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Navigating New Realities: The Impact of Metaverse Technologies on Financial Innovation

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***Abstract*—The application of augmented and virtual reality (AR/VR) technology in finance broadly referred to as the Metaverse presents transformative potential for enhanced user experience, regulatory compliance, and financial innovation in general. This study empirically examines how AR/VR investments, user experience (UX) design, regulatory compliance, and consumer technology readiness impact financial innovation in Metaverse settings. Based on a survey of 202 Jordanian users, findings are that investment in VR/AR significantly enhances the customization and interactivity of financial services, whereas UX design increases user engagement and satisfaction directly. Regulatory compliance is also found to be critical for maintaining transactional integrity and supporting innovation, especially in cross-jurisdictional environments. In addition, technology adoption acts as a key driver, significantly enhancing the effectiveness of VR/AR investments and user experience design in generating innovative financial outcomes. The study confirms that these factors are collectively responsible for the majority of variance in financial innovation, offering useful insights to the financial institutions and policymakers who seek to dominate the virtual economy. This study pushes theoretical models of technology acceptance and provides pragmatic insights for using Metaverse technologies to construct immersive, secure, and user-centric financial systems.**

Keywords—Metaverse finance, VR/AR investment, financial innovation, User Experience (UX) design, Technology adoption models, Immersive financial services

I. INTRODUCTION

The Metaverse, in the context of financial services, has begun a new era in which economic activity and digital socialization will be conducted in an entirely different format [1]. As the Metaverse is developing, it beginning to see some use cases within the financial industry that include; greater, user-friendly channels that are combined with novel ways of serving the customers, however, this does create a plethora of fascinating opportunities as well as challenges with regards to investment strategy as well as regulations [2]. Across several sectors, especially in finance, Metaverse represents a great technological initiative allowing to merge virtual reality with the ever reliable blockchain technologies and providing users with highly customized interfaces [3]. Such a dramatic change is made possible by Metaverse as it enables financial institutions to provide interactive financial services and products such as loans global telecommunication or insurance-things that were previously thought only to exist in the realm of fantasy [4].

As the financial industry gradually participates in the VR & AR space, one may ask, how do these developments improve the state of finance and what sort of innovation is happening in the metaverse [5]. The promise of an all-encompassing financial service experience means that new tech-savvy clientele will enter the field and it will also alter all definitions of how customers are serviced and how financial goods are sold to them. But this vision of reality is not free of technical issues and large investments, which means that an analysis of investment strategies and resulting financial innovation has to be done [6]. In conjunction with these ever-growing technologies, user experience (UX) design in the Metaverse greatly impacts the performance of finance-based businesses. An interface that is easy to use and allows the client to feel secure and engaged in the virtual world could boost business and enhance customer satisfaction [7-9]. This part of the Metaverse is crucial since it assists in comprehending the services, virtue or otherwise, provided by the virtual financial services. In light of this, it is especially significant to evaluate the effectiveness of UX design in Metaverse platforms with regard to its significance within the financial setting [10-11].

Another key aspect of finance in the Metaverse is the risk of regulatory compliance. As virtual environments begin to extend into physical geographical regions, it becomes clear that sound regulatory environments which cater for the distinct features posed by the Metaverse should be put in place [12]. Such regulations have to be appropriate for the particular financial transactions that are intended to be carried out in virtual environments while at the same time adhering to international monetary laws [13]. The passage of regulatory agencies in considering these new technologies and their capacity to incorporate them into the legal frameworks already established is a key factor both to the potential acceleration and obstruction of the development of financial services within the Metaverse [14-15]. In addition, the preparation of the consumer to embrace the technology in question is a factor that must be taken into account as well. It disrupts the relationship between the two processes adoptions of technologies and innovations in finance, which refers to the readiness of consumers to use new technology [16]. This preparedness affects not only current adoption levels but also the future of finance in the Metaverse initiatives. Knowing levels of consumer technology readiness assists in designing Metaverse solutions which are not only technologically advanced but also easy to use.

The goal of this paper is to examine the interrelated areas of UX design, investment in AR/VR technologies, Metaverse technology adoption and how these four components correlate with one another in greater detail. By taking those into account,

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this paper also encompasses the significant moderating consideration of consumer technology readiness in the context of the interrelations of Metaverse technology adoption, investment in VR/AR and financial innovation. The goal of this paper is to fill in the gaps, therefore the aim is to provide ample discussion of aspects that are associated with the existing mystery of financial innovation in the Metaverse. Consequently, this will provide a clearer understanding of the evolution of the economic ecosystem.

This paper identifies a number of crucial questions that aid in addressing the overarching themes of the paper: How does an investment in VR and AR technologies aid in driving financial innovation in the Metaverse? What are some of the ways in which UX design can improve user engagement and satisfaction on virtual financial services? what changes are necessary for the regulatory frameworks in order to cater for the unique characteristics of the Metaverse? Finally, and more crucial, what is the effect of consumer technology readiness on the acceptance and efficacy of the Metaverse technologies in finance?

The significance of these inquiries lies in their potential to not only understand but also shape the future of finance. As the Metaverse continues to expand its influence, the insights derived from this research could guide financial institutions in developing strategies that leverage these technologies to their fullest potential, while also informing policymakers and regulatory bodies on the necessary adaptations for governance in a virtual economic environment. Moreover, Thus, the exploration of the Metaverse in finance is not merely an academic exercise but a crucial endeavor to foresee and forge the future of financial interactions. As this paper unfolds the layers of technological integration, user engagement, regulatory adaptation, and consumer readiness, it aims to chart a path forward that is informed by rigorous analysis and strategic foresight. This research stands at the intersection of technology and finance, seeking to illuminate the path towards a digitally inclusive financial future that is innovative, equitable, and universally accessible.

II. THEORETICAL FRAMEWORK AND HYPOTHESES DEVELOPMENT

This study focusing on the role of the Metaverse in the finance sector is drawing from several theories in order to inform on how the glasses of virtual reality and augmented reality are integrated in the service. Theory of Diffusion of Innovations by Everett Rogers integrates this framework as it also shows how culture is affected by the adoption of new technologies [17]. In the case of the Metaverse, this theory aids in exploring the technologies of VR and AR in the context of financial services and what factors work to their advantage and to their disadvantage [18]. Also the Technology Acceptance Model will be important in the comprehension of the acceptability of the users as well as the regular use of the Metaverse technologies for financial applications [1]. As per the Technology Acceptance Model (TAM) framework, adoption decisions of users are believed to be determined by perceptions of the usefulness and ease of the product. Such determinants in a Metaverse are important as they decide whether users of finance would be willing to shift and remain engaged with alternative virtual financial platforms [19].

Where previous studies used Diffusion of Innovation, TAM, and Institutional Theory independently, this study compiles their links to elicit complementary and contrarian opinions in relation to adopting technology in schools. For instance, whereas TAM concentrates on individual-level uptake depending upon perceived ease of use and usefulness, Institutional Theory emphasizes structural and normative forces that influence organizational-level adoption behavior. The difference serves to underscore deficiencies in existing research wherein individual and institutional factors have generally been dealt with separately. In addition, comparative results from different geographic locations and institutional environments allow for a deeper understanding of how socio-cultural forces facilitate the effect of these theories. This added depth enhances the explanatory power of the model of the study and its scholarly relevance.

For regulatory frameworks it is important to see how they are aligned with the Institutional Theory, which says that the legitimacy and existence of innovations very much relies on the regulatory support or normative pressures offered to them. In the fast changing Metaverse, the regulators have to rethink the way they scheme such that the rate of innovation is not higher than that of governance, so that there is no abuse of the technology against the customers [20]. Consumer Technology Readiness is also included in this framework as a moderating factor, being a concept within the consumer behavior and innovation resistance theories. This construct measures the tendency of particular consumers to accept or reject new technology on the basis of their technology optimism and technology pessimism and therefore the potential of the financial institutions to use metaverse technologies [21].

A. Technology Adoption and Financial Innovation in Metaverse Platforms

The Metaverse platforms' technology adoption and financial innovation seems to be a newly discovered area of research as several publications notice in it a great promise, as the development and implementation of new technologies is said to be able to change the industry [22]. With the growth of the Meta world, the prospects for financial technology innovation with the use of the latest technologies such as VR and AR become increasingly clear. According to [23], it can be argued that immersive technology helps to produce new products and services in the financial market and provides a competitive edge to investors who are the first to take up advantage. Reaffirming, [24] showed that employing VR technology in the work of financial advisers greatly improves clients' experiences and satisfaction as a result of which new services become available. Moreover, [25] extend this discussion by utilizing AR technologies as a means of interfacing with consumers in the finance industry and assesses whether such applications enhance interaction security and speed of transactions which are vital for innovation in finance. In the same vein, [26] reported that in the context of trading stocks, the use of a virtual metaverse has led to better utilization of data in the visualization of trading platforms and decision-making processes. Also, [27] reported a similar

finding that AR and VR integration in the trading platform was able to not only help retain customers but also help acquire a new generation of investors that enjoyed enhanced interactive experiences while trading which is sought after in today's AR environment. Also, [28] notes the role of blockchain as trust building technology, which is especially important for the evolution of finance, and how it works as supportive technology in the metaverse. Appraising this interaction is particularly important as [29] have shown that the use of blockchain technology for safe and decentralized transactions promotes the development of Metaverse platforms by conventional bankers. Also, the research by [30] point out that the integration of AI into the virtual and augmented reality world termed the Metaverse facilitates automation and customization of the financial industry, hence fostering growth. Therefore, this study proposes:

H1: Technology Adoption significantly impacts Financial Innovation in Metaverse Platforms

B. User Experience Design and Financial Innovation in Metaverse Platforms

A growing body of literature highlights the importance of user experience (UX) design in driving the Fintech within metaverse ecosystems [31]. This is corroborated by the fact that the Metaverse is an interactive platform and thus requires the development of engaging UX designs that are self-explanatory. Such an approach is crucial in ensuring users' satisfaction and continuous usage, which are a prerequisite for the adoption of new financial technologies [32]. [33] state that when creating a great experience, it is necessary to not only consider the aspects that will draw users in but also ones that will ensure the users remain engaged through interaction. This principle is important for financial applications when user's trust and their continuous engagement on the platform is critical for its success. In the same line, [34] also make contributions by assessing the factors of UX and suggesting emotional connection and usability to be working premises in decision making by users in virtual spaces [35]. [36] asserts the widespread use of AR and VR technologies into UX design can revolutionize how people interact with a plethora of financial services thus simplifying difficult transactions. [37] explain the role UX design plays in enhancing financial innovation by arguing that good design leads to better financial perception among users. They observed that there's more adoption of innovation in those cases where the platform interface is better designed with more interaction features added to it. In the same vein, a study conducted by [38] found that the Ux design aesthetic and functional features on the virtual platform enhance the level of financial innovations by increasing the satisfaction and ease of use of the user. Furthermore, [39] ponders on the role emotional design of the metaverse has on a user's decisions when dealing in finances, positing that UX is a strong tool in driving financial innovation through the association of emotions of users with their financial actions. Therefore, this study proposes:

H2: User Experience Design significantly impacts Financial Innovation in Metaverse Platforms

C. Regulatory Compliance and Financial Innovation in Metaverse Platforms

Regulatory compliance is an important aspect for both the innovation of the financial Metaverse and its limits. Regulatory frameworks, financial technologies and new ideas are all intertwined, and balance must be maintained. It is self-evident that regulation should not stifle innovation and that it is critical to fulfill legal obligations that would preserve the integrity of the market [13]. It is evident from the existing literature that the legal frameworks will have to be changed to respond to the challenges and qualities of the Metaverse. For instance, [40] note that there is an increase in the number of barriers regulators face due to the expansion of VR and AR, which includes but is not limited to data control, privacy and international transactions. These researchers note that the pace of regulatory change must have some flexibility so that it does not impede technological advancement. [41] also considers the compliance with regulation in the context of introduction of the innovations in finance within virtual environments. He explains that fair regulations and rules are one of the necessary conditions to encouragement of innovative activity. In this context, [42] provides evidence that the increase in the trust of investors and users is desirable for the effective introduction of new technologies in the financial services domain. Furthermore, [12] examine the function of adherence and risk mitigation in the context of the financial transactions in the Metaverse. In their opinion, proper measures need to be taken to regulate the virtual financial world such as the anonymity of users and the scope for fraudulent behavior. [43] also relate the regulation in the Metaverse to other jurisdictions by suggesting that international collaboration will need to be employed especially because of control overlaps where four or more jurisdictions could have control over the same group. Their studies advocate for the formulation of international standards that would ease cross border proliferation of the services in the Metaverse by harmonizing the regulatory practices in various countries. Therefore, this study proposes:

H3: Regulatory Compliance significantly impacts Financial Innovation in Metaverse Platforms

D. Investment in VR/AR Technologies and Financial Innovation in Metaverse Platforms

Investments into VR and AR Technologies are becoming perceived as one of the key elements that can cause finance innovations in Metaverse platforms [2]. This growth in interest is explained by their ability to enhance user interactions and business processes within the context of the highly digitized financial world. [22] study establishes a one to one correspondence between the increase in investment onto VR/AR technologies and the increase in financial services facilitated in the Metaverse. [22] asserts that such investments raise the standards of the interaction that user has with the application, and facilitate seamless interactivity with various financial products and services that are customized to the users at a particular moment thus enhancing financial creativity. [3-44] support this claim as they contain case studies where investments into VR and AR had a positive effect to financial engineering and assessment of risks ensuring users had a range of more advanced tools at their disposal. According to [45], the

capacity of VR/AR to broaden the reach of financial services to a larger audience is impressive. Isa further contend that because the technologies eliminate both geographical and physical constraints, services can be provided on a much larger stage, therefore resulting in a more robust financial ecosystem. [46] take a close look at the strategies and the competitive edge offered by the investment in VR/AR. The research establishes that, in most cases, institutions which anticipate the technological shift invest in these technologies, allowing them to emerge as first movers and fostering an unprecedented level of service interaction and customization to be offered. Such evolution of technology then inflates the incentive for competitors to try to reach or surpass these new benchmarks. Integrating existing financial infrastructure with new technology is expensive and complicated, but the savings in operating costs, and increased customer satisfaction and sales in the long run makes the case very compelling [47-48]. Therefore, this study proposes:

H4: Investment in VR/AR Technologies significantly impacts Financial Innovation in Metaverse Platforms

E. Technology Adoption, Consumer Technology Readiness and Financial Innovation in Metaverse Platforms

In the context of Metaverse platforms, technology adoption and consumer technology readiness serve as key components that moderate the relationship of financial innovations within these platforms [49]. [50], a baseline is established for the argument that adoption of technology in the financial industry is a prerequisite to the use of Metaverse platforms as part of financial services. They assert that the rapid integration of new technologies such as the VR and AR technologies is a required step in creating new financial services and products suitable to the Metaverse. However, such arms are mostly reliant on the technological infrastructure of the financial institution along with the institution availing adequate financial innovations. Furthering this argument, [51] brings in the idea of the consumer technology readiness which is used to measure the readiness of consumers to adopt and utilize technology. This readiness is not only about the possession of technology but also other technology-related attitudes that include tech-savvyness and a willingness to experience new digital worlds, all of which can impact the adoption and effectiveness of new financial technologies. [52] point out the importance of consumer technology readiness in understanding the relationship between technology adoption and elements of financial innovation. [53] state that high levels of consumer readiness not only expedite the adoption of Metaverse technologies, but also aid these technologies in effectively offering novel financial services. In such cases where there is high consumer readiness, adoption of VR and AR technologies is especially associated with increased financial innovation as the consumers are more willing to use cutting-edge financial services offered in the Metaverse [54-56]. [57] extend the analysis of the context of technology readiness by examining particular demographic and psychographic characteristics that influence the extent of moderation. Their findings suggest that Metaverse platforms are more rapidly adopted by younger users who tend to be more skilled in technology than older or less skilled users, thus enabling innovations in finance at a higher pace. Moreover, [58] confirms real challenges and implications of different pace of technology adoption and levels of consumer readiness to use such technologies. findings say that if financial institutions use new technology without regard to consumer readiness they only miseducate consumers by excess provision of innovations which results in the lower effectiveness ratio on the total innovation. Therefore, it can posit:

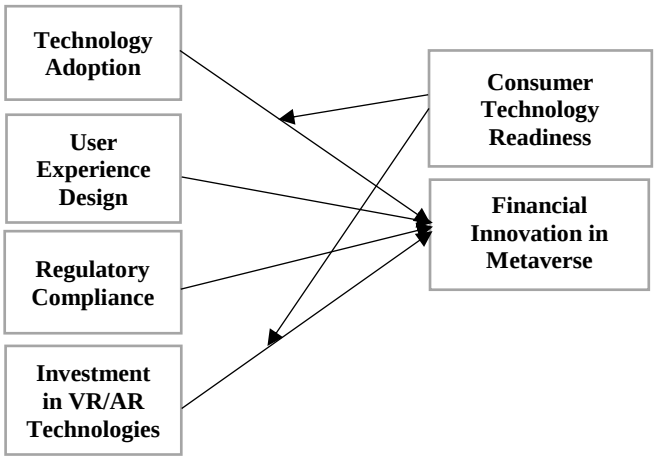
H5: Consumer Technology Readiness has an important moderating role between Technology Adoption and Financial Innovation in Metaverse Platforms.

F. Investment in VR/AR Technologies, Consumer Technology Readiness and Financial Innovation in Metaverse Platforms

The Consumer Technology Readiness variable helps to blend the interaction between the investment in Metaverse platforms and the technological innovations in VR and AR technologies [59]. Investment in VR and AR comes with immense potential and transformational advantages within the financial sector [60]. [61] pointed out how the provision of investment in VR and AR has led to financial innovations by allowing previously unachievable immersive and interactive experiences, which are difficult to achieve without these technologies. Consumer technology readiness, which was analysied by [62], affects the efficiency with which VR/AR investments aim to encourage financial innovation. According to [62], the positive impacts from the adoption of VR and AR technologies in finance is strengthened by the consumers' high levels of technology readiness. This readiness encompasses not only the skills or knowledge to use such technologies, but also the mental preparedness to accept these tools, which goes hand in hand with lesser technology anxiety and higher innovation inclination. In addition, [63] conducted further analysis to determine the impact of consumer technology readiness on the link between VR/AR investment in the provision of new financial services within the Metaverse. The results support the notion that high levels of consumer readiness are associated with greater rates of diffusion of new financial technologies. [64] highlight the importance of consumer education and engagement strategies alongside real investments in technology tools. Institutions may ensure that investments in VR and AR are optimally utilized by increasing the Consumer Technology Readiness which contributes to deeper and more extensive financial innovations [65-66]. Therefore, it can posit:

H6: Consumer Technology Readiness has an important moderating role between Investment in VR/AR Technologies and Financial Innovation in Metaverse Platforms

In light of recognized gaps within the current body of literature, this study presents a research model (illustrated in Figure I) that postulates the substantial influence of different constructs on Financial Innovation in Metaverse Platforms. Furthermore, it posits that Consumer Technology Readiness plays a significant role in moderating the relationships between Technology Adoption, Investment in VR/AR Technologies and the other study construct. Lastly, these proposed relationships and the accompanying hypotheses have been expounded upon in the above section.



III. Research Methodology

A. Instrument Development

Empirical data was collected for this study through a questionnaire-based survey. As shown in Table I, the questionnaire items were derived from reliable research sources and previous studies related to the study research model.

Table I. Sources of Measurement

Constructs	References
Technology Adoption	[67-69]
User Experience Design	[70-71]
Regulatory Compliance	[72-73]
Investment in VR/AR Technologies	[74-75]
Consumer Technology Readiness	[76-77]
Financial Innovation in Metaverse Platforms	[22-78]

The measurement tool employed was a questionnaire developed from the literature's pre-tested scales. It was divided into six sections per construct: Technology Adoption, User Experience Design, Regulatory Compliance, Investment in VR/AR Technologies, Consumer Technology Readiness, and Financial Innovation. The items were rated on a 5-point Likert scale and distributed via an online survey website (See Table I).

The questionnaire, which includes 20 items, as shown in Table II. Respondents rated each item on a Likert scale from 1 (strongly disagree) up to 5 (strongly agree). Nevertheless, data analysis was carried out to address the issues of common method bias (CMB), using Kock's assessment technique that includes calculating the full collinearity variance inflation factor (FCVIF) for all research model constructs. The CMB test revealed that the greatest FCVIF value is less than 3.3, which indicates the measurement model is unaffected by CMB.

B. Sampling and Data Collection

The study adopted a quantitative approach using a survey research design to examine the influence of Metaverse technologies on financial innovation among different groups in Jordan. The population of interest consisted of Jordanian citizens who were classified into different levels of exposure and experience with Para- Meta verse including VR AR technologies and platforms.

Table II. Questionnaire Items

Constructs	Statements
Technology Adoption	Our organization rapidly adopts new technologies within the Metaverse.
	We continuously update our technology to ensure compatibility with Metaverse developments.
	Our team is proactive in implementing technological changes that affect the Metaverse.
User Experience Design	Our Metaverse platforms are designed to be intuitive and easy to use.
	We regularly update our user interfaces to improve user satisfaction within the Metaverse.
	The design of our Metaverse platforms enhances user engagement.
Regulatory Compliance	We strictly adhere to all regulatory requirements when developing new financial products in the Metaverse.
	Our Metaverse initiatives are regularly reviewed for compliance with international financial regulations.
	We have a dedicated team to handle regulatory issues in our Metaverse platforms.
Investment in VR/AR Technologies	We have significantly invested in VR/AR technologies to improve our Metaverse platforms.
	Our investments in VR/AR technologies have led to noticeable improvements in financial service delivery.
	The ROI from our VR/AR technology investments has met or exceeded our expectations.
Consumer Technology Readiness	Our target consumers are highly knowledgeable about using VR/AR technologies.
	Our consumers are comfortable navigating and transacting in the Metaverse.
	There is a high level of enthusiasm among our consumers for using advanced technologies in the Metaverse.
	Our consumer base regularly updates their technology to enhance their Metaverse experience.
Financial Innovation in Metaverse Platforms	Our Metaverse platforms have introduced unique financial products that were previously unavailable.
	The financial services provided on our Metaverse platforms are superior to traditional digital services.
	Innovations in our Metaverse platforms have significantly improved our market share.
	Our Metaverse initiatives have been pivotal in attracting a new demographic of customers.

To ensure representativeness, a total of 202 individuals were selected to cover the rural and urban areas so as to achieve the required statistical threshold. The applied sampling technique was stratified random sampling designed to represent varying age, income, and educational levels. This

stratification was significant to demonstrate the differences in preparedness and adoption of new technologies in the financial industries among various segments. The collection of quantitative data was conducted over two months, September to November 2024, and the surveys were administered through the internet. The demographic profile of the respondents (n=192) was made up of 53% males and 47% females. They were mostly aged 25-34 years (41%), followed by 35-44 years (28%), 18-24 years (19%), and 45 years and above (12%). The most educated respondents were bachelor's degree and above (63%), followed by 27% with postgraduate qualifications and 10% secondary level education. For Fintech applications, 78% claimed to have used mobile financial services and 62% had engaged in the use of at least one Metaverse-associated demo or platform.

The instrument had 20 items on the Likert scale borrowed from proven past literature, and these were correlated to six constructs: Technology Adoption, User Experience Design, Adherence to Regulations, Investment in VR/AR Technology, Consumer Tech Readiness, and Financial Innovation. SmartPLS version 4 was used for PLS-SEM analysis to execute Partial Least Squares Structural Equation Modeling, which is a variance-based method suited to exploratory models and complex constructs. The measurement model reliability and validity were tested with Cronbach's alpha, composite reliability (CR), and average variance extracted (AVE). Discriminant validity was confirmed using the Fornell-Larcker criterion. To avoid any potential common method bias (CMB), full collinearity variance inflation factors (FCVIFs) were calculated, all of which were below the threshold value of 3.3, thus confirming no significant CMB threat.

IV. Data Analysis

This study employed version 4 of the Smart Partial Least Squares (PLS) software to apply variance-based Structural Equation Modeling (SEM) using the PLS path modeling technique. Before conducting the structural model assessment and testing hypotheses, this software enables estimating the research model, including the reliability and validity of the scales.

A. Model Assessment

To confirm the homogeneity and reliability of the items measuring each construct, Cronbach's Alpha (α) and Composite Reliability (CR) were assessed with a cutoff threshold of > 0.70. In addition, the Average Variation Extracted (AVE) has been evaluated to estimate the degree of the variance observed in a construct's items relative to measurement error as part of the convergent validity assessment process with a cutoff threshold of > 0.50. As shown in Table III, the values of Cronbach's α and CR were above of cutoff threshold for all constructs. The AVE values also were above 0.5.

TABLE III. VALIDITY AND RELIABILITY

Constructs	**Cronbach's α**	**CR**	**AVE**
Consumer Technology Readiness	0.824	0.882	0.653
Financial Innovation in Metaverse Platforms	0.796	0.868	0.624
Investment in VR/AR Technologies	0.85	0.909	0.769
Regulatory Compliance	0.742	0.847	0.648
Technology Adoption	0.8	0.882	0.714
User Experience Design	0.784	0.874	0.698

To assess the discriminant validity of the measurement, Fornell and Larcker's criterion was adopted (see Table IV).

TABLE IV. DISCRIMINANT VALIDITY

No.	**Constructs**	**1**	**2**	**3**	**4**	**5**	**6**
1	Consumer Technology Readiness	0.808					
2	Financial Innovation in Metaverse Platforms	0.707	0.79				
3	Investment in VR/AR Technologies	0.594	0.71	0.877			
4	Regulatory Compliance	0.841	0.779	0.622	0.805		
5	Technology Adoption	0.499	0.737	0.668	0.637	0.845	
6	User Experience Design	0.761	0.842	0.605	0.681	0.643	0.835

The results of Smart PLS, as shown in Table IV, confirm the discriminant validity of all research constructs as the square root of each AVE coefficient of each construct exceeded the correlation between the constructs.

B. The Structural Model

The outcome of Smart PLS (Figure II) indicates that Investment in VR/AR Technologies, Regulatory Compliance, Technology Adoption and User Experience Design, accounts for 85.9% of the variances in Financial Innovation in Metaverse Platforms.

More details on the outcome of PLS path analysis are provided in Table V. The findings show that (H1-H6) significantly impacts Financial Innovation in Metaverse Platforms.

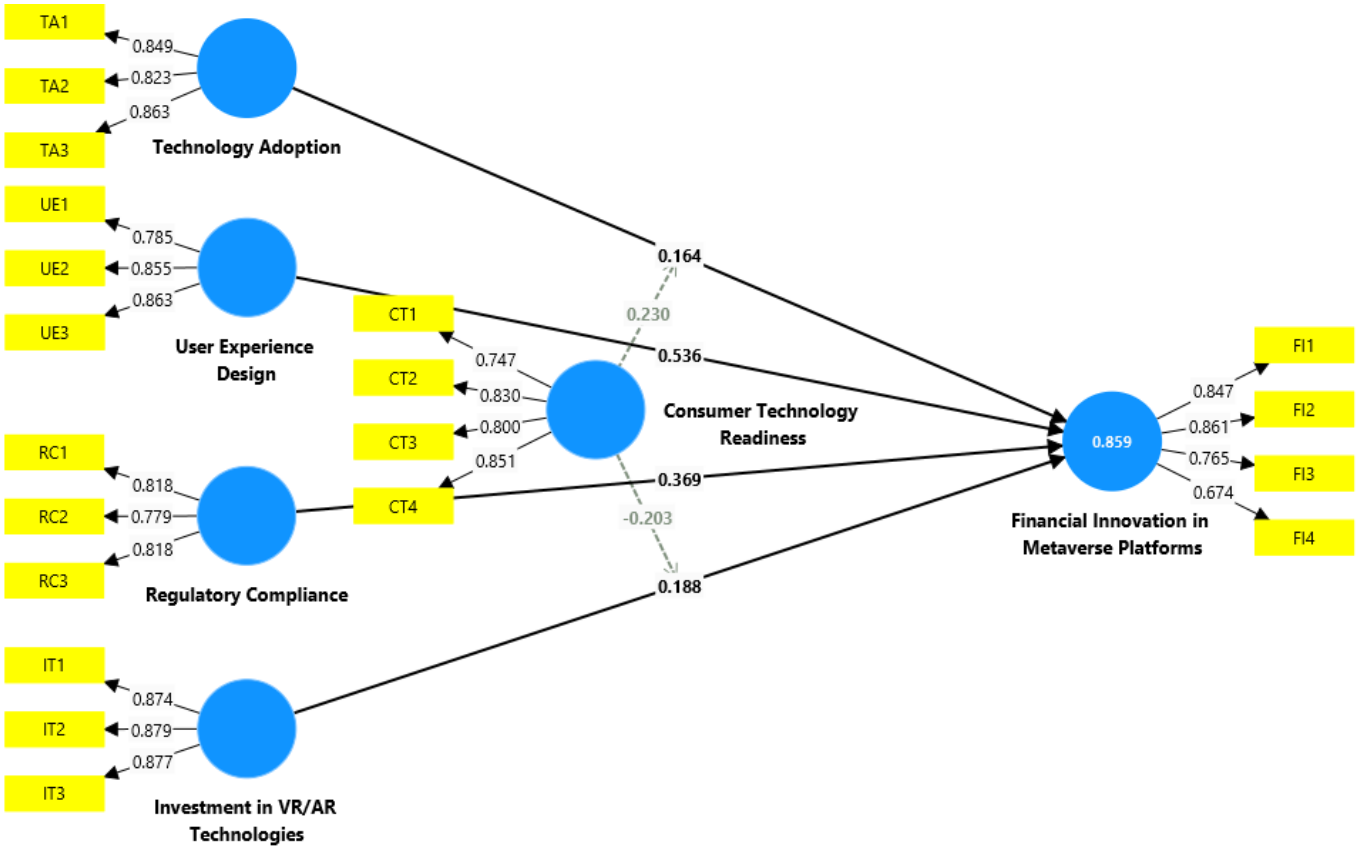


FIGURE II. THE RESULTS OF PATH ANALYSIS

TABLE V. HYPOTHESES TESTING

H	Path	β value	T value	P-value	The result
1	Investment in VR/AR Technologies -> Financial Innovation in Metaverse Platforms	0.068	2.782	0.005	Significant
2	Regulatory Compliance -> Financial Innovation in Metaverse Platforms	0.067	5.529	0	Significant
3	Technology Adoption -> Financial Innovation in Metaverse Platforms	0.069	2.364	0.018	Significant
4	User Experience Design -> Financial Innovation in Metaverse Platforms	0.052	10.334	0	Significant
5	Consumer Technology Readiness x Investment in VR/AR _Technologies -> Financial Innovation in _Metaverse Platforms	0.051	4.004	0	Significant
6	Consumer Technology Readiness x Technology Adoption -> Financial Innovation in Metaverse Platforms	0.051	4.507	0	Significant

V. DISCUSSION

The results confirm that such investments enhance interactivity, customization, and overall service delivery, thus stimulating new user experiences and financial products, thereby driving them. Second, the role of user experience design is substantiated by evidence that highlights its influence on user satisfaction and engagement, thus confirming its importance in shaping virtual financial services. Third, the area of regulatory compliance has been found to be an important area in contributing to innovation, underlining the need for flexible regulatory frameworks accommodating the unique dynamics of virtual financial spaces. Finally, the moderating effect of consumer technology readiness on technology adoption and investment efficacy reveals its significant contribution to the successful utilization of Metaverse-based financial services.

The findings indicate that the embrace of new technologies is an important factor enhancing financial innovation in the Metaverse platforms. This result is consistent with the other authors regarding the potential effects of VR and AR technologies on the financial sector due to the ability to create new services and products [23-24]. It also concurs with the above authors regarding the effective use of VR and AR with the financial advisors and the clients interface with respect to enhancing experience, greater speed and security in the wild, which pave the way for innovations and competitive benefits to early adopters [25- 26]. Furthermore, other researchers have pointed that inclusion of AI boosts the level of automation and personalization in a virtual and augmented setting, hence creating more room for growth of financial services in the Metaverse [30, 79-80]. Such explanations support other researchers in particular who have indicated that these technologies when better matured serve to retain existing customers while at the same time draw new generations of investors who would want more engaging, innovative, and secure forms of digital experience [22, 27].

The findings indicate that user experience design in Metaverse platforms is critical for fostering financial innovation. This result is consistent with the findings relating to the necessity of having standards and user-friendly user interfaces that are interactive and engaging to guarantee customer satisfaction and promote their continued use, which is necessary for users of financial technologies [31-32]. This also goes hand in hand with other scholars who argued that the inclusion of interactive and engaging aspects helps users to gain and sustain trust while heavily being involved in the financial application while in a virtual space [33-35]. Furthermore, authors also emphasize how AR and VR technologies have the great opportunity of changing the nature of the financial process by designing for the user experience in a thoughtful way [36-37]. Nevertheless, scholars have argued that the aesthetics and functional characteristics of the virtual platforms further contributed to the overall satisfaction with their use and its ease which in the end contributed to the development of financial innovations [38]. As such, a possible essence within the emotional aspect of the user experience has been established in relation to decision making within the financial context of the Metaverse and this further implies that there is scope for financial innovation if emotions of the users are well understood [39, 81].

It was discovered that UI design had a great effect on the development of financial services in the Metaverse. Furthermore, regulation for the Metaverse must contend with fragmentation of jurisdiction, where disparate nations have alternative financial data protection laws, KYC/AML rules, and tax standards. For example, while the European Union has draconian data privacy under GDPR, other places may be more focused on financial invention or inclusion than draconian rules. These types of differences lead to operational inefficiencies for financial firms deploying Metaverse-based solutions globally. Harmonization schemes or mutual recognition agreements may be necessary to prevent regulatory arbitrage and allow for frictionless cross-border transactions. The innovation potential of Metaverse platforms thus depends not just on the presence of regulation but also on the ability of regulatory authorities to coordinate across legal systems. This conclusion concurs with earlier works that stress the role of comprehensive legal regimes, privacy protection laws, and interfaces designed for users in order to promote the confidence and use of people in a virtual world [13, 40, 82]. It also corroborates earlier studies which emphasized that definite and equitable regulations are the necessary basis for stimulating the innovative work in the Metaverse [41-42]. In addition, experts have pointed out that there is a need to solve the issues of anonymity, the possibility of fraud and other threats in the virtual financial market in the context of appropriate control mechanisms [12]. Overall, the research demonstrates that global engagement and compatible standards will be key in addressing control overlaps and enabling the free spread of services across jurisdictions in the Metaverse [43].

The findings indicate that the funding of VR/AR technologies also leads to growth in financial services innovation in Metaverse platforms. This observation however, is consistent with the research studies on how these technologies improve client engagement and facilitate business processes within the financial industry [2, 22]. It equally gives support to earlier works which have shown that such investments enhance user's levels of engagement and therefore eliminate the problems of interactivity and personalization of financial service and products as well as the sophisticated risk assessment mechanisms [3, 45, 84]. Furthermore, scholars have pointed out that organizations, which are the first to use VR/AR, usually have a competitive edge, and later this encourages other companies to implement the same technology in order to maintain the same level of competitiveness for changing standards [46]. The studies also outline integration difficulties and data protection problems associated with the purchases that are usually expensive and hard to fix but eventually lead to cheaper costs and better services in the future [47]. Cause-and-effect potential of VR/AR investment and financial innovation is exemplified by how these technologies natively revolutionize the provision and experience of financial services. As opposed to legacy digital banking, which is primarily about 2D interfaces and transactional efficiency, VR/AR offers spatially contextual, game-like, and immersive environments that redefine the experience and engagement of users with financial products. This revolution leads to tangible innovations, such as real-time 3D financial advisory modeling or augmented onboarding processes. These are not mere enhancements but represent a paradigm shift in financial interactivity. The findings from the research reveal that VR/AR investments don't merely enhance existing services they enable the creation of totally new value propositions and revenue models that were unachievable in conventional frameworks.

There is enough evidence that technology readiness moderates the link between financial innovation and the adoption of technology within the context of the Metaverse. The evidence provided in this section is consistent with previous findings that have discussed about the importance of combining VR and AR technologies in order to provide higher level of financial services within the umbrella of Metaverse contexts [49-50]. It also concurs with the findings that relate the consumer technology willingness to use new digital spaces with its effective adoption of new financial services [51-52]. However, researchers have pointed out that both demographic and psychographic factors such as age and level of IT skills are important moderators of this moderation effect [54, 57, 83]. Additionally, these studies indicate that the failure to consider different degrees of consumer technology readiness may result in sub-optimal innovations and low effectiveness of the new financial services on Metaverse platforms [58]. To further dissect consumer technology readiness, it is necessary to look at demographic factors like age, level of education, and urban vs. rural dwelling. Younger consumers (especially Gen Z and Millennials) have greater comfort levels with immersive technology and are thus more likely to embrace and experiment with Metaverse financial services. Older generations might show reluctance based on lower digital literacy or security and usability concerns. Education level also comes into play since individuals with higher education levels are more at ease using and trusting sophisticated technological platforms. Consumers in urban areas also have better infrastructure and internet penetration, leading to higher readiness, but rural areas can lag behind in adoption based on connectivity as well as device capability. Synchronizing Metaverse financial services to these demographic conditions is essential for impacting wide-based innovation.

The findings indicate that Consumer Technology Readiness significantly moderates the relationship between

Investment in VR/AR Technologies and Financial Innovation in Metaverse Platforms. This finding is consistent with previous studies which emphasize that investment in VR/AR has a great market potential and transformational benefits for the financial industry [59-60]. Also, it supports studies which claim that VR/AR significantly enables new types of financial services through interactive and immersive experiences and provides greater innovation across Metaverse Platforms [61]. Additionally, it has been observed that such user technology readiness, which is a combination of user abilities and psychological preparation, strongly facilitates the moderating effect of the level of VR/AR investment on the level of financial innovation [62-63]. This approach is further supported by the calls for consumer education and engagement strategies for the effective use of VR/AR tools and for achieving the desired level of financial innovation outcomes [64-65]. However, the analysis results also found the mediators moderated negatively as well. This partial negative effect corroborates the observed concerns that high technology anxiety or low technology readiness can dampen the benefits high-tech and AR applications can bring to Metaverse based finance services. As a result, even though the moderating effect of consumer technology readiness tends to be positive, the degree of its success depends greatly on acquiring proper education, desirable disposition, and commitment to supporting higher end-user acceptance and proficiency levels of the completed product [62]. Moreover, the role of Consumer Technology Readiness (CTR) as a moderator is also described under interactionist and contingency theories. CTR acts as a catalyst that enhances or diminishes the influence of perceived usefulness and institutional pressures on technology adoption, depending on the individual's attitude toward technological change. High CTR individuals would interpret external drivers normative and mimetic pressures in opportunity terms, not as constraints, and hence reinforce the adoption intention. Lower CTR would negate or reverse these effects. In addition, counterintuitive findings such as the less-than-anticipated effect of normative pressure may be interpreted by the saturation hypothesis, in which people exposed to high levels of digital transformation messaging become immune or resistant.

VI. Implications

A. Contribution to Theory

This technology has the ability of being a game changer in the banking and finance world, especially through virtual and augmented reality. By using the information technology model and structure from this research, the improvement of these technologies enhances the provision of financial services through increasing customer satisfaction, use and development of such technologies. Insights of this study include the firm process of adopting a new technology by the consumer such as readiness to use the technology and how this impact mechanism works. It deepens the theoretical discourse on the use of sociocultural virtual environments for imitation and replacement of traditional financial ecosystems, offering a working concept that makes it possible to continue studying the processes of digital transformation of finance.

B. Practical Implications

Within the context of the Metaverse, this study makes concrete recommendations for financial institutions and policymakers, in the case that they are looking for actionable steps. For instance, financial institutions may enhance their virtual engagement strategies and service delivery by knowing what drives technology adoption and how crucial user experience design is. Furthermore, the Findings of this research point to the need for regulatory compliance and investment in VR/AR technologies, this means that taking preemptive steps to comply with regulations and persistently putting investment into modern technology is key to achieving financial innovation. These insights may also prove usable to policymakers in creating suitable regulatory frameworks that promote the introduction of new technologies but not at the expense of consumer protection or orderly competition in the virtual financial markets.

The findings of this study have important strategic implications for practitioners across the whole financial services value chain. For fintech firms and banks alike, the significance of Consumer Technology Readiness (CTR) highlights the need to segment users not only demographically but also in terms of their psychological readiness for technology adoption. Tailored communication strategies, training initiatives, and digital onboarding experiences can enhance engagement among less tech-ready consumers. These findings can be utilized by regulatory bodies to develop more comprehensive digital policies that account for heterogeneity in user readiness and digital literacy, facilitating equitable access to financial innovations. Furthermore, the demonstrated influence of institutional pressures suggests that strategic alignment with public expectations and industry norms can attain smoother adoption of new technologies. Practitioners, therefore, need to think through digital transformation as not just a technological upgrade but as an ecosystem-level shift requiring synchronized organizational, cultural, and regulatory responses.

C. Limitations and Future Research

The main limitations of this study revolves in the investigation of specific elements of financial innovations within the Metaverse and therefore may not capture factors that may be socio-economic in nature. Future studies may wish to advance this exploration, focusing on how different members of society might behave within and around, Metaverse platforms. Also, as more technological innovations emerge within the Metaverse, there would be a need for longitudinal research to help analyze any changes over the given period and also forecast the effects that the technologies may have on financial services in the distant future. Furthermore, examinations on efficacy of various technological paradigms in undertaking financial tasks can add more clarity on the suitable approaches to apply the metaverse technologies in different financial settings.

VII. Conclusion

Metaverse technologies integration into the financial sector is the new turn that changes the approach towards the customers and how they interact with financial companies. Augmented and virtual reality technologies, in conjunction

with good design user experience, significantly influence the process of financial services provision, thus creating an innovation in the way people would interact with the services or products. Technology diffusion seems to be key to the financial innovation process in the context of the Metaverse environment customized in a large extent by the consumer technology readiness.

The study also emphasized that there were technology advancements in VR and AR that were not only upside moves but were also the catalysts of financial innovations. These technologies improve the user experience that is most needed to ensure that customers who have an affinity for technology are attracted and retained. In addition, the research analyses the state of the art on compliance and adaptation of financial services in the increasing number of virtual environments. The ability of different financial institutions to operate in and within this regulatory framework remains fundamental to the reliability and integrity of the virtual financial market.

This research not only enlightens theoretical frameworks such as the Technology Acceptance Model and Diffusion of Innovation but also empirically confirms their applicability in Metaverse-based financial systems. In line with [84-85], this research confirms that immersive technologies significantly improve user engagement and foster innovation in financial products. Similarly, our findings align with [36] in establishing the precedence of user experience design for financial engagement in virtual spaces. Practically, this study contributes to regulatory discourse as championed by [13], through its emphasis on synchronized and adaptive compliance mechanisms. Further, the moderating role of consumer technology readiness highlighted in this research corroborates evidence from [51, 54] in calling for the need for personalized engagement approaches based on consumer demographics and psychographics. Overall, this research provides robust evidence that investment in VR/AR, responsive UX design, and strategic regulatory alignment moderated by high consumer readiness can create inclusive, scalable, and resilient financial ecosystems in the Metaverse.

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CONFLICT OF INTEREST

The authors certify that there is no conflict of interest with any financial organization regarding the material discussed in the manuscript.

DATA AVAILABILITY

The data supporting the findings of this study are available upon request from the authors.

ETHICAL STATEMENT

This article followed the principles of scientific research and publication ethics. This study did not involve human or animal subjects and did not require additional ethics committee approval.

DECLARATION OF AI USAGE

No generative AI tools were used for content creation in this manuscript (e.g., drafting, rewriting, or generating ideas).

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