highlighted that metaverse is an important part of upcoming business. The future of business activities, especially marketing, is dependent on the metaverse technology. Hence, business should incorporate metaverse technology before to involve in various technologies related to industry 5.0. On the other hand, this study is limited to various elements. For instance, this study is limited to cross-sectional research design involving the survey-based study. To enhance deeper understanding, it is important to conduct interviews. Thus, future studies should include interviews. Additionally, future research should continue to explore the specific mechanisms through which the metaverse facilitates this transition and its broader implications across different industries.

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CRediT Authorship Contribution Statement

Nguyễn Châu Anh: Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology. Ibrar Khan: Project administration, Resources, Software, Supervision, Validation, Visualization, Writing – original draft. Ibrar Khan: Writing – Review & Editing.

Declaration of Competing Interest

We have no financial or non-financial interests influencing the content of this study.

Fundings

The authors report that this work was conducted without external financial backing.

Ethical Statement

Ethical guidelines were observed, and no approval was required since no human tissue or biological samples were included in the research.

Data Availability Statement

On reasonable request, the datasets generated during the current research are obtainable from the corresponding author.

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