

The Metaverse as Green Technology: Revolutionizing Responsible Tourism Practices in Star-rated Hotels

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ABSTRACT

The Metaverse is poised to be the next disruptive green technology set to profoundly impact society in the forthcoming decades. This research explores the transformative impact of the metaverse on responsible tourism practices within star-rated hotels, focusing on its potential to revolutionize sustainability efforts in the hospitality industry. Employing a PRISMA approach, the study evaluates the metaverse's influence on guest engagement, eco-friendly technologies, and overall environmental conservation. It aims to provide insights into how virtual experiences, coupled with green technology, can reshape luxury hospitality and promote responsible tourism behaviours. The research also conducted SWOT analysis associated with metaverse integration, emphasizing the need for a balanced adoption to ensure harmony between technological advancements and ecological preservation in star-rated hotels.

Keywords: Metaverse; Responsible tourism; Disruptive green technology; Responsible tourism practices

1. INTRODUCTION

In an era marked by rapid technological advancements and an increasing global consciousness towards sustainability, the intersection of virtual reality and responsible tourism stands as a pivotal frontier (Nayyar et al., 2018). The emergence of the Metaverse, a collective virtual shared space that intertwines physical and digital realities, presents a groundbreaking paradigm for the hospitality industry (Buhalis, Lin, et al., 2023). The transformative potential of the Metaverse, particularly in the context of star-rated hotels, as a green technology that has the capacity to revolutionize and elevate responsible tourism practices. As environmental concerns continue to escalate, the hospitality sector faces mounting pressure to adopt innovative solutions that reduce its ecological footprint (Gursoy et al., 2022). Star-rated hotels, often synonymous with luxury and opulence, find themselves at the forefront of this challenge. The Metaverse, with its immersive and virtual capabilities, offers a unique avenue to not only enhance the guest experience but also to reimagine and reshape the very foundations of sustainable and responsible tourism within these establishments (Buhalis,

Lin, et al., 2023; Kouroupi & Metaxas, 2023).

The Metaverse is poised to be the forthcoming disruptive technology with far-reaching implications for society in the upcoming decades, facilitating immersive experiences in both virtual and physical realms (A et al., 2023). While still in a conceptual phase, the Metaverse serves as a convergence point for the physical and digital universes, enabling users to seamlessly navigate between them. The concept of digital immersion presents possibilities for individuals to engage in time travel, providing virtual experiences of historical events, space explorations, or even encounters with hazardous natural phenomena like volcanic eruptions (Rehm et al., 2015; Seidel et al., 2022). Dwivedi et al., (2023) suggested that "The metaverse has the potential to extend the physical world using augmented and virtual reality technologies allowing users to seamlessly interact within real and simulated environments using avatars and holograms. Virtual environments and immersive games (such as Second Life, Fortnite, Roblox and VRChat) have been described as antecedents of the metaverse and offer some insight to the potential socio-economic impact of a fully functional

persistent cross platform metaverse”.

The integration of the Metaverse into star-rated hotels marks a paradigm shift towards the adoption of disruptive green technology within the hospitality sector (Chen, 2023). This innovative approach not only enhances the guest experience by offering immersive and virtual elements but also aligns with the growing demand for responsible tourism practices in the industry (Samaddar & Mondal, 2023). By leveraging the Metaverse, star-rated hotels reduced their ecological footprint, providing guests with a more environmentally conscious and responsible travel experience (Go & Kang, 2023). The virtual environment created by the Metaverse not only enhances the efficiency of hotel operations but also contributes to minimizing physical resource consumption. As the hospitality industry strives to embrace eco-friendly practices, the Metaverse emerges as a transformative tool, fostering a harmonious blend of luxury, technology, and sustainability in star-rated hotels (Buhalis, Lin, et al., 2023).

While the Metaverse remains predominantly in the conceptual stage and has not yet fully materialized as a commercial reality, it has already become the lived experience for a considerable number of individuals, despite being a concept unfamiliar to the majority of the population (Ananya Babu & Mohan, 2022). The World Economic Forum (2022) recognized tourism as a sector with significant potential advantages from the Metaverse. Gursoy et al. (2022) theorized that consumer behaviour within the Metaverse would diverge from traditional patterns due to the increased accessibility to a wider array of virtual resources. Rospigliosi (2022) forecasted “By 2030, every physical device that can be digitally connected will be. Eventually, every action in the digital world will have an effect on the physical world, and vice versa. So, the metaverse isn’t dependent on a virtual reality headset. Rather, it’s the coming together of complementary technologies, including cloud and edge (near the data source) computing, artificial intelligence, blockchain, the internet of things, virtual reality, augmented reality and digital twins.”

This research endeavours to conceptualize the role of the Metaverse in the tourism industry and establish foundational principles that can guide future research endeavours. The paper critically examines existing Metaverse-related literature, elucidating how this emerging technology revolutionizes responsible tourism practices experiences in tourism management and marketing. The primary objective is to equip tourism practitioners with a robust understanding, enabling them to formulate suitable strategies for integrating Metaverse technology into their businesses and anticipating future developments.

2. LITERATURE REVIEW

2.1. Metaverse: concepts, definitions, and dimensions

Coined by Neal Stephenson in his 1992 science fiction novel “Snow Crash,” the term “Metaverse” combines “meta,” meaning “beyond” in Greek, and “universe.” Buhalis, Leung, et al. (2023) as depicted in the novel, the Metaverse is an expansive virtual realm that exists parallel to the physical world, akin to what is now commonly referred to as a “digital twin.” The concept involves augmenting the physical world with a layer of virtual reality, seamlessly merging the digital and physical universes into a cohesive and interconnected space (Roo & Hachet, 2017). The term “Metaverse” encompasses a multifaceted realm of concepts, definitions, and dimensions that collectively define a dynamic space blending virtual and physical realities (Wang et al., 2022). At its core, the Metaverse represents a digital universe where users can engage in immersive, interconnected experiences (Kim et al., 2023). Conceptually, it transcends traditional boundaries, offering a seamless integration of the physical and virtual realms. Definitions vary, but commonly, the Metaverse is understood as a collective virtual space comprising augmented reality, virtual reality, and the artificial intelligence (Iqbal & Campbell, 2023; W. Y. B. Lim et al., 2023; “Metaverse,” 2019; Zainab et al., 2022).

2.2. Functionality

The incorporation of the Metaverse into star-rated hotels holds immense potential for advancing responsible tourism practices. By leveraging virtual alternatives to physical travel, these hotels can significantly reduce their carbon footprint and contribute to environmental conservation (Zainab et al., 2022). The Metaverse becomes a powerful tool for immersive, educational experiences that raise awareness about sustainability initiatives and eco-friendly practices. Additionally, virtual platforms enable efficient collaboration among industry stakeholders, fostering a sense of collective responsibility (Dwivedi et al., 2022). As star-rated hotels use the Metaverse for resource management and guest engagement, they not only enhance their eco-friendly credentials but also provide a pathway for guests to actively participate in responsible tourism efforts. This fusion of technology, luxury hospitality, and sustainable practices positions the Metaverse as a catalyst for positive change within the industry, shaping a future where responsible tourism is seamlessly integrated into the immersive experiences offered by these establishments.

2.3. Interoperability

This concept refers to the seamless integration and interaction between various elements and platforms within

the Metaverse, allowing for a cohesive and interconnected virtual environment. In the realm of responsible tourism, interoperability facilitates a unified approach where diverse components, such as virtual simulations, sustainable practices, and guest engagement, work harmoniously to create a comprehensive and immersive experience (Dwivedi et al., 2022).

For instance, consider a scenario where a star-rated hotel employs Metaverse technology to offer virtual tours of eco-friendly initiatives, showcasing sustainable practices like water conservation, renewable energy sources, and waste reduction. Through interoperability, these virtual experiences could be seamlessly integrated with real-time data from the hotel's actual sustainability metrics, providing guests with a transparent and immersive understanding of the environmental efforts in place. This integration not only enhances guest awareness but also promotes a sense of responsibility and eco-consciousness. Moreover, interoperability allows for the integration of responsible tourism information into the virtual space, offering guests insights into local conservation efforts, cultural preservation, and community engagement initiatives. By fostering a connection between the virtual and physical dimensions, star-rated hotels can use the Metaverse to not only enhance the guest experience but also actively contribute to responsible tourism practices. The interoperable nature of the Metaverse thus becomes a powerful tool for aligning virtual immersive experiences with tangible sustainable actions within the hospitality industry (Yacoub, 2023).

2.4. Immersiveness

The immersiveness of the Metaverse holds significant potential in shaping responsible tourism practices within star-rated hotels, providing innovative ways to enhance guest experiences while promoting sustainability. One notable example is the reduction of physical travel through virtual alternatives. By offering immersive virtual tours of local attractions, cultural sites, or natural wonders, star-rated hotels can contribute to minimizing the carbon footprint associated with travel. Guests can virtually explore destinations, reducing the need for actual transportation and mitigating the environmental impact of traditional tourism (Buhalis, Lin, et al., 2023d).

Additionally, the Metaverse enables hotels to simulate sustainable practices within a virtual setting. For instance, guests can engage in virtual activities that promote environmental awareness, such as participating in simulated beach clean-ups or wildlife conservation efforts. This not only educates visitors about responsible tourism but also encourages them to adopt eco-friendly behaviours (Monaco & Sacchi, 2023).

Furthermore, the Metaverse allows hotels to showcase their commitment to sustainability by creating virtual replicas of their green initiatives. Guests can virtually tour eco-friendly features like solar panels, water conservation systems, and waste management practices. This transparency fosters a sense of trust and aligns with the growing demand for environmentally conscious travel experiences (Allam et al., 2022).

Its dimensions extend beyond mere technological aspects, delving into social, economic, and cultural spheres. The Metaverse is envisioned as a shared, persistent space with its own economy, governance, and user-created content, presenting a new frontier for human interaction and collaboration. As technologies evolve, so too do the dimensions of the Metaverse, shaping the way individuals perceive and engage with this intricate fusion of realities.

2.5. Revolution of responsible tourism practices through metaverse

In revolutionizing responsible tourism practices, star-rated hotels are increasingly turning to Metaverse technologies to offer immersive and educational experiences to their guests. Virtual Reality (VR), Augmented Reality (AR), and Mixed Reality (MR) are among the key technologies being employed. Through VR, guests can explore destinations, hotel facilities, and sustainability initiatives in a simulated environment, enhancing their understanding and appreciation of responsible tourism practices. AR overlays digital information onto the real world, enabling hotels to provide contextual information about local attractions, cultural sites, and eco-friendly initiatives, thereby promoting awareness and engagement. Mixed Reality combines elements of VR and AR to create interactive experiences that blend virtual and physical elements, offering guests dynamic storytelling opportunities and personalized educational content (W. M. Lim et al., 2024).

Moreover, 3D mapping and visualization technologies allow hotels to create detailed virtual replicas of their properties, showcasing sustainable features such as green infrastructure and renewable energy installations. Additionally, hotels can collaborate with virtual tour platforms to develop customized experiences that highlight responsible tourism initiatives, cultural heritage, and environmental conservation efforts. By leveraging these Metaverse technologies, star-rated hotels can redefine the guest experience, fostering a deeper connection to destinations and promoting responsible travel practices in an engaging and interactive manner (Rahaman et al., 2023).

Incorporating Metaverse technology into star-rated hotels presents a transformative avenue for promoting responsible tourism practices worldwide. One exemplary

application lies in the creation of Virtual Sustainability Tours as shown in Fig.1. For instance, the InterContinental Maldives Maamunagau Resort utilized VR technology to offer guests virtual tours of their eco-friendly initiatives, including coral reef restoration projects and renewable energy installations. Through these immersive experiences, guests gained insights into the hotel's sustainability efforts, inspiring them to adopt similar practices and make informed choices during their stay (Gursoy et al., 2022).

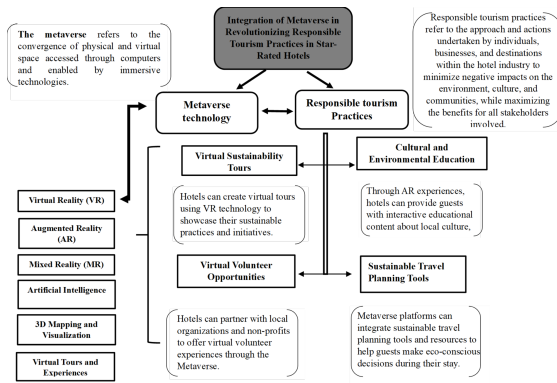


Figure 1. A visual representation illustrating the integration of the Metaverse in revolutionizing responsible tourism practices in star-rated hotels. Source : Author's own creation/work

Moreover, Metaverse technology enables hotels to provide guests with interactive Cultural and Environmental Education experiences. Take the example of the Smithsonian American Art Museum in Washington, D.C., which developed an AR application allowing visitors to learn about indigenous cultures and environmental conservation efforts. Similarly, hotels can utilize AR overlays to offer information about local cultural heritage sites, wildlife habitats, and conservation projects, fostering awareness and appreciation for the destination's cultural and natural heritage among guests (Sheng & Chen, 2012).

Another innovative practice involves offering Virtual Volunteer Opportunities through the Metaverse. For instance, the Shangri-La Hotel in Singapore partnered with local conservation organizations to create virtual volunteer experiences, where guests could participate in virtual beach clean-ups and conservation workshops. By facilitating these virtual engagements, hotels empower guests to contribute to responsible tourism practices and make a positive impact on the environment and communities, regardless of their physical location.

Furthermore, Metaverse platforms can serve as Sustainable Travel Planning Tools, aiding guests in making eco-conscious decisions during their travels. The Four Seasons Hotels and Resorts developed an AR app that provides guests with information about local sustainable transportation options, eco-friendly dining choices, and responsible tourism activities in various destinations. By

equipping guests with the knowledge and resources to support responsible tourism practices, hotels not only enhance the overall guest experience but also play a pivotal role in promoting sustainable behaviours and responsible travel practices worldwide (Sigala et al., 2021).

3. RESEARCH METHODOLOGY

The study adopted a qualitative systematic literature review methodology to explore the role of the Metaverse as a green technology in promoting responsible tourism practices in star-rated hotels. The research employed the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) approach to identify, screen, and evaluate relevant literature on the Metaverse, sustainability, hospitality, and responsible tourism. Academic databases such as ScienceDirect, EBSCOhost, and Emerald were systematically searched for publications released between November 2021 and December 2023, while Google Alerts was utilized to capture newly emerging Metaverse-related studies and industry developments.

The study relied on an in-depth content analysis method to examine and synthesize information gathered from scholarly articles, industry reports, and news media sources. Selected publications were individually reviewed and analyzed by the researchers to identify major themes related to Metaverse technologies, virtual hospitality, guest engagement, sustainability initiatives, and responsible tourism practices. The content was then categorized and compared to determine the potential applications, benefits, and challenges of integrating Metaverse technologies into star-rated hotel operations.

To further strengthen the analysis, the researchers conducted a SWOT (Strengths, Weaknesses, Opportunities, and Threats) analysis to evaluate the strategic implications of Metaverse adoption in the hospitality industry. The findings from the literature review and content analysis were collaboratively discussed and cross-validated by the authors through multiple review sessions to ensure consistency and reliability. This methodological framework enabled the researchers to develop a comprehensive conceptual understanding of how Metaverse technologies can enhance sustainability, improve guest experiences, and revolutionize responsible tourism practices in star-rated hotels. (figure 1)

4. RESULTS AND DISCUSSION

4.1. Virtual Hospitality and its influence on guest engagement and satisfaction

As hospitality technology advances, the emergence of the metaverse presents a groundbreaking opportunity to revolutionize customer engagement. Virtual hospitality, a

pioneering concept within the digital age, redefines traditional service delivery by operating within virtual or augmented reality spaces, offering immersive and personalized experiences. This innovative approach not only enhances connectivity with potential customers but also fosters a sense of inclusion and real-time interaction. In the realm of virtual hospitality, every aspect, process, or individual can be replicated and interconnected, creating a digital environment where services are initially provided digitally before transitioning to physical settings. This evolution enables guests to envision attending events, enjoying dining experiences, and receiving hospitality within a virtual landscape, ultimately transcending physical constraints and offering warmth and hospitality within virtual spaces (Buhalis, Lin, et al., 2023).

The potential applications of the Metaverse within the hotel industry are vast, offering opportunities for enhanced customer engagement and loyalty. One significant use is through virtual hotel experiences, where guests can explore digital replicas of hotel spaces before their physical arrival, providing a personalized and immersive preview of the hotel's amenities and ambiance. Additionally, virtual concierge services within the Metaverse enable guests to receive personalized assistance and recommendations, enhancing their overall experience and connectivity with the hotel even when they are not physically present (Dwivedi et al., 2022).

Moreover, the Metaverse transforms traditional meetings and conferences by offering immersive virtual spaces where participants can gather from anywhere globally, utilizing lifelike avatars for dynamic interactions and networking. This shift caters to the growing demand for remote collaboration and reduces logistical challenges, providing a visually compelling and engaging alternative to traditional event formats. Furthermore, virtual dining experiences facilitated by the Metaverse allow guests to select virtual dishes and interact with restaurant avatars, revolutionizing the way flavors are savored through the art of virtual dining (Dwivedi et al., 2022).

Additionally, virtual events and entertainment hosted within the Metaverse redefine traditional entertainment possibilities, offering immersive digital environments for conferences, concerts, and social gatherings. These virtual experiences transcend physical boundaries, providing memorable and inclusive entertainment options accessible from anywhere in the world. Through virtual concerts, digital stages, and artistic displays, the Metaverse enables personalized engagements and interactive experiences, setting the stage for the future of metaverse tourism and hospitality.

Numerous major players in the hospitality industry have

embraced the potential of the metaverse to elevate their brand presence and allure guests. Marriott Hotels stands out as an industry trailblazer, leveraging blockchain-based technologies like NFTs and VR to offer guests the novel opportunity of ordering virtual reality experiences within their rooms, aiming to spark creativity and innovation. Similarly, Budweiser, a renowned beer brand, has ventured into the metaverse through NFTs, utilizing digital advancements to redefine consumer engagement and bolster brand loyalty, including initiatives like introducing virtual racehorses in gaming platforms.

Stella Artois's parent company, AB InBev, has made strides in metaverse sponsorship, utilizing NFTs and virtual worlds to cultivate unique user experiences and foster brand allegiance. Meanwhile, boutique hotel chain CitizenM has made waves by being the first in its industry to establish a metaverse presence, using NFT sales to fund this innovative venture and providing exclusive perks for real-world hotel patrons. Millennium Hotels has taken a digital leap by operating a virtual hotel within the metaverse, offering guests interactive experiences guided by avatars. Additionally, RendezVerse has introduced RV360, a platform enabling hospitality venues to create immersive social spaces within the metaverse, providing a seamless entry point into this dynamic digital landscape.

The metaverse's integration into star-rated hotels reshapes guest engagement and satisfaction dynamics through a comprehensive embrace of responsible tourism practices. Firstly, leveraging immersive Virtual Reality (VR) experiences enhances guest engagement by providing vivid encounters with sustainable initiatives. These tours not only educate but also emotionally connect guests to the hotel's dedication to responsible tourism, fostering higher levels of satisfaction. Interactive digital guides within the metaverse complement this experience by offering guests in-depth knowledge about sustainable choices, empowering them to make informed decisions during their stay. This active involvement contributes significantly to guest satisfaction, as they feel a sense of ownership in supporting eco-friendly practices (W. M. Lim et al., 2024).

Secondly, blockchain technology plays a pivotal role in establishing trust among guests regarding the hotel's sustainability endeavours. By providing transparent and verifiable data on eco-friendly practices, blockchain-verified sustainability assures guests of the hotel's unwavering commitment to responsible tourism. This transparency fosters enhanced satisfaction and loyalty as guests perceive themselves as contributing to a meaningful cause. Furthermore, participation in virtual community events within the metaverse cultivates a sense of connection to the destination's sustainability efforts. Guests engaging in these events feel more invested and

satisfied with their overall experience, seeing themselves as active participants in a broader environmental mission.

Thirdly, the metaverse's implementation of digital rewards for responsible actions serves as a compelling motivator for guests to embrace sustainable practices. These rewards not only incentivize eco-friendly behaviour but also enhance guest satisfaction by providing tangible recognition for their contributions. Moreover, seamless metaverse-driven processes such as remote virtual check-ins streamline the

guest experience, reducing friction during the arrival process and boosting overall satisfaction with a hassle-free check-in procedure. Overall, the metaverse offers a dynamic platform for personalized sustainability experiences, gamification of eco-friendly practices, and virtual challenges that further encourage guests to embrace responsible tourism, leading to heightened engagement and satisfaction levels throughout their stay (Markowitz & Bailenson, 2021; Zhao et al., 2021).

Table 1. Aspects of the Metaverse as Responsible Tourism Practices and Their Influence on Guest Engagement and Satisfaction

Metaverse-Based Responsible Tourism Practices	Relationship	Outcome Variable
Virtual Reality (VR) Engagement	+	Guest Engagement and Satisfaction
Interactive Digital Guides	+	Guest Engagement and Satisfaction
Blockchain-Verified Trust	+	Guest Engagement and Satisfaction
Metaverse Community Participation	+	Guest Engagement and Satisfaction
Digital Rewards for Responsible Actions	+	Guest Engagement and Satisfaction
Remote Virtual Check-ins	+	Guest Engagement and Satisfaction
Personalized Sustainability Experiences	+	Guest Engagement and Satisfaction
Gamification of Sustainable Practices	+	Guest Engagement and Satisfaction
Metaverse Challenges for Guests	+	Guest Engagement and Satisfaction
Digital Carbon Footprint Tracking	+	Guest Engagement and Satisfaction
Real-time Energy Management Awareness	+	Guest Engagement and Satisfaction
Virtual Meetings and Events Options	+	Guest Engagement and Satisfaction
Virtual Tours of Eco-friendly Practices	+	Guest Engagement and Satisfaction

Source : Author's own creation/work

4.2. Metaverse will reshape luxury hospitality and promote responsible tourism behaviours

The concept of environmentally responsible behavior encompasses the actions and conduct undertaken by individuals or groups aimed at reducing or counteracting their adverse effects on the environment. It includes practices such as pro-environmental behavior, ecological behavior, sustainable behavior, and eco-friendly behavior (Fenitra et al., 2022). Essentially, it involves any efforts made to mitigate environmental harm and promote ecological sustainability. The integration of virtual experiences with green technology stands as a promising frontier in luxury hospitality, poised to redefine guest engagement and sustainability practices. By leveraging virtual reality (VR) and augmented reality (AR), luxury hotels can provide guests with immersive digital experiences that transcend traditional boundaries. For instance, a high-end resort might offer VR tours of its eco-friendly initiatives, allowing guests to virtually explore renewable energy installations, organic gardens, and

conservation efforts. These virtual experiences not only enhance guest engagement but also foster a deeper understanding of the hotel's commitment to sustainability.

Furthermore, the incorporation of green technology amplifies the impact of these virtual experiences, showcasing the hotel's dedication to environmental stewardship. For example, a luxury hotel may utilize solar panels, energy-efficient lighting, and water-saving fixtures to minimize its carbon footprint. Guests can learn about these sustainable practices through interactive AR overlays that provide real-time data on energy usage, waste reduction efforts, and environmental impact. By seamlessly integrating virtual experiences with green technology, luxury hotels can create compelling narratives that inspire responsible tourism behaviours among guests (Pereira et al., 2021).

Moreover, the immersive nature of virtual experiences enables luxury hotels to offer personalized and customizable experiences tailored to guests' preferences and interests. For instance, a high-end eco-resort might develop VR simulations of local excursions, allowing

guests to virtually explore nearby natural attractions, cultural landmarks, and wildlife habitats. Through these immersive experiences, guests can gain a deeper appreciation for the destination's natural beauty and cultural heritage while minimizing their ecological footprint by reducing the need for physical travel.

In addition, virtual experiences coupled with green technology can serve as educational tools, empowering guests to make informed choices that support responsible tourism practices. Luxury hotels can offer virtual workshops, seminars, and eco-tours that highlight the importance of sustainability, conservation, and community engagement. For example, a luxury eco-lodge might host virtual cooking classes using locally sourced ingredients, accompanied by educational sessions on sustainable farming practices and ethical food production. Through these immersive educational experiences, guests can learn how their travel choices impact the environment and local communities, inspiring them to adopt more sustainable behaviours (Pereira et al., 2021). In conclusion, the fusion of virtual experiences with green technology holds tremendous potential to transform luxury hospitality and promote responsible tourism behaviours. By offering immersive, environmentally-conscious offerings, luxury hotels can create meaningful connections with guests, while also contributing to the preservation of natural resources and cultural heritage. As the hospitality industry continues to embrace innovation and sustainability, the integration of virtual experiences and green technology will play a pivotal role in shaping the future of luxury travel.

4.3. SWOT Analysis of integration of Metaverse in Revolutionizing Responsible Tourism Practices in Star-Rated Hotels

Integrating the Metaverse into responsible tourism practices presents a compelling opportunity for star-rated hotels to redefine guest experiences and sustainability efforts. One notable strength lies in the enhanced visitor experience. For instance, hotels can leverage virtual reality (VR) technology to offer immersive previews of destinations, allowing guests to explore local attractions, cultural landmarks, and eco-friendly initiatives before their arrival. An exemplary case is Marriott International's "VRoom Service," which enables guests to experience virtual travel adventures using Samsung Gear VR headsets in select hotels, thereby enhancing engagement and satisfaction (Casaló et al., 2015; W. M. Lim et al., 2024).

However, this initiative also faces certain weaknesses. Accessibility challenges arise as not all guests may possess the necessary technology or internet connectivity to access the Metaverse experiences as illustrated in Fig.2.

Additionally, there are concerns regarding the costs associated with implementing and maintaining Metaverse technologies, particularly for smaller hotels with limited resources. Despite these challenges, opportunities abound. Hotels can differentiate themselves and gain a competitive edge by embracing Metaverse technology. For example, Hilton's "Hilton Honors" loyalty program introduced a virtual reality experience that allows members to explore hotel rooms and amenities virtually, showcasing their commitment to innovation and personalized service (Dwivedi et al., 2022; Soliman et al., 2024).

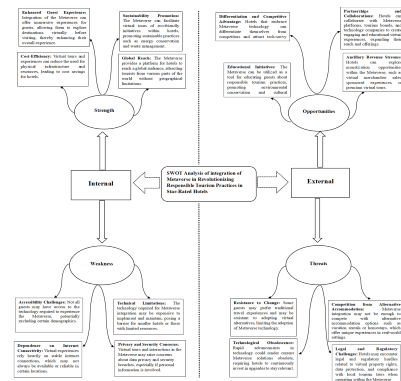


Figure 2. SWOT Analysis of integration of Metaverse in Revolutionizing Responsible Tourism Practices in Star-Rated Hotels. Source : Author's own creation/work

Yet, threats loom on the horizon. Resistance to change from guests accustomed to traditional travel experiences may hinder widespread adoption of Metaverse solutions. Moreover, competition from alternative accommodations, such as Airbnb's virtual tours of unique stays, poses a challenge to traditional hotel offerings. Additionally, legal and regulatory complexities, including issues related to virtual property rights and data privacy, need to be carefully navigated. Despite these challenges, the integration of the Metaverse presents a transformative opportunity for star-rated hotels to revolutionize responsible tourism practices, offering guests immersive experiences while advancing sustainability efforts on a global scale. Through strategic partnerships, innovative initiatives, and a commitment to technological advancement, hotels can leverage the power of the Metaverse to shape the future of the hospitality industry (Dwivedi et al., 2023). (Figure 2)

5. CONCLUSION

The integration of the Metaverse into responsible tourism practices within star-rated hotels represents a significant opportunity to revolutionize guest experiences and advance sustainability efforts. By leveraging virtual reality (VR), augmented reality (AR), and other immersive technologies, hotels can offer guests interactive and educational experiences that transcend traditional

boundaries as illustrated in Fig.1. These virtual experiences not only enhance guest engagement and satisfaction but also foster a deeper understanding and appreciation of responsible tourism practices as shown in Table 1. Furthermore, the fusion of virtual experiences with green technology amplifies the impact of sustainability initiatives within luxury hospitality. Figure.1. showcasing eco-friendly initiatives and environmental stewardship through virtual platforms, hotels can inspire guests to adopt responsible travel behaviours and contribute to the preservation of natural resources and cultural heritage. Moreover, the immersive nature of virtual experiences enables hotels to offer personalized and customizable experiences tailored to guests' preferences and interests, further enhancing guest satisfaction and loyalty. While challenges such as accessibility limitations and implementation costs exist, strategic partnerships, innovative initiatives, and a commitment to technological advancement can help hotels overcome these obstacles and unlock the transformative potential of the Metaverse. By embracing this groundbreaking technology, star-rated hotels can not only differentiate themselves in the competitive hospitality market but also lead the way in shaping the future of responsible tourism practices on a global scale.

5.1. Theoretical Implications

The integration of the Metaverse in revolutionizing responsible tourism practices within star-rated hotels offers theoretical implications across multiple domains. These insights illuminate the transformative potential of this technological advancement. In the domain of technology and hospitality management, the convergence of virtual reality (VR), augmented reality (AR), and other Metaverse technologies presents opportunities for enhancing guest engagement and satisfaction. Through immersive and personalized experiences, hotels can deepen connections with guests, fostering loyalty and positive brand perception. Moreover, the incorporation of the Metaverse facilitates sustainability initiatives such as virtual sustainability tours, interactive educational experiences, and virtual volunteer opportunities. These initiatives raise awareness about environmental conservation and promote eco-friendly behaviours among guests, showcasing the intersection of environmental psychology, sustainable tourism, and digital technologies. Economically, embracing Metaverse technologies can provide star-rated hotels with a competitive advantage by enabling them to differentiate themselves through innovative offerings and personalized experiences. This can attract tech-savvy guests and potentially justify premium pricing. However, the adoption of Metaverse technologies also necessitates addressing regulatory complexities related to data privacy,

virtual property rights, and accessibility. This underscores the importance of ethical decision-making and regulatory compliance in the context of digital transformation. Lastly, the Metaverse has the potential to reshape cultural and social interactions within the hospitality space by fostering virtual environments that reflect diverse cultural heritage and facilitating virtual community engagement. This can promote cross-cultural understanding and social integration among guests. Theoretical frameworks from various disciplines such as technology management, environmental psychology, marketing, law, and sociology provide valuable insights into the implications and impacts of integrating the Metaverse into responsible tourism practices, shaping the future landscape of the hospitality industry.

5.2. Practical Implications

The integration of the Metaverse into responsible tourism practices within star-rated hotels yields several practical implications for the hospitality sector. Firstly, by leveraging virtual reality (VR) technology and immersive experiences, hotels can significantly enhance guest engagement and satisfaction. Through interactive and personalized tours of eco-friendly initiatives and cultural attractions, guests develop a deeper connection to the destination, leading to heightened satisfaction with their overall stay. Secondly, the integration of virtual experiences coupled with green technology serves as a powerful tool for promoting responsible tourism behaviours. Hotels can offer virtual workshops, seminars, and eco-tours to educate guests on sustainability practices, inspiring them to make informed choices that support conservation efforts. This educational aspect not only enriches the guest experience but also contributes to broader environmental awareness and consciousness. Additionally, embracing Metaverse technology enables hotels to differentiate themselves in the market and build brand loyalty among guests who value sustainability and innovation. By offering immersive and innovative experiences, hotels can enhance their brand image and stand out in a competitive landscape. Moreover, the operational efficiencies and cost savings associated with virtual experiences, such as virtual concierge services and remote virtual check-ins, further underscore the benefits of integrating the Metaverse into hotel operations. Overall, the practical implications of Metaverse integration in star-rated hotels extend beyond guest experiences to encompass sustainability initiatives, operational efficiencies, and brand differentiation, positioning the hospitality industry at the forefront of responsible tourism practices.

5.3. Limitations

This study has certain limitations that should be

considered when interpreting the findings. The research is based primarily on secondary data collected from academic journals, industry reports, and other published sources, which may not fully reflect current industry practices and emerging developments in Metaverse adoption. As the Metaverse is still an evolving concept, the availability of comprehensive and empirically validated literature in the hospitality and tourism sector remains limited, affecting the broader applicability of the findings. Furthermore, the study adopts a conceptual and analytical approach without collecting primary data from hotel managers, employees, or guests, thereby limiting direct insights into stakeholder perceptions, implementation challenges, and operational outcomes. The rapidly changing nature of digital technologies may also influence the relevance of the findings over time. Future research should incorporate empirical investigations, case studies, and longitudinal analyses to provide a more comprehensive understanding of the Metaverse's role in advancing responsible tourism practices in star-rated hotels.

5.4. Future Research Directions

Future research suggestions stemming from the integration of the Metaverse in revolutionizing responsible tourism practices in star-rated hotels encompass several key areas. In-depth analysis of user experience and satisfaction levels resulting from Metaverse technologies is essential. Empirical studies, surveys, and qualitative interviews with guests who have engaged with virtual hospitality services can offer valuable insights into their perceptions and preferences. Addressing accessibility and inclusivity concerns within Metaverse experiences is crucial. Research focusing on strategies to enhance access for individuals with disabilities or limited technological literacy can ensure equitable participation in virtual hospitality. Assessing the sustainability impact of Metaverse integration is essential, requiring lifecycle assessments and environmental analyses to quantify the environmental benefits and drawbacks. Additionally, exploring socio-economic implications on local communities and cultural heritage sites is imperative. Investigating regulatory and ethical challenges associated with virtual hospitality is vital. Studies examining data privacy, intellectual property rights, and consumer protection within Metaverse contexts can guide industry stakeholders and policymakers. Understanding market adoption trends and competitive dynamics of Metaverse-enabled hospitality services is necessary. Analysing factors influencing adoption, organizational readiness, and business models can inform industry trends. Lastly, conducting longitudinal studies and trend analyses to track changes in consumer preferences, technological innovations, and regulatory landscapes will contribute to a

comprehensive understanding of global hospitality trends. Overall, addressing these research areas will advance knowledge and inform strategic decision-making in Metaverse-enabled responsible tourism practices, ensuring a sustainable and inclusive future for virtual hospitality.

6. FUNDING STATEMENT

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7. ETHICAL STATEMENT

Secondary data were used. The research has been carried out in accordance with the COPE guidelines.

8. AUTHORS CONTRIBUTIONS

Conceptualization/Supervision :Dhirendra Tiu

Introduction/Supervision :Dr.Anindita Bharadwaj

Review and writing : Hare Krishna Chaudhary

CONFLICT OF INTEREST

Authors declare no conflict of interest

DATA AVAILABILITY STATEMENT

All data generated or analyzed during this study are included in this published article (and its supplementary information files).

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