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MICE IN METAVERSE: LINKING UTAUT 2 AND EXPERIENCESCAPE

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ABSTRACT

In an era where fourth industrial revolution is unfolding before our eyes and digital workplace is making its advancements into everyday life, the international Meetings, Incentives, Conferences, and Exhibitions (MICE) industry is transforming under the influence of metaverse. The present study unearths performance expectancy (PE), effort expectancy (EE), social influence (SI), facilitating conditions (FC), price value (PV), cognitive (C) and affective (A) responses (R) as the antecedents of behavior intention to use MICE in metaverse. From theoretical perspective, the novelty and originality of current study dwells in portraying the conceptual framework for the consumer behavioral intentions (BI) towards MICE in metaverse based on the stakeholder-centric approach. The practical implications demonstrate that MICE in metaverse can offer end-users remote interaction with meaningful, immersive experiences where consumers can organically interact with each other without losing the sense of belonging within the community as they engage and navigate through various virtual worlds that mirror the best versions of the physical world.

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INTRODUCTION

Over the last four years, the hospitality and tourism sector has experienced evolutionary change under the extreme events of COVID-19 pandemic, global inflation, risk of recession followed by the massive layoffs, and technological progress of Web 3.0 and metaverse. The influence of such forceful events has not spared the MICE industry. Nevertheless, as the hospitality and tourism sector proved to be resilient and adaptive to changes (Radic et al., 2022a), the future looks bright for the international MICE industry as Dinesh et al. (2021) estimate that the market capacity of the MICE market could reach $1,337.4 billion by 2028. Furthermore, Ghose et al. (2022) estimate that the maximum potential of the metaverse will be between $8 to $13 trillion per annum by 2030, while Gursoy et al. (2022) and Dwivedi et al. (2022) outline that the rapid expansion of metaverse is affecting the hospitality and tourism sector including the MICE industry. Accordingly, the MICE industry stakeholders are exploring new and innovative business models in order to adapt to this evolutionary change. Subsequently, despite the fact MICE in metaverse is just beginning to adopt technology, it is appealing to consumers due to its potential to reduce their traveling time and other expenses. Thus, as science fiction prototyping assist business to re-assemble their vision for future (Bell et al., 2013), we can expect that in not so distant future the metaverse will allow consumers to stay in the comfort zone of their homes while being immersed in MICE.

The MICE industry is part of hospitality and tourism sector, and it refers to a group of tourism stakeholders that plan, book and organize conferences, seminars and other events (Esen & Kocabas, 2019) that contribute to the advanced economy that inspires the intelligent usage of the cultural past and natural leisure resources (Aburumman, 2020). The recent research on MICE industry and MICE tourism in general explored the value chain (Rojas Bueno et al., 2020; Rojas-Bueno et al., 2023), personal data privacy (Esen & Kocabas, 2019), technology usage (Talantis et al., 2020; Hur et al., 2022), MICE destination image during crises (Rittichainuwat et al., 2020), crisis management (Aburumman, 2020), learning experiences (Sangpikul, 2020), Muslim-friendly services (Teerakunpisut et al., 2023), and loyalty and intention to attend MICE in metaverse (Heo et al., 2022). Moreover, in similar study, Heo et al. (2022) concluded that smoothness, being present, and the financial aspects have an evident impact on users' retention, whereas being present and the financial aspects have a reliable impact on the desire towards the event. Furthermore, Heo et al. (2022) study employed SPICE (Seamlessness, Presence, Interoperability, Concurrence, Economy) model while recent study by Ariza-Montes et al. (2023) employed

modified Extended Unified Theory of Acceptance and Use of Technology (UTAUT 2) to describe conferences and meetings in metaverse, and it is to the authors' best knowledge the only studies on this topic. Hence, there is an obvious void in current body of knowledge on the metaverse technology adoption within the MICE industry and consumer experiences in MICE in metaverse. Furthermore, our study has accepted a call from Koo et al. (2022), Gursoy et al. (2022), Dwivedi et al. (2022) and Ariza-Montes et al. (2023) in addressing the following research questions:

- What are the essential aspects that are influencing the adoption of MICE in metaverse?
- What are the core determinants that are shaping the MICE metaverse-scape?

The current study sets to provide theoretical value through revealing the robust relations within the constructs of Venkatesh et al.'s (2012) UTAUT 2 with Pizam and Tasci's (2019) experienscape model build on Mehrabian and Russell's (1974) Stimulus-Organism-Response (S-O-R) paradigm. In addition, this study intended to 1) compose a theory-based model according to the extended Venkatesh et al.'s (2012) UTAUT 2 that would elucidate the adoption of MICE in metaverse, 2) objectively test the adoption of MICE in metaverse, 3) objectively test the Pizam and Tasci's (2019) model in metaverse, 4) disclose the mediating role of C and A R within the framework of MICE in metaverse.

The novelty and uniqueness of this study is in portraying the conceptual framework for the consumer behavioral intentions toward MICE in metaverse based on the stakeholder-centric approach. In practical terms, this study can assist the tourism and hospitality sector stakeholders, Web 3.0 developers and the metaverse Decentralized Autonomous Organizations (DAOs) in understanding the underlying mechanism associated with the adoption of MICE in the new, emerging world– the metaverse.

THEORETICAL FRAMEWORK AND HYPOTHESES DEVELOPMENT

The UTAUT 2, S-O-R Paradigm and MICE in Metaverse-Scape Research Framework

The recent technological evolution and the uprising of Web 3.0, blockchain technology, cryptocurrencies and metaverse has captured the interest of hospitality and tourism researchers and practitioners. Although metaverse

per se is not a novel concept, its applications indicate it will reshape the sector with disruptive outcomes in the near future (Dwivedi et al., 2022; Gursoy et al., 2022; Koo et al., 2022). Hence, the metaverse is a conception of the next looping of the internet and the creation of a post-reality universe where humans can pursue limitless experiences in a single entity, collective, captivating, and tenacious, 3D virtual space that bridges physical reality and digital virtuality (Mystakidis, 2022). Accordingly, Gursoy et al. (2022) illustrate the hospitality and tourism metaverse-scape as a co-creation process where consumers wander through the "stream of engagement" that leads to their immersive experiences. In this study, the MICE metaverse-scape is established on the extended platform between Venkatesh et al.'s (2012) UTAUT 2 and Pizam and Tasci's (2019) model.

Previous studies related to the adoption of metaverse technologies in various sectors gave us novel perspectives on decentralized sustainable management (Sze et al., 2024), Internet of Value (IoV) in the travel and hospitality industries (Radic, 2024), marketing, brand experience and customer engagement (Barrera & Shah, 2023; Mogaji et al., 2023; Park & Lim, 2023), consumer behavior (Kaur et al., 2023; Hadi et al., 2024), social interactions (Hennig-Thurau et al., 2023; Ghali et al., 2024), educational purposes (Kalınkara & Özdemir, 2024) and conferences and meetings (Ariza-Montes et al., 2023). In recent structured content analysis approach, Sze et al. (2024) have identified five key attributes: a creator economy, a persistent synchronous virtual environment, decentralization, an interoperable network, and a digitalized mindset. Aforementioned authors highlight that metaverse is novel technology that could enhance sustainable management practices, however, authors call upon additional empirical research in order to understand how metaverse technologies adoption, social interaction and psychological well-being shape metaverse experience (Sze et al., 2024). Similarly, Radic (2024), in his critical reflection, concluded that metaverse technologies offer a virtual reality platform, on which end users can engage in experience co-creation with possibility of monetization of metaverse experience. Thus, Radic (2024) outlines a lack of empirical studies based on robust frameworks that are grounded in well-known models and theories in order for metaverse technologies to unlock the experience and IoV across the leisure industry. Moreover, Barrera and Shah (2023), in their systematic literature review and a content analysis of metaverse viewpoints, have highlighted an insufficient comprehension of the metaverse implications for marketing practice and research. Hence, aforementioned authors call upon empirical studies based on 'consumer experience' and/or empirical studies that could combine metaverse user

experience and metaverse technology adoption (Barrera & Shah, 2023). Subsequently, Barrera and Shah (2023) argue that the aforementioned future empirical studies could help in the production of various models for companies and use cases that will support businesses that produce, promote, and sell various metaverse experience based products and services. Similarly, Dwivedi et al. (2023) employed multiple perspectives from the various expert contributors in their comprehensive study, and concluded that metaverse within tourism and hospitality industry holds great potential of delivering immersive hospitality experiences. However, aforementioned authors outline that an apparent gap exists in academic literature with lack of understanding on the nexus between adoption of metaverse technologies and metaverse experience (Dwivedi et al., 2023). Accordingly, Dwivedi et al. (2023) argue that future empirical studies should address supply and technical sides of metaverse adoption and the driving factors of metaverse experience and its effects on purchasing patterns and general competitiveness of tourism organizations. Moreover, Park and Lim (2023), in their study based on a thematic analysis approach, recognize the importance of metaverse experiences related to brands, and the authors propose three marketing strategies that have an impact on the consumer metaverse experience with the possibilities for brand equity enhancement. Thus, Mogaji et al. (2023) argue that today's consumers seek experiences that surpass the actual world. Subsequently, the metaverse serves as a nexus for immersive time (ImT), where consumers consciously and deliberately dedicate their time to escaping the real world (Mogaji et al., 2023). Analogously, Kaur et al. (2023) adopted a qualitative approach in pursuit of exploring the behavior of Generation Z metaverse end-users. Thus, the authors concluded that consumers undergo a concurrent decision-making process when assessing their metaverse experience while actively seeking engagement (Kaur et al., 2023). Furthermore, Hadi et al. (2024) conclude that end-user behavior in the metaverse is immersive, with characteristics of temporal and spatial dynamism. Hennig-Thurau et al. (2023) have integrated comprehensive field-experimental investigations with theoretical reasoning, and results of their study showed the significance of multisensory social interactions in real time in metaverse experience. Moreover, Ghali et al. (2024) conducted research based on a multi-study approach and concluded that Generation Z metaverse consumers value spending their time in the metaverse to increase the number of friends while at the same time using virtual places to promote their social presence. Lastly, in recent study by Ariza-Montes et al. (2023) employed modified UTAUT 2 with moderating impact of human values, gender, and age to uncover the behavioral intention to use the

metaverse in MICE. They concluded that PE, FC, SI, HM, and a lack of anxiety had a positive influence on BI to use the metaverse in MICE, while EE, in contrast, had no significant effect (Ariza-Montes et al., 2023). However, conservation as a human value had a moderating effect on SI impact on BI, while openness to change had a moderating effect on FC impact on BI (Ariza-Montes et al., 2023). Moreover, gender had a moderating effect on PE, EE, FC, and SI on BI, while age had a moderating effect on PE, FC, HM, and a lack of anxiety impact on BI (Ariza-Montes et al., 2023).

At the beginning of the new century, Venkatesh et al. (2003) created the UTAUT model by combining the Theory of Reasoned Action (TRA) (Fishbein & Ajzen, 1975), Theory of Planned Behavior (TPB) (Ajzen, 1991), Technology Acceptance Model (TAM) (Davis et al., 1989), motivational model (Vroom, 1964), innovation diffusion theory (Rogers, 1962), and social cognitive theory (Bandura, 1986). The UTAUT model successfully explained 70% of the variability in BI by employing four principal components of BI, specifically - PE, EE, SI, and FC. Nevertheless, under the influence of important breakthrough technologies in 2010, Venkatesh et al. (2012) added HM, PV, and habit (H) as specific constructs that would resonate with technological advancements that have triggered changes in society. Accordingly, the UTAUT 2 compared to the UTAUT put forward advancements in enlightening the variance in BI as it reckoned 74% of such variance (Venkatesh et al., 2012). Moreover, with the inception of blockchain technology and cryptocurrency payments in hospitality and tourism (Radic et al., 2022b), flexibility of the preventive medicine (Ćwiklicki et al., 2020) and adoption of telemedicine cabins (Baudier et al., 2020), aforementioned authors have demonstrated that Venkatesh et al.'s (2012) UTAUT 2 can serve as an collaborative platform for adding various components from other models and premises as such endeavor excels the explained variability in end-users' BI in contrast to the initial UTAUT 2.

The majority of theories of consumer behavior are in one way or another in harmony to S–O–R paradigm (Müller & Wittmer, 2023). In a nutshell, aforementioned paradigm is based on perspective that specific environmental cues boost emotions, which leads to the behavior approach. However, as the travel and hospitality industry changes under the influence of emerging technologies, consumers' behavior is adopting a more progressive role (Pizam & Tasci, 2019). Thus, an answer on hospitality and tourism consumers' behavioral changes comes in a form of Pizam and Tasci's (2019) model that has its foundation on the Mehrabian and Russell's (1974) S–O–R paradigm. Pizam and Tasci's (2019) model is a stakeholder-

focused strategy with its relevant stimuli (S), such as sensory (S), functional (F), social (So), naturalistic (N), cultural (C), and hospitality culture (HC) elements that serve as precursors to either positive or negative cognitive and affective organisms (O), and behavioral approach reactions (R) toward products and services related to hospitality and tourism. However, the recent studies (Meng & Cui, 2020; Huang et al., 2021; Radic et al., 2021; Yu et al., 2021; Chen, 2022; Zhang et al., 2022) have not fully exploited the aforementioned model and the model has not been used in any prior research in the context of metaverse or MICE in metaverse. Thus, this study demonstrates originality by presenting significant theoretical contributions.

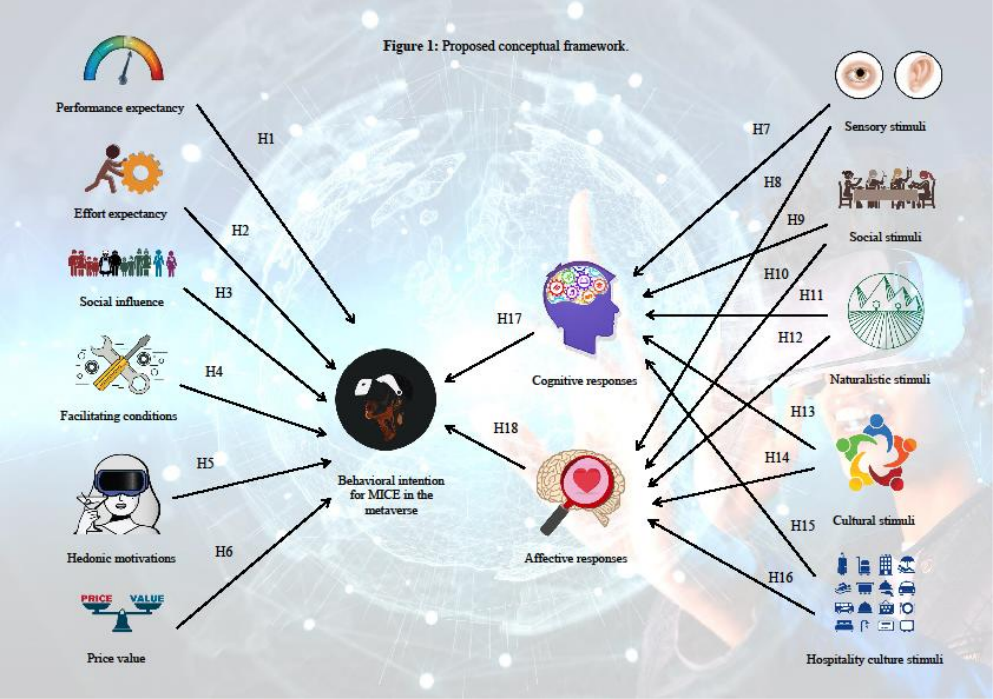

Figure 1: Proposed conceptual framework.

Supported by published studies, it is clear that there is a complete absence of empirical studies that offer a conceptual framework based on well-established theories and models that has robust explanatory power for the adoption of metaverse technologies with driving factors towards behavioral intention for MICE in the metaverse. Hence, the authors of this study propose a conceptual framework (Figure 1). More precisely, Figure 1 depicts specific relations of Venkatesh et al.'s (2012) UTAUT 2 constructs which include PE, EE, SI, FC, HM and PV, and Pizam and Tasci's (2019) model that encompass S, So, N, C, and HC stimuli (S), C and A R (O) that fundamentally configure the end-users' approach or avoidance response (R) behaviors toward MICE in metaverse. Thus, by combining aforementioned models, our study met the criteria for the theoretical contributions set forth by Shaw and Costanzo (1982) as: a) the proposed model can be effectively incorporated into current, widely recognized

theoretical bodies and extended in contexts that pertain to the public at large; b) the proposed model provides a greater range of the theory; c) the proposed model is logically consistent and is rich in scope. Furthermore, our study's proposed model fits the standard for research originality set forth by Jaccard and Jacoby (2020) as it is both creative and novel, and as such, it meets the criteria for good theory since it offers novel insights into an interesting and emerging phenomenon.

PE, EE, SI, FC, HM, PV and Metaverse-Scape

PE has robust influence on behavioral intention toward metaverse as consumers can benefit from user interactivity, artificial intelligence, blockchain technology features and Internet-of-Things (IoT) as services for cloud and frontier computing can enhance the application performance and customer experience (Lee et al., 2021). Thus, Ariza-Montes et al. (2023) argue that academics and/or professionals who use the metaverse for MICE are recognizing the benefits of using such virtual platforms, and those individuals have a favorable BI to use the metaverse, as the metaverse assists them in enhancing their job performance. Similarly, Radic (2024) argues that in the metaverse, end users' digital identity is completely within their authority, which increases professional camaraderie, improves collaboration, speeds up learning processes, reduces the need for physical space, and makes for joyful collaboration where end users own their data. Accordingly, in the context of cultural heritage tourism, metaverse can integrate virtual and real environments, where consumers can engage in immersive, extraordinary experiences which are appealing as they allow them to perform various economic activities and capitalize on cultural heritage resources (Fan et al., 2022). Moreover, Muhammad et al. (2020) outlined the influence of the novel technologies in their literature review on the MICE industry key success factors while Buhalis et al. (2022) pointed out that metaverse is a novel technology in marketing and management of hospitality and tourism that enables experience co-creation and thereby that transforms consumer experience in MICE industry and their services. Accordingly, Dwivedi et al. (2022) argue that the advantages of performance expectancy in the form of almost limitless freedom in the absence of realistic constraints has a strong impact on BI toward the metaverse. Therefore, the following hypothesis is proposed in light of the aforementioned findings:

Hypothesis 1. *PE has positive influence on the BI to use MICE in metaverse.*

The metaverse combines various technologies based on an intuitive interface that has the potential to bridge the digital and physical universes while empowering consumers to integrate different assets through holistic experiences (Buhalis, 2020). Thus, EE demonstrated positive influence towards consumer BI and engagement with cultural contents created in metaverse as visitors are enabled to take part in cultural tourism attractions such as concerts, exhibitions and museums (Erol & Ülkü, 2022). Moreover, as metaverse is slowly but surely penetrating the hospitality and tourism sector (Topsakal et al., 2022), the EE clearly demonstrates positive impact on the consumer BI toward metaverse since consumers can easily engage in exhibition and sales of tourism artifacts through Non-Fungible Token (NFT) and even take a part as spectators in various organized events (Cannavo & Lamberti, 2021). Accordingly, due to the metaverse's potential to serve as an inclusive interface, it holds the possibility of lowering EE as end users can interact in their native language through images and videos and digital replicas of real spaces (Hadi et al., 2024). Moreover, as the perceived ease of use of the metaverse enhances the user experience, additionally, it aids in expanding the variety of use cases and business models. (Barrera & Shah, 2023). It is likely that some portion of this new digital experience will utilize blockchains that incorporate NFTs or other forms of tokenized assets where royalty proceeds are given to end users to own the content they create and have partial ownership in the digital worlds in which they spend a significant portion of their time (Barrera & Shah, 2023). Thus, the effort expectancy in a form of virtual immersive experience and value co-creation through the NFTs are one of the driving forces of consumer behavioral intentions toward metaverse adoption (PricewaterhouseCoopers [PwC], 2022). Consequently, the below hypothesis is proposed:

Hypothesis 2. *EE has positive influence on the BI to use MICE in metaverse.*

The recent technological advancements have made metaverse as a realm for both work and play. Since metaverse can offer mesmerizing consumer experiences, consumers gladly interact with their significant others with whom they have shared beliefs about their ability to co-create and share the value they generate (Dwivedi et al., 2022). Thus, the SI is essential in BI to use metaverse as early adopters are excited about the broadened horizons to interrelate with families and friends, ameliorate hands-on experience and create additional opportunities to socialize (Klynveld Peat Marwick Goerdeler [KPGM], 2022). Hence, as society integrates the metaverse into daily life, end users in the metaverse have the potential to acquire additional new ways to spend time and satisfying social

imperatives, as metaverse SI shapes various aspects of human behavior and culture (Ghali et al., 2024). Accordingly, metaverse social influences are multifaceted, as they range from entertainment to education (Dwivedi et al., 2023). Thus, metaverse SI facilitate new ways to collaborate and communicate, creating communities that are only accessible digitally (Dwivedi et al., 2023). Furthermore, Generation Z e-commerce is characterized by socializing, live streaming and willingness to try anything special/new including metaverse. Thus, adoption of metaverse within Generation Z is driven by the SI as aforementioned consumers are creating various communities where they can enjoy socialization through virtual avatars (AYO Innovation Consulting and Daxue Consulting, 2022). Hence, the essence of MICE has traditionally been associated with benefits of networking between the members of a shared community, and the recent technological advancements of 4.0 industry including metaverse allows the MICE industry to pave the way to MICE 5.0 and its human-centeredness (Hur et al., 2022). Consequently, the below hypothesis is put forward:

Hypothesis 3. *SI has positive influence on the BI to use MICE in metaverse.*

A frictionless merger of virtual and physical environments depends on the FC which have positive impact on consumers' BI toward MICE in metaverse (Buhalis et al., 2022). Thus, from the perspective of FC, 3D and virtual reality methods offer immersive experiences that have a positive effect on the metaverse adoption as consumers recognize the social utility of metaverse (Dwivedi et al., 2022). Moreover, FC in the form of augmented reality and computing platform are essential for adoption of the metaverse tourism as consumers are searching for social interaction through NFTs collection (Koo et al., 2022). Accordingly, FC must provide frictionless experiences and technical interoperability based on the strong network infrastructure where data seemingly flows between hardware and software as it delivers immersive consumer experience (World Economic Forum and Accenture, 2023). Hence, the metaverse thrives on interoperability, where end users can unleash their creativity to generate original content and boost their economic prosperity by utilizing social activities across different platforms (Radic, 2024). However, as the metaverse advances, it must remain an interoperable, synchronous, and accessible environment where everyone may work and have fun (Huynh-The et al., 2023). Nevertheless, to achieve general adoption of metaverse, facilitating conditions must secure a positive climate, inclusion, safeguards for mental well-being, civil conversation and democratic society as such facilitating conditions set forth by the government regulations would mitigate potential negative externalities as they bring benefits to all metaverse stakeholders

(Kulasooriya et al., 2022). Thus, the presented hypothesis resulted from the previously described rationale:

Hypothesis 4. *FC have a positive influence on the BI to use MICE in metaverse.*

The hospitality and tourism consumers, driven by HM toward the adoption of metaverse, are undertaking metaverse experiences for amusement and delight, whereas consumers with utilitarian motives are fulfilling their functional or pragmatic needs (Gursoy et al., 2022). Similarly, as online platforms activities are transferring toward metaverse, it is argued that emphasize on practical exchange will decrease while the hedonic aspects that provoke stronger emotional responses and shape us as humans (instead of consumers) will increase as metaverse can act as an extension of ourselves as humans (Dwivedi et al., 2022). Moreover, within the hospitality and tourism sector a newly emerged phenomenon of the metaverse tours is gaining momentum as its' hedonic features are positively impacting BI toward a tourism destination in metaverse (Tsai, 2022). Thus, in recent study by Yang et al. (2022), the authors posit that the HM relates to the consumers' self-fulfillment, thus, HM has an advantageous influence on the BI toward metaverse. Similarly, the individuals believe that they will enhance the degree of pleasure, fun, and enjoyment as they participate in MICE in the metaverse (Ariza-Montes et al., 2023). The HM towards the metaverse is essentially based on the pleasure or fun that comes from being able to share various activities such as conversing, shopping, playing games, learning and developing (Radic, 2024). However, even though certain users enjoy the pleasure of escaping reality consciously and entering the metaverse (Park & Lim, 2023), the study by Kalınkara and Özdemir (2024) showed that in the education context, the students of anatomy did not derive pleasure and enjoyment from using the metaverse. Similarly, Yang et al.'s (2022) study in the sport education context showed that HM has a favorable impact on students' viewpoints on learning via metaverse technology; however, HM was insignificant towards BI. Consequently, the authors put forward the following hypothesis:

Hypothesis 5. *HM have positive influence on the BI to use MICE in metaverse.*

The PV aspect has a favorable outcome on the BI toward metaverse as metaverse can lower consumers' overall costs while boosting the value co-creation (Arpaci et al., 2022). Moreover, the positive impact of PV on the adoption of metaverse with business and leisure travelers is growing as consumers can enjoy and co-create value in immersive experience while they reduce their traveling time and other expenses (Dwivedi et al., 2022). Accordingly, Vidal-Tomás (2023) outlines that economic governance and

metaverse commerce will play an important role on the overall PV and its impact on the BI toward metaverse. Thus, Park et al. (2023) concluded that the PV of digital apparel had a positive influence on BI for digital fashion products in the metaverse. Similarly, the PV of the metaverse concert platform improves engagement and BI in the tourism and entertainment industries, with a robust moderating effect of gender in the relationship between PV and flow state (Cha et al., 2024). Moreover, Momtaz (2022) argues that metaverse will proliferate human activities and value co-creation by decreasing the operating costs since blockchain technology, smart contracts, and NFTs can provide frictionless, cheap transactions, where PV has a positive impact on the metaverse adoption. Consequently, since metaverse is enhancing the physical hospitality and tourism sector, immersive experiences in metaverse will effectively enable and diversify certain aspects of hospitality and tourism products, where value perception will play an important role on the adoption of metaverse (Gursoy et al., 2022). Thus, based on the abovementioned studies the below hypothesis is put forward:

Hypothesis 6. *PV has a positive influence on the BI to use the MICE in metaverse.*

Sensory Stimuli (SS)

Metaverse includes a multisensory environment where visual and auditory stimuli have an advantageous effect on the end-users' C and A R which results in the enhanced experience within metaverse (Dwivedi et al., 2022). Moreover, as a sensory-rich environment has advantageous effect on the end-users' C and A R, it is of the utmost to incorporate 3D rendering technologies and broadband capacity to the metaverse design as such technologies would lead to immersive experiences (Laukkanen et al., 2022). Thus, although metaverse can offer a digital sensory stimulation that has an advantageous effect on the end-users', current technology might not be able to elicit a complete immersion that end-users experience during the real-life kinesthetic thrills and proprioceptive pleasures (Spence, 2022). Hence, to build and operate a metaverse that can provide digital sensory stimulation that has an advantageous effect on end-users' C and A R, it is of paramount importance to replicate a broad spectrum of data related to the physical world and human interactions (Zhao et al., 2024). Thus, it is sensory stimulation that plays a critical function in translating kinesics into virtual actions, permitting clients to have C and A R with the metaverse (Radic, 2024). Bringing novel technologies related to digital sensory stimulation will ultimately enhance the metaverse user experience, creating a captivating experience (Dwivedi et al., 2023). The stronger the digital

sensory stimulation impacts C and A R in metaverse experiences, the more potential applications the metaverse will have (Mogaji et al., 2023). Nevertheless, metaverse is certainly an innovative technology that can produce multisensory stimuli which favorably impacts the MICE end-users that lead to their favorable BI toward metaverse (Mohanty et al., 2020). In turn, the below hypotheses are proposed:

Hypothesis 7. *SS have a positive influence on CR.*

Hypothesis 8. *SS have a positive influence on AR.*

Social Stimuli (SoS)

The SoS of metaverse demonstrate solid influence on the end-users' C and A R as consumers expect that metaverse will serve as nexus which connects the real and virtual world through social fabric (Suanpang et al., 2022). Hence, as metaverse stimulates a sense of sociality, it is the end users' C and A R that are leading to the immersive experiences and BI toward metaverse adoption (Shen et al., 2021). Furthermore, Kozinets (2023) outlines that avatar-based social interactions provoke consumers' C and A R that eventually result in the immersive service experiences. Accordingly, metaverse provides immersive experiences that are founded on the robust social interaction of its consumers (Buhalis & Karatay, 2022). Socializing in the metaverse is exciting, as the future of networking, where social stimuli have influence on end-users' C and A R, is almost unlimited. In the metaverse, people are guided by SoS to meet and connect with other people worldwide by breaking any potential social media boundaries (Hennig-Thurau et al., 2023). One can argue that the metaverse will set up the new social media era, which is driven by SoS that impact consumers' C and A R (Han et al., 2023). As humans explore the metaverse, SoS will enable them to connect with people cognitively and emotionally (Park & Lim, 2023). Accordingly, RMSIs' based on SoS's influence on end-users' C and A R will be the focal point of the metaverse, as this novel computer-mediated environment will overcome national borders (Hennig-Thurau et al., 2023). Thus, metaverse can offer greater social value as it can serve as a powerful tool to enhance everyday life through interchange of various experiences and co-creation of valuable insights among its consumers (Dwivedi et al., 2022). As a result, the authors proposed the following hypotheses:

Hypothesis 9. *SoS have a positive influence on CR.*

Hypothesis 10. *SoS have a positive influence on AR.*

Naturalistic Stimuli (NS)

The NS of metaverse are to a large extent an imaginary landscape build on various visual narratives that offer glimpses of stunning natural sceneries for end-users' activities which can elicit their C and A R in a space where financial markets and the economy are aligned with nature (Dozio et al., 2022). Moreover, in metaverse, end-users can purchase virtual lands and develop their own natural scenery made of trees and wildlife as such NS are enhancing their interaction with other end-users through the collaborative act of creation which ultimately provokes their C and A R (Murray, 2020). Thus, metaverse provides possibilities for end-users to create deep and meaningful links among humans, other species, and natural environment where NS encourage C and A R that lead toward end-users' desire for the protection of wildlife and ecosystems (Shah & Boudinot, 2022). Similarly, the metaverse, founded on spatial computing, can offer a novel interaction with nature by combining real-time mapping of the physical environment with virtual worlds, where end-users' activities can elicit their C and A R in a highly immersive manner (Jaung, 2022). Moreover, digital NS have the power to influence how people view, understand, and interact with nature (Chan et al., 2023). Hence, digital NS, with their impact on users' C and A R, could provide an immersive experience in the metaverse (Radic, 2024), where people can challenge conventional perceptions and question the depths of human collective nostalgia (Radic et al., 2024a). Lastly, metaverse brings together consumers who enjoy the presence of natural scenery around their communities as NS positively impact their C and A R as they engage in the interchangeable experience co-creation (Buhalis et al., 2022). Consequently, the below hypotheses are offered as alternatives:

Hypothesis 11. *NS have a positive influence on CR.*

Hypothesis 12. *NS have a positive influence on AR.*

Cultural Stimuli (CS)

Metaverse integrates offline and social network service experiences into one where diverse audience can meet and share their similar interest in cultural life without being limited by spatial capacity and time (Dwivedi et al., 2022). As metaverse evolves, the CS influence end-users' C and A R of their perception and creation of art itself (Zhang et al., 2022). Moreover, metaverse's positive CS impact is exhibited in a way that it expands access to education, knowledge and experience co-creation as consumers are engaged both cognitively and affectively in an immersive and interactive

way (Buhalis & Karatay, 2022). However, the CS embedded in metaverse often differ from the end-user's geographical location, thus end-users' C and A R will have a spillover effect on their physical world as cultures from smaller regions will get under strong pressure on the subconscious levels from the dominant regions which can lead to various deviations against fairness (Henz, 2022). Nevertheless, the metaverse can create digital CS of a country's culture, history, and philosophy, impacting end-users' C and A R in the comfort of their homes (Hutson & Ratican, 2023). Hence, users through metaverse avatars can experience cultural archetypes, motifs, art, and architecture based on captivating storylines centered around history and folklore (Radic, 2024). The innovative use of the metaverse is a trend that merges technology with cultural phenomena on a global scale while celebrating cultural richness through digital landscapes in immersive experiences of a country's art, culture, and architecture (Ariza-Montes et al., 2023). Thus, the following hypotheses resulted from the above described rationale:

Hypothesis 13. *CS have a positive influence on CR.*

Hypothesis 14. *CS have a positive influence on AR.*

Hospitality Culture Stimuli (HCS)

The tourism sector is built on organizations' culture of hospitality, where HCS of metaverse promotes an experience co-creation by allowing consumers to be engaged both cognitively and affectively in an immersive and interactive way through services within extended geographical regions, and without spatial and temporal constrictions (Gössling & Schweiggart, 2022). Moreover, as consumers interact through the metaverse features in an immersive and fun environment, the HCS play a significant part as it impacts the end-users' C and A R in evolving hospitality and tourism sector (Koo et al., 2022). Hence, HCS of metaverse provide an experience with collaborative spatial structures intensified by the end-users' C and A R in bringing together physical and virtual environments (Go & Kang, 2022). The HCS in the metaverse have the possibility to transform the leisure industry by co-creating guest experiences on a C and A level (Radic, 2024). Hence, digital hospitality culture stimulates the opportunity to co-create memorable virtual experiences and transcend traditional physical offerings (Ashton et al., 2024). The metaverse is providing HCS and opportunities for consumers and travelers to visit attractions, attend events, and engage with leisure products that they may not be able to interact with in the physical world (Chen, 2023). One can

argue that HCS proposals take place within the framework of experiences and events (Ashton et al., 2024). Hence, HCS put forward personalized service while enhancing organizational performance and co-creating memorable experiences (Radic, 2024). Accordingly, as marketers are transcending real-life experiences to metaverse, the HCS influence end-users' C and A R, ultimately influencing their decision-making behaviors (Gursoy et al., 2022). As a result, the authors proposed the following hypotheses:

Hypothesis 15. *HCS have a positive influence on CR.*

Hypothesis 16. *HCS have a positive influence on AR.*

Cognitive (C) and Affective (A) Responses (R)

The MICE in metaverse provides a unique opportunity for tourist destination resilience and crisis readiness as it enables immersive virtual experiences (Lui & Goel, 2022) that are driven by the end-users' cognitive responses related to trust and confidence which in return have a robust influence on the end-users' behavior approach in cases where mobility barriers such as pandemics are present (Yung et al., 2022). End-users C and A R lead towards ephemeral experiences (Radic et al., 2024b), and such experiences can be designed to improve empathy and human connection (Visconti et al., 2023). Hence, end-users' C and A R in the metaverse possess the capacity to unleash infinite levels of human ingenuity and output, ultimately leading towards favorable behavioral intentions (Suh, 2024). However, various stakeholders of MICE in metaverse need to be mindful about potential consumers' inequalities when creating the infrastructures of virtual worlds based on immersive experiences as privileging certain social stratum could negatively impact the overall end-users' C and A R and subsequently end-users' behavior approach toward MICE in metaverse (Yung et al., 2022). Moreover, the success of MICE in metaverse adoption is heavily depended on the end-users' C and A R that are influencing end-users' behavior approach, thus, the system quality of metaverse has to be designed to deliver immersive experience and end-user overall satisfaction (Lee, 2022). Similarly, Gursoy et al. (2022) outline that metaverse possesses the capacity to be a disruptor of hospitality and tourism sector including the MICE industry as the adoption of MICE in metaverse is driven by the end-users' C and A R that are ultimately shaping customer behavior approach. Furthermore, Allam et al. (2022) outline that human characteristics and moral values derived from the end-users' C and A process must be considered as they have robust influence on the

consumer behavior and metaverse adoption. Lastly, Müller and Wittmer (2023) outline that in the post-COVID world MICE industry is undergoing through fundamental changes due to various factors as more and more companies are embracing cost savings strategies. Nevertheless, in order to keep high fidelity, work engagement and positive emotions among its' employees, it is of paramount importance that the end-users' C and A processes are considered as they have robust influence on the technology adoption including metaverse (Müller & Wittmer, 2023). Hence, based on the abovementioned studies the following hypotheses are suggested:

Hypothesis 17. *CR have a positive repercussion on BI to use MICE in metaverse.*

Hypothesis 18. *AR have a positive repercussion on BI to use MICE in metaverse.*

RESEARCH METHODOLOGY

Measures for Study Variables

For this study, a self-reported survey was designed which contains a combination of multi-item measures. Moreover, all scale items for the purpose of the present study were taken from measurement items that had already been evaluated and tied on a 7-point Likert-type scale. Accordingly, PE, EE, SI, FC, HM, and PV scales were adopted from Venkatesh et al. (2012). SS, SoS, NS, CS, and HCS were appropriately developed and amended for the study's premise from Pizam and Tasci's (2019) scale. Furthermore, CR, AR, and BI were taken and customized for the study's conditions from Tasci and Pizam (2020).

The reduction of a common method bias (CMB) was accomplished by adhering to the methods of Jordan and Troth (2020). Looking at the procedural tactics, all of the respondents were aware of the purpose of the study and how the findings will be applied. The measurements were not broad, the questionnaire utilized was not enormous, the item phrasing was cautious, the measures originated from multiple sources, and the inquiries were straightforward and easily understood (Radic et al., 2022a). The previously mentioned a group of procedural solutions has been verified in the tourism and hospitality studies by Calder et al. (2022) and future technology studies by Singh et al. (2024). Therefore, it is unlikely that this research will raise issues with the common method bias. Additionally, Harman's (1967) one-factor test was utilized from the statistical method, given that Jordan and Troth (2020) emphasize Harman's one-factor test as arguably particularly prevalent statistical techniques for assessing CMB. Harman's one-factor test highlights concerns with CMBs,

which results from the applied method (Fuller et al., 2016). The questionnaire was further pilot tested by a committee embodied of faculty members and undergraduates/postgraduates in the travel and hospitality industry.

Data Gathering and Statistical Findings Regarding the Participants' Personal Information

This study used an online survey through a professional survey agency located in South Korea. Random links to the questionnaire were distributed to the potential participants through November and December of 2022. The beginning of the questionnaire stated the purpose of the study with all instructions related to this study. Participants were requested to thoroughly read the description of the purpose and content of the study as they completed the questionnaire. To be certain that the participants comprehended completely the subject matter of the questionnaire, the following screening question had to be confirmed "I have heard about the metaverse". Individuals who responded "Yes" were deemed qualified to take part in the survey. Participants who answered "No" were disqualified from participation in the survey. Accordingly, the purposive sampling approach was employed to collect the sample. The purposive sampling is a non-probability sampling technique that delivers comprehensive details on particular phenomena in specific contexts (Tashakkori et al., 2020). The aforementioned sampling in this study provided participants that meet the research population's inclusiveness (Berget & Kvikne, 2022). Furthermore, by adopting purposive sampling technique, we have fulfilled the prerequisites for the diversity of survey considering the factors as described by Ochsner (2021), as accuracy of such sampling gives assurance that the results of the study are trustworthy (Barratt & Lenton, 2015). Following the selection process and the completion of the questionnaire, a total of 364 questionnaires were collected.

The authors analyzed the collected participant data through frequency analysis in SPSS. The results of the data analysis are presented in Table 1. The detailed demographic characteristics are as follows. Of the 364 surveys that have been collected, 60.16% were male and 39.84% were female. The average age of participants was approximately 37 years old. Participants that have heard about metaverse through electronic word-of-mouth (eWOM) communication accounted for 50%. The Internet was the main source of information about metaverse for 32.14% while 9.07% participants heard about metaverse through broadcast news. Moreover, 5.77% participants heard about metaverse through print media while

traditional word-of-mouth (WOM) communication was primary source for the 2.47% of participants. Lastly, only 0.55% of participants heard about metaverse through other means. The annual income of participants was evenly distributed. The percentage of participants with annual income of $40,000 ~ $54,999 was 22.25%. 18.41% reported annual income of $25,000 ~ $39,999, followed by 15.93% who had annual income of $55,000 ~ $69,999 while 12.36% had annual income of $70,000 ~ $84,999. The 12.36% of participants had annual income of $85,000 ~ $99,999, where 12.36% of participants earn between $85,000 ~ $99,999 per year. Finally, participants who have earned $100,000 or higher was 11.54% while only 5.22% of the participants had an annual income of below $25,000. Looking at the education level of participants, 70.33% had a college degree, 16.76% had a graduate degree, 7.42% had a 2-year degree / community-college degree, and 5.49% had a high school degree. In response to the question "Have you ever attended MICE through metaverse?", 52.75% of the participants answered "Yes" and 47.25% answered "No". Furthermore, those who responded that they had attended MICE through metaverse, 45% had such experience 2-3 times and 38% had only 1 time, while the percentage of participants with 4-5 experiences was 9% and 5% had 5-9 experiences. Lastly, only 3% of the participants had an experience with more than 10 MICE experiences through metaverse (see Figure 2).

Table 1. *Profile of participants*

		Frequency	Percent
Gender	Male	219	60.16%
	Female	145	39.84%
Where have you heard about Metaverse?	Broadcast news (e.g., TV, radio)	33	9.07%
	Internet (e.g., YouTube, online newspaper, news blogs)	117	32.14%
	Print media (e.g., newspapers, newsmagazines)	21	5.77%
	Electric word-of-mouth (eWOM) communication (e.g., blogs, online reviews, social media posts, messages posted to online groups)	182	50.00%
	Traditional word-of-mouth (WOM) communication (e.g., friends, family, or others)	9	2.47%
	Other	2	0.55%
Salary	Under $25,000	19	5.22%
	$25,000 ~ $39,999	67	18.41%
	$40,000 ~ $54,999	81	22.25%
	$55,000 ~ $69,999	58	15.93%
	$70,000 ~ $84,999	52	14.29%
	$85,000 ~ $99,999	45	12.36%
	$100,000 or higher	42	11.54%

Education	Less than high school degree	0	0.00%
	High school degree	20	5.49%
	2-year degree / community-college degree	27	7.42%
	University degree	256	70.33%
	Graduate degree	61	16.76%
Have you ever attended a conference/meeting through Metaverse?	Yes	192	52.75%
	No	172	47.25%
Average age	37 years old		

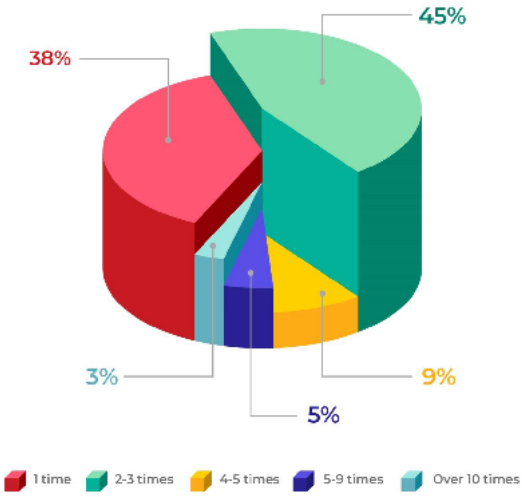

Figure 2. *Frequency of 192 participants attending conference/meeting through the metaverse*

RESULTS

Measurement Model Assessment

A confirmatory factor analysis was applied in this study to test the adequacy of the constructed measurement model through AMOS 26.0. The results are shown in Table 2. The measurement model demonstrated satisfactory model fit metrics ($\chi 2$ = 2958.563, df = 1234, $\chi 2/df$ = 2.398, $p < 0.01$, NFI = 0.916, IFI = 0.925, CFI = 0.924, RMSEA = 0.056). Firstly, to ensure that there is no common method bias in the data, we derived a total variance of 49.376% which was below the threshold criterion of 50% (Podsakoff et al., 2003) for a single factor. Then, factor loading values were equal or greater than 0.659 for all 14 constructs, except for the third measure of FC, which had a factor loading of 0.512 and was removed (please see Appendix A). Cronbach Alphas' indicator is between 0.814 and 0.960. It is higher than the 0.8 suggested by Bonett and Wright (2015). The average variance

extracted from the derived factor loading values ranged from 0.635 to 0.892. The composite reliability ranged from 0.837-0.961, both above the critical values of 0.500 and 0.700 recommended by Hair et al. (2017), which implied a high support for the convergent validity and internal consistency of the measured items. We also found that the square root values of AVE calculated from the mean variance extracted scores exceeded the correlation coefficients following successive pair of constructs (Fornell & Larcker, 1981). The adequate discriminant validity of the data sample was verified.

Assessment of Hypotheses Testing and Indirect and Total Effects of Structural Model

The constructed structural model and hypotheses were tested using the AMOS 26.0. The fit of the structural equation model showed satisfactory indicators ($\chi2$ = 2832.336, df = 1292, $\chi2$/df = 2.192, $p < 0.01$, IFI = 0.938, TLI = 0.917, CFI = 0.937, RMSEA = 0.056). The findings of the hypothesized analyses revealed significant effects of PE ($\beta = 0.244$, $p < 0.01$), EE ($\beta = 0.108$, $p < 0.05$), SI ($\beta = 0.299$, $p < 0.01$), FC ($\beta = 0.170$, $p < 0.01$), PV ($\beta = 0.153$, $p < 0.01$), CR ($\beta = 0.179$, $p < 0.01$), and AR ($\beta = 0.381$**, $p < 0.01$) on the BI to use MICE in metaverse. There was no significant relationship between the HM and BI to use MICE in metaverse ($\beta = -0.053$, $p > 0.05$). SS (CR: $\beta = 0.329$, $p < 0.01$; AR: $\beta = 0.346$, $p < 0.01$), SoS (CR: $\beta = 0.159$, $p < 0.01$; AR: $\beta = 0.330$, $p < 0.01$), NS (CR: $\beta = 0.087$, $p < 0.05$; AR: $\beta = 0.106$, $p < 0.01$), CS (CR: $\beta = 0.330$, $p < 0.01$; AR: $\beta = 0.366$, $p < 0.01$) and HCS (CR: $\beta = 0.541$, $p < 0.01$; AR: $\beta = 0.279$, $p < 0.01$) had significant effects on the CR and AR. Thus, all hypotheses, except H5, were statistically supported. Furthermore, the outcomes of the total variance explained values for the BI showed that all antecedent constructs explained 54.3%, 65.4%, and 85.3% of the CR, AR, and BI toward MICE in metaverse.

A significant indirect effect of sensory component on the BI was tested for indirect effects (SS→ CR→ BI: $\beta = 0.059$, $p < 0.05$; SS→ AR→ BI: $\beta = 0.132$, $p < 0.01$). The indirect effect of SS on the BI was significant only when factored through the affective responses (SS→ CR→ BI: $\beta = 0.028$, $p > 0.05$; SS→ AR→ BI: $\beta = 0.126$, $p < 0.01$). CS had a significant indirect effect on the BI (CS→ CR→ BI: $\beta = 0.059$, $p < 0.05$; CS → AR→ BI: $\beta = 0.139$, $p < 0.01$). There was a significant indirect relationship between the HCS and BI (HCS → CR→ BI: $\beta = 0.097$, $p < 0.05$; HCS → AR→ BI: $\beta = 0.106$, $p < 0.01$). In contrast, there were no significant indirect effects of NS on the BI through C and A R. The results of the detailed data analysis of the indirect and total effects were displayed in Table 3.

Table 2. *Correlations and data quality testing*

		[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]	[14]
[1]	PE	**0.858**													
[2]	EE	0.488**	**0.861**												
[3]	SI	0.719**	0.462**	**0.925**											
[4]	FC	0.395**	0.729**	0.499**	**0.797**										
[5]	HM	0.699**	0.432**	0.615**	0.374**	**0.944**									
[6]	PV	0.736**	0.399**	0.715**	0.444**	0.616**	**0.822**								
[7]	SS	0.663**	0.365**	0.640**	0.302**	0.634**	0.688**	**0.825**							
[8]	SoS	0.699**	0.328**	0.640**	0.342**	0.642**	0.684**	0.767**	**0.855**						
[9]	NS	0.559**	0.189**	0.515**	0.160*	0.509**	0.585**	0.726**	0.706**	**0.867**					
[10]	CS	0.684**	0.570**	0.671**	0.603**	0.586**	0.667**	0.663**	0.768**	0.606**	**0.825**				
[11]	HCS	0.696**	0.419**	0.645**	0.433**	0.590**	0.709**	0.711**	0.747**	0.673**	0.825**	**0.839**			
[12]	CR	0.816**	0.463**	0.673**	0.394**	0.712**	0.778**	0.741**	0.727**	0.647**	0.766**	0.825**	**0.845**		
[13]	AR	0.730**	0.399**	0.650**	0.361**	0.734**	0.710**	0.739**	0.760**	0.649**	0.747**	0.738**	0.822**	**0.836**	
[14]	BI	0.768**	0.521**	0.740**	0.518**	0.648**	0.742**	0.680**	0.678**	0.522**	0.760**	0.726**	0.794**	0.792**	**0.877**
	AVE	0.737	0.742	0.856	0.635	0.892	0.675	0.681	0.730	0.752	0.680	0.703	0.714	0.699	0.768
	CR	0.918	0.920	0.947	0.837	0.961	0.861	0.895	0.890	0.901	0.864	0.876	0.926	0.948	0.909
	Cronbach Alphas	0.917	0.919	0.946	0.814	0.960	0.857	0.889	0.889	0.897	0.864	0.880	0.924	0.948	0.908
Extraction Sums of Squared Loadings: % of Variance = 49.376%															

Note1. Goodness-of-fit statistics for the baseline model: $\chi 2 = 2958.563$, df = 1234, $\chi 2/df = 2.398$, $p < 0.01$, NFI = 0.916, IFI = 0.925, CFI = 0.924, RMSEA = 0.056.
AVE: Average variance extracted, CR: Composite reliability
Coefficient in **BOLD**: $\sqrt{AVE}$.
*p < 0.05 and **p < 0.01.

Table 3. *Hypotheses testing*

				β	*t*-values	p values
H1	PE	→	BI	0.244	5.218**	0.005
H2	EE	→	BI	0.108	2.406*	0.043
H3	SI	→	BI	0.299	6.431**	<0.001
H4	FC	→	BI	0.170	3.558**	0.003
H5	HM	→	BI	-0.053	-1.204	0.159
H6	PV	→	BI	0.153	3.294**	0.007
H7	SS	→	CR	0.329	7.307**	<0.001
H8	SS	→	AR	0.346	7.712**	<0.001
H9	SoS	→	CR	0.159	3.817**	0.002
H10	SoS	→	AR	0.330	7.588**	0.001
H11	NS	→	CR	0.087	2.143*	0.046
H12	NS	→	AR	0.106	2.603**	0.008
H13	CS	→	CR	0.330	7.275**	0.005
H14	CS	→	AR	0.366	8.042**	<0.001
H15	HCS	→	CR	0.541	10.985**	<0.001
H16	HCS	→	AR	0.279	6.456**	0.006
H17	CR	→	BI	0.179	3.341**	<0.001
H18	AR	→	BI	0.381	6.904**	<0.001

Indirect Path	β	Lower	Upper
SS→ CR→ BI	0.059*	0.015	0.099
SS→AR→ BI	0.132**	0.061	0.173
SoS→ CR→ BI	0.028	0.003	0.062
SoS→ AR→ BI	0.126**	0.048	0.163
NS→ CR→ BI	0.016	-0.001	0.034
NS→ AR→ BI	0.041	0.001	0.067
CS→ CR→ BI	0.059*	0.013	0.107
CS→ AR→ BI	0.139**	0.057	0.183
HCS→ CR→ BI	0.097*	0.025	0.133
HCS→ AR→ BI	0.106**	0.030	0.150

Total variance explained: R^2 for CR = 0.543, R^2 for AR = 0.654, R^2 for BI for MICE in the metaverse = 0.853.

Total impact on BI for MICE in the metaverse: $\beta_{PE} = 0.244^{**}$, $\beta_{EE} = 0.108^{*}$, $\beta_{SI} = 0.299^{**}$, $\beta_{FC} = 0.170^{**}$, $\beta_{HM} = -0.053$, $\beta_{PV} = 0.153^{**}$, $\beta_{SS} = 0.191^{**}$, $\beta_{SoS} = 0.154^{**}$, $\beta_{NS} = 0.056$, $\beta_{CS} = 0.198^{**}$, $\beta_{HCS} = 0.203^{**}$, $\beta_{CR} = 0.179^{**}$, $\beta_{AR} = 0.381^{**}$.

Note1. Goodness-of-fit statistics for the baseline model: $\chi 2 = 2832.336$, df = 1292, $\chi 2/df = 2.192$, $p < 0.01$, IFI = 0.938, TLI = 0.917, CFI = 0.937, RMSEA = 0.056.

*p < 0.05 and **p < 0.01.

DISCUSSION AND IMPLICATIONS

The MICE in metaverse connect end-users in novel, authentic and profound ways as consumers engage in experience co-creation as they share information in real time, instantly from various remote places. Moreover, MICE in metaverse provides immersive consumer experiences, and its impact on the hospitality and tourism sector is disruptive as it changes the very nature of how end-users work and play, and how customers and brands interact and engage. Thus, the aim of the present study was to

evaluate the consumer behavior intention to use MICE in metaverse. To measure consumers' perspective, the study encompassed the following variables: PE, EE, SI, FC, HM, PV, SS, SoS, NS, CS, HCS, and C and A R. The study's summary results are compatible with the progressive theoretical framework's interpretation of the influencing dependent variables, BI to use MICE in metaverse (85.3%), C R (54.3%), and A R (65.4%).

Regarding the antecedents of the BI to use MICE in metaverse, the present study suggested the relationship between PE, EE, SI, FC, HM, PV, C and A R with BI to use MICE in metaverse. Accordingly, AR exhibited as the superb antecedent (β = .381, p <. 01), followed by SI (β = .299, p <. 01), PE (β = .244, p <. 01), CR (β = 179, p >. 01), FC (β = .170, p <. 01), PV (β = .153, p <. 01) and EE (β = .108, p <. 05). However, this study showed that the effect of HM on BI to use MICE in metaverse is insignificant (β = -0.053, p > 0.05).

The aim of the present study was to unearth key factors which determine the consumers' BI to use MICE in metaverse. This research displayed that the end-users' A R have a positive influence on the BI to use MICE in metaverse. The A R are elicited through immersive experience of metaverse where end-users experience freedom and fulfillment through opportunities to be what they choose to be in a world of their choice. Thus, MICE in metaverse is essentially build on the pop culture where people can escape from the real-world issues such as energy crisis, financial crisis, fear of recession and poverty, pandemics and even threats of World War III and nuclear apocalypse. Accordingly, the ARs' positive influence on the BI to use MICE in metaverse is shaped by end-users needs to be a part of the better world, a world without inequalities or privileged social stratums (Yung et al., 2022) that is built on the humanistic centered characteristics and socially accepted moral values (Allam et al., 2022). As to the SI, this study showed that consumers prefer MICE in metaverse as it offers them the integration of social media and big data where end-users have the opportunity to build communities where they can engage in collaborative problem solving without harassments and bullying. Moreover, positive effect of SI on the BI to use MICE in metaverse is wrapped around gamification that offers an immersive and dynamic workplace that encourages employees to engage in problem solving. Thus, MICE in metaverse offers work and play consumer experiences (Dwivedi et al., 2022) where consumers are excited about the broadened horizons to interrelate with families and friends, and create additional opportunities to socialize (KPGM, 2022). With regard to the PE, this study exhibited that consumers believe MICE in metaverse possess an advanced, user-friendly infrastructure that enables a sort of hyperbolic opportunities where end-

users can smoothly and in frictionless way exploit limitless freedom of their choices. Subsequently, the PE has a positive influence on the BI toward metaverse is founded on the benefits from user interactivity that enhance the application performance and customer experience (Lee et al., 2021) where virtual environments provide immersive, extraordinary experiences (Fan et al., 2022). Concerning the cognitive responses influence on the BI to use MICE in metaverse, the research revealed that consumers have trust and confidence while they engage in libertarian learning within MICE in metaverse. To consumers coming from the industries that deal with physical objects and where problem solving depends on trust and confidence, MICE in metaverse offers endless possibilities where end-users can learn, work, socialize and play while keeping their social responsibilities through activism and sharing of information. Accordingly, this study finding mirrors the reasoning put forward by Yung et al. (2022) who argue that MICE in metaverse provides a unique opportunity for immersive virtual experiences driven by the end-users' CR, where high fidelity and work engagement build on trust boosts consumers CR that ultimately shape their BI (Müller & Wittmer, 2023). Furthermore, this research demonstrated that the FC positively influence BI to use the MICE in metaverse. Thus, since MICE in metaverse is built on the infrastructure where end-users can participate in the experience co-creation in an enthusiastic, simple and easy way, consumers can enjoy instant entertainment as they meet new people in a virtual world that is the image of the best of real world, however, in much brighter and vivid way. Consequently, the FCs' positive influence on the BI to use MICE in metaverse is a direct result of frictionless merger of virtual and physical environments (Buhalis et al., 2022) where 3D and virtual reality methods offer immersive experiences through social utility (Dwivedi et al., 2022). Similarly, regarding the PV, our study displayed that the immersive environment of metaverse is an elegant concept that provides workplace productivity at low costs as MICE built on the cloud-based platform offers a great value for money. Hence, MICE in metaverse lowers consumers' overall costs (Arpaci et al., 2022) while economic governance and the metaverse commerce strengthens the PV aspect of the positive impact on the BI to use MICE in metaverse (Vidal-Tomás, 2023). Furthermore, this research demonstrated that the EE positively influences the BI to use MICE in metaverse as immersive experience is offered at glance even on smart phones that are compatible with metaverse technology. Thus, the level of ease of MICE in metaverse usage solves the issue of space where empowered consumers can exhibit their ideas, interact and communicate on various topics in a place without creative limits. Consequently, MICE in

metaverse is an intuitive interface with a potential to bridge the digital and physical universes in a holistic way where empowered consumers can easily integrate different assets in the experience co-creation (Buhalis, 2020). Lastly, this study showed that consumers of the MICE in metaverse are guided by the utilitarian rather than HM. Thus, at least in the context of BI to use MICE in metaverse, it appears that consumers are driven by the utility of virtual world as they engage with each other in the experience co-creation. Accordingly, the study findings are supported by Gursoy et al. (2022) who outlined that certain hospitality and tourism consumers are driven by the utilitarian motives as they search to fulfill their functional or pragmatic needs.

This study suggests the relationship between SS, SoS, NS, CS, and HCS with C and A R positively affects BI to use MICE in metaverse regarding the antecedents of C and A R. HCS are exhibited as the most significant antecedent (CR: $\beta = 0.541$, $p < 0.01$; AR: $\beta = 0.279$, $p < 0.01$), which are followed by CS (CR: $\beta = 0.330$, $p < 0.01$; AR: $\beta = 0.366$, $p < 0.01$), SS (CR: $\beta = 0.329$, $p < 0.01$; AR: $\beta = 0.346$, $p < 0.01$), SoS (CR: $\beta = 0.159$, $p < 0.01$; AR: $\beta = 0.330$, $p < 0.01$) and NS (CR: $\beta = 0.087$, $p < 0.05$; AR: $\beta = 0.106$, $p < 0.01$).

The results of present study demonstrated that the HCS of MICE in metaverse are built on the collaboration between touristic destinations, technology companies, hospitality and tourism sector and various innovators who jointly work toward the optimization of the consumer experience co-creation within metaverse-scape. Thus, the HCS ensure consumers' confidence by engaging them to cognitively and affectively take a part during the booking process, price evaluation, 3D tours and interactions within the larger community of MICE stakeholders. Accordingly, the study findings are supported by Gössling and Schweiggart (2022) who outline that culture of hospitality promotes experience co-creation in metaverse by enhancing the consumer interaction both cognitively and affectively in an immersive way through services within the extended geographical regions. Moreover, the research demonstrated that the CS bridge fact and value dichotomy as consumers socialize, interact, communicate, progress and navigate between real and virtual worlds as they cognitively and affectively engage in MICE in metaverse. This finding is supported by Dwivedi et al. (2022) who outlined that metaverse integrates consumers' experiences where diverse audiences meet and share their similar interest in cultural life. With regard to the SS, our study exhibited that realistic digital textures of MICE in metaverse lead to immersive experiences inspired by the artistic aesthetics which directly impact how consumers reason, feel, contemplate and introspect. Thus,

MICE in metaverse encompass what Laukkanen et al. (2022) described as sensory-rich environment that has a positive effect on end-users' C and A R which ultimately lead to their immersive experiences. Concerning the SoS of MICE in metaverse, this research revealed that consumers meet, communicate and connect with each other not to escape from real life, but rather to find themselves as part of a larger community built on the social network where they can cognitively and affectively participate in the experience co-creation. The results of the study reflect the idea that was put forward by Suanpang et al. (2022) who argue that SoS of metaverse have a robust influence on the end-users' C and A R as metaverse can serve as nexus that connects the real and virtual world through social fabric. Lastly, our study showed that the NS in form of the artistically designed natural objects within MICE in metaverse positively influence end-users' C and A R as NS are foundation for the immersive consumers' experiences. This finding is supported by Dozio et al. (2022) who argues that NS of metaverse are an imaginary landscape build on the various visual narratives with the intention of eliciting end-users' C and A R.

Theoretical Implications

Firstly, the present study intended to examine behavioral intentions toward MICE in metaverse based on the conceptual framework built on the specific relations within the constructs of Venkatesh et al.'s (2012) UTAUT 2 with Pizam and Tasci's (2019) experienscape model. Respectively, the proposed model explains 85.3% of the variance of BI toward MICE in metaverse. Moreover, CR (explained 54.3% of the variance) and AR (explained 65.4% of the variance) had a robust mediating role with significant explanatory power for behavioral intentions toward MICE in metaverse. Hence, the present study demonstrated that the modified UTAUT 2 offers an important advancement in variance explained in the behavioral intention in comparison to the original Venkatesh et al.'s (2012) UTAUT 2 and Ariza-Montes et al.'s (2023) modified UTAUT 2 (85.3% versus 74% versus 82.4%).

Secondly, this study is a pioneering endeavor that combines SS, SoS, NS, CS, HCS, C and A R, PE, EE, SI, FC, HM and PV with BI toward MICE in metaverse. Even though there is a growing number of companies that are working on designing various metaverse platforms, to the best of authors' knowledge, it is still theoretically unknown and empirically invalidated what are the key factors that are driving the adoption of MICE in metaverse. Furthermore, there is an evident knowledge gap in the academic literature on the topic of the nexus between technology adoption and MICE in metaverse. Thus, results of the present study reveal that end-users' C and

A R, PE, EE, SI, FC and PV have a significant and positive influence on BI toward MICE in metaverse. Accordingly, present study results can serve as a baseline for various forthcoming studies on topic of MICE in metaverse or topics related to the experience co-creation and marketing of metaverse in tourism and hospitality sector in order to genuinely understand end-users' BI.

Thirdly, the results of this study showed that within MICE in metaverse there is an insignificant impact of HM on consumers' BI. Thus, the aforementioned result offers novelty and originality by providing a theoretical contribution in support of Bentham's (1789/2012), Mills' (1861/2018), and Hume's (1758/2020) philosophy of utilitarianism and directly opposing Spenglers' (1918/2020) philosophy of "Faustian" culture. More precisely, this study finding shows that consumers of MICE in metaverse are not unconditional individualists driven by HM in the pursuit of pleasure as the ultimate good. Quite oppositely, this study's findings showed that consumers of MICE in metaverse through novel technology adoption and metaverse-scape are aiming for the betterment of society as a whole. Accordingly, consumers of MICE in metaverse prefer metaverse technology and metaverse-scape that benefits all equally, not just the elite. Lastly, this finding is supported by Kalınkara and Özdemir (2024) and Yang et al. (2022).

Finally, present research provides a holistic approach toward understanding the nature of MICE in metaverse-scape. This research has outlined that end-users' BI toward MICE in metaverse are guided by their C and A R as end-users' expression under the influence of metaverse offers immersive experiences. Hence, the BI toward MICE in metaverse is driven by unique and refreshing symbolic connotations.

Practical Implications

MICE in metaverse has the potential to provide immersive consumer experiences founded on the human centric end-user's interaction. However, it is up to MICE in metaverse stakeholders to create and maintain community build on a social network platform where end-users are provided with the opportunities that enable their positive AR which lead to the immersive consumer experience. One of the avenues to create such social network platform is to embrace DAO that run on a blockchain as DAO offers consumers freedom and confidence that are based on transparency without central leadership. Moreover, MICE in metaverse stakeholders have to implement bottom-up community organization on the

democratically voted set of rules that runs on a blockchain as such community would enhance consumers' CR while they engage in libertarian learning. Thus, as MICE in metaverse offers endless possibilities where end-users can learn, work, socialize and play, MICE in metaverse stakeholders should not lose sight of the gamification aspects.

MICE in metaverse stakeholders should offer gamification within business concept where consumers can have the ownership of their in-game and perhaps even MICE assets that are built on social contracts within the MICE ecosystem. In such MICE ecosystem, it would be MICE in metaverse stakeholders' responsibility to bring together consumers, developers and touristic destinations in a shared workplace where they can engage in incentives value co-creation build on shared responsibilities. Moreover, MICE in metaverse can transfer these incentives to its consumers in a form of NFTs that are governed by DAO. Hence, in that way MICE in metaverse stakeholders would address the consumers' price value aspect as they would deliver an elegant concept that provides workplace productivity at low costs built on the cloud-based platform that offers a great value for money. The MICE in metaverse stakeholders can unlock consumers' experience co-creation as they can offer social platform where end-users can freely navigate between the communities and engage in various dialogs and community building without leaving their homes. Accordingly, the MICE in metaverse stakeholders must provide the facilitating conditions that are built on infrastructure where end-users can participate in experience co-creation in an enthusiastic, simple and easy way, as they enjoy in an instant entertainment by meeting new people in a virtual world that is the best image of the real world. Furthermore, MICE in metaverse stakeholders have to address the language barriers for its end-users by creating real time on-demand translations. Thus, once the MICE in metaverse stakeholders enable social platform that removes language barriers for its end-users, the performance expectancy of consumers would be fulfilled as consumers would have the user-friendly infrastructure at glance that enables hyperbolic opportunities where end-users can smoothly and in frictionless way exploit limitless freedom of their choices.

MICE in metaverse stakeholders should also explore opportunities to offer nexus of virtual and real-life experiences built on socialization as there are consumers who prefer the best of both worlds. Hence, the nexus between virtual and real world would enhance social influence, where the MICE in metaverse stakeholders would offer to end-users the opportunity to build dynamic workplace that encourages employees toward the engagement in problem solving. Moreover, the MICE in metaverse

stakeholder should seize the opportunity to address the consumers' effort expectancy by solving consumers' physical location home obligations. The MICE in metaverse stakeholders can achieve the aforementioned task as they could offer immersive experience at glance on smart phones that are compatible with the metaverse technology. Thus, the MICE in metaverse stakeholders could solve the issue of space where empowered consumers, without leaving their homes, can exhibit their ideas, interact and communicate on various topics in a place without creative limits.

Limitations and Future Research

This study comes with several limitations, however, those limitations are opportunities for upcoming research. The first limitation is the conceptual framework. Even though this research is established on the specific conceptual constructs and theory associated with Venkatesh et al.'s (2012) UTAUT 2 and Pizam and Tasci's (2019) experienscape model, authors of this study were not able to include moderators who were a part the aforementioned models. Thus, regardless that present study demonstrated that UTAUT 2 can be extended since it can function as an open platform that allows incorporation of other conceptual elements and ideas, forthcoming studies should include moderators who are associated with the aforementioned models. More specifically, future research should build on this study's findings by determining and understanding the boundary conditions of consumers sociodemographics, consumer psychographics, and consumers' familiarity within the comprehensive model offered in this study. The second limitation is the self-administered online survey questionnaire itself. Accordingly, potential self-response biases should be considered in generalizing the conclusions of the present study. Nevertheless, the authors applied procedural methods set by Jordan and Troth (2020) to lessen the possible influence of self-response bias. The third limitation is the research design, which was cross-sectional. Thus, as Wang and Cheng (2020) argue in such studies, casual relations among variables cannot be confirmed, group effects are not perceptible, and frequencies are not resolved. Upcoming analyses could utilize a longitudinal study design to surpass this limitation of the current study. Even though the results of this study are credible and data were gathered from a variety of sources, generalizability and transferability should be carefully considered. Future research should therefore include qualitative methodologies and mixed methods, which may yield different results, as this study is limited to a quantitative approach.

CONCLUSION

In an era where the fourth industrial revolution is unfolding before our eyes and digital workplace is making its advancements into everyday life, the MICE industry is transforming under the influence of metaverse. Thus, MICE in metaverse can offer end-users remote interaction with meaningful, immersive experiences where consumers can organically interact with each other without losing the sense of belonging within a community as they engage and navigate through various virtual worlds that mirror the best versions of the physical world.

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Appendix A. *Confirmatory factor analysis assessment*

	β	AVE	CR	Cronbach Alphas
Performance expectancy				
I find Metaverse would be useful in conferences/meetings	0.853			
Using Metaverse for conferences/meetings would increase my chances of achieving things that are important to me.	0.844	0.737	0.918	0.917
Using Metaverse would help me accomplish conferences/meetings more quickly	0.864			
Using Metaverse for conferences/meetings would increase my productivity	0.872			
Effort expectancy				
Learning how to use Metaverse for conferences/meetings would be easy for me.	0.919			
My interaction with Metaverse for conferences/meetings would be clear and understandable.	0.904	0.742	0.920	0.919
I would find Metaverse easy to use.	0.777			
It would be easy for me to become skillful at using Metaverse for conferences/meetings.	0.838			
Facilitating conditions				
I would have the resources necessary to use Metaverse for conferences/meetings.	0.878			
Metaverse for conferences/meetings should be compatible with other technologies that I use.	0.959	0.856	0.947	0.946
I could get help from others when I have difficulties using Metaverse for conferences/meetings.	0.937			
Social influence				
People who are important to me think that I should use Metaverse for conferences/meetings.	0.659			
People who influence my behavior think that I should use Metaverse for Metaverse conferences/meetings.	0.885	0.635	0.837	0.814
People whose opinions that I value would prefer that I use Neuralink for conferences/meetings.	0.830			
Hedonic motivations				
Using Metaverse for conferences/meetings would be fun.	0.928			
Using Metaverse for conferences/meetings would be enjoyable.	0.977	0.892	0.961	0.960
Using Metaverse for conferences/meetings would be very entertaining.	0.927			
Price value				
Metaverse will be reasonably priced.	0.891			
Metaverse will be value for the money.	0.845	0.675	0.861	0.857
At the current price of physical conferences/meetings, Metaverse would provide a good value.	0.719			
Sensory stimuli (2 senses)				
Background sounds in Metaverse for conferences/meetings are nice.	0.791			
Colors in Metaverse for conferences/meetings are in harmony.	0.818	0.681	0.895	0.889
NFT's in Metaverse for conferences/meetings are attractive	0.870			
High-resolution in Metaverse for conferences/meetings is pleasant.	0.820			
Social stimuli				
The crowd level in Metaverse during conferences/meetings is comfortable	0.890	0.73	0.890	0.889

People seem to be enjoying themselves in Metaverse during conferences/meetings.	0.883			
People are interacting with each other in Metaverse for conferences/meetings.	0.788			
Naturalistic stimuli of virtual world				
The landscape in Metaverse for conferences/meetings reflects the natural flora.	0.835			
Plants in Metaverse for conferences/meetings are used effectively in overall design.	0.933	0.752	0.901	0.897
Natural elements make the Metaverse for conferences/meetings attractive.	0.829			
Cultural stimuli				
Cultural symbols in Metaverse for conferences/meetings are familiar to me.	0.833			
People in Metaverse for conferences/meetings act similar to me.	0.810	0.680	0.864	0.864
In Metaverse for conferences/meetings I can interact with other participants easily.	0.830			
Hospitality culture stimuli				
Metaverse for conferences/meetings meets all stakeholders' needs	0.903			
Conferences/meetings in the Metaverse are detail-oriented.	0.827	0.703	0.876	0.880
Metavrese for conferences/meetings develops and maintains positive relationships with all stakeholders	0.781			
Cognitive responses				
Metaverse is a good place to be for conferences/meetings.	0.849			
Metaverse has a positive image.	0.876			
Metaverse offers good quality products and services for conferences/meetings.	0.864	0.714	0.926	0.924
Metaverse for conferences/meetings offers good value for money	0.807			
I trust Metaverse.	0.827			
Affective responses				
I would feel excited in Metaverse.	0.903			
I would have pleasant in Metaverse.	0.912			
I would feel happy in Metaverse.	0.896			
I would feel safe and secure in Metaverse.	0.760	0.699	0.948	0.948
I would forget about everything in Metaverse.	0.666			
I would feel immersed in Metaverse.	0.727			
I would feel satisfied with my experience with Metaverse.	0.880			
I would love Metaverse.	0.906			
Intention to use Metaverse				
I intend to use Metaverse for conferences/meetings.	0.863			
I plan to use Metaverse for conferences/meetings when they become available.	0.895	0.768	0.909	0.908
I predict that I will use in near future Metaverse for conferences/meetings.	0.872			

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CASE STUDY: THE CLASSIFICATION OF THE ROOMS IN HOLIDAY HOMES WITH DEEP LEARNING

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ABSTRACT

From reservation to the accommodation process, the effects of technology are increasing day by day in the field of tourism. Online booking platforms, virtual support assistants, mobile applications, and artificial intelligence tools can be given as examples. In the focus on artificial intelligence for tourism, different tools can be presented as examples, especially price analysis regression/recommendations, room, house & amenity classifications from images, and occupancy estimations. Our case study consists of two different steps. First, a dataset was created from a German-based tourism reservation company. In the second step, 5 different deep learning models were trained to compare the accuracy and loss with the dataset. We trained ResNet, DenseNet, VGGNet, Inception v3, and NASNet models. The following accuracies were observed based on 20 epochs of training; ResNet 97.4%, DenseNet 98.69%, VGGNet 97.31%, Inception v3 97.33%, and NASNet 97.21%.

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INTRODUCTION

Tourism is an important area that directly contributes to the economies of various countries and regions around the world. National and international holidays increase accommodation, services, and other activities in tourism destinations. Places such as hotels, holiday homes, etc. can be considered as accommodation options (Martín et al., 2018). As a type of accommodation, holiday homes are in a house or flat or can cover the entire place. Holiday

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homes do not belong to a hotel, and they do not provide services like a hotel. These kinds of accommodations have their own cooking facilities. Generally, holiday homes, are rented by guests for a short period (Scanlon et al., 2014).

When we look at the holiday homes business statistically, the income for 2019 is 57.6 million dollars (Statista, 2019). Moreover, holiday homes are the most preferred holiday plan by European Union (EU) citizens with a rate of 51% (Statista, 2023). Vacation preferences of EU citizens are presented in Table 1.

Table 1. *Distribution of holiday preferences of EU citizens for 2023 (Statista, 2023)*

Holiday Preference	**Percentage of the Preference (%)**
Holiday Homes*	51
Hotels	47
Bed and Breakfast	15
Camping	10
Boat/Cruise	5
Motor home, Camping Trailer, Mobile Home	5

* The holiday homes percentage includes rental houses, holiday homes friend's/family's houses, or own holiday homes

According to the statistics published by Homeaway, the holiday homes business generated a total net income of 285 million pounds in the UK in 2014. When this revenue is analyzed regionally, London earned 70 million pounds, Cornwall 15 million pounds, and North Yorkshire 9 million pounds net income (Scanlon et al., 2014).

Table 2. *Percentage distribution of holiday home markets in the EU by country (Assa Abloy, 2017)*

Country	**Market Distribution (%)**
Germany	17.47
France	13.49
United Kingdom	12.91
Spain	10.41
Italy	6.51
Other EU Countries	39.21

According to the research of Assa Abloy (2017), the size of the holiday homes business in the EU is 23.28 billion euros as of 2016 and the estimation for 2023 is reaching 32.5 billion euros. The compound growth rate in this year's range is expected to be 5.8%. 29.3% of bookings are made online and the rest by other methods. The largest holiday home markets in the EU as of 2017 published in Table 2 (Assa Abloy, 2017).

According to data published by the Turkish Statistical Institute (TUIK), the average number of overnight stays in Turkey in 2023 (first three quarters) was 10 nights. Annual tourism revenue is 41.9 billion dollars for 2023, with a total of 44.6 million visitors (first three quarters). Tourism statistics for the last 9 years published by TUIK are given in Table 3 (Turkish Statistical Institute, 2024).

Table 3. *Tourism data from TUIK (*Only the first two quarters provided for 2024)*

Year	Annual Tourism Revenue (Thousand $)	Number of Visitors	The average number of overnights
2015	32,492,212	41,617,530	10.1
2016	22,839,468	31,365,330	11.4
2017	27,044,542	38,620,346	10.9
2018	30,545,924	45,628,673	9.9
2019	38,930,474	51,860,042	9.9
2020	14,817,273	15,826,266	12.4
2021	30,173,587	29,357,463	12.6
2022	46,477,871	51,369,026	10.3
2023	55,874,176	57,077,440	13.3
2024*	23,660,318	25,107,974	11.1
Total	**322,855,845**	**387,830,090**	**11.19 (Average)**

In the past, companies sold holiday packages through various agencies, communicating face-to-face with customers. Nowadays, online reservation is mostly preferred. Customers can find help at the decision stage through personal assistants and Artificial Intelligence (AI) applications used by major booking portals. For offering the best holiday to the customers, these major booking portals use price analysis, location suggestions, date suggestions, and personal offers to the customers. Behind these applications, technologies such as big data, algorithms, deep learning (DL), mobile applications, artificial chat assistants can be found (Zsarnoczky, 2017).

The main objective of this study is to explore the application of DL models in the classification of images related to holiday homes, with the aim of improving the accuracy and efficiency of automated systems in the tourism industry. Specifically, our research aims to achieve the following objectives;

1. Dataset creation: Create, develop and design a unique dataset from a German-based tourism reservation company, ensuring privacy and confidentiality, to allow the training of DL models.
2. Model training and comparison: Train and compare the performance of five popular DL models - ResNet, DenseNet, VGGNet, Inception v3 and NASNet - on the dataset created.

3. Accuracy assessment: Evaluate the accuracy and loss metrics of these models over 20 epochs to determine their suitability for practical applications in the tourism industry.
4. Optimize user experience: Improve the usage of AI and technology in the tourism industry to enhance the experience of both guests and landlords, and to demonstrate possible application perspectives for the industry.

By addressing these objectives, this study aims to contribute to the growing body of knowledge on the use of AI in tourism, specifically in the automated classification of holiday home images. The knowledge gained from this research can contribute to the development of more accurate and efficient AI-based tools for online booking platforms, thus improving the overall customer experience in the tourism sector. Therefore, we performed a case study and focused on the classification results of the five popular DL models with our own created dataset. Our study consists of two different steps. The first step was creating the dataset for this study. The room image data was collected from a German-based tourism reservations company (due to the privacy concerns, researchers are not allowed to expose any data publicly). In step two, using the dataset, ResNet, DenseNet, VGGNet, Inception v3, and NASNet were trained. The accuracy results of these DL models were then compared. The reasons for choosing these five different DL models & metrics, the process of creating the dataset, and the experiments were explained in the corresponding sections of this study.

LITERATURE REVIEW

The presence of various technologies in the tourism business is become more evident. In our literature review, we examined articles that used similar methodologies, as well as studies that focused on the intersection of tourism and technology. These reviews included comparisons, findings and discussions that highlighted gaps and needs within the tourism industry in terms of technological advances.

The content, information and media data (images – videos of a hotel/holiday home) directly affects the decision of potential tourists for a destination (hotel, holiday home, etc.). Therefore, the provided data need to be correct. There are various studies published in the literature for improving the decision-making process of potential tourists with using technological tools. Kim and Kang (2022) identified the visual elements of tourist attractions with DL. Bozyiğit et al. (2021) provided a hotel image

classifier for travel agencies in order to improve the selection process of guests. Yuan et al. (2019) reviewed the technological trends in tourism industry between 1990-2016 and presented that the use of AI, big data and Internet-of-Things (IoT) increased in the recent years. Xiao et al. (2020) performed a visual content mining on the images of tourism destinations and according to the results, it provides an important reference for tourism marketing. Chang et al. (2020) proposed a clean-coast detector using a Convolutional Neural Networks (CNN) image classification for improving the coastal tourism. Pliakos and Kontropoulos (2015) conducted a tourism recommender system based on probabilistic latent semantic analysis (PLSA) for improving the various tourism destinations. Kang et al. (2021) provided a method to explore the tourism activities from social media texts and images for analyzing the emotions of a tourism destination. Law et al. (2019) provided a study on tourism demand forecasting with a DL approach. Marigliano (2024) analyzed and predicted sentiments expressed in tourism reviews using DL. Xu et al. (2024) employed SqueezeNet DL model with Slender West Lake tourism image dataset for providing more scientific reference for the study of tourism images.

We performed a second literature review in the methodological aspect of this study. Rasheed (2019) obtained an average value of 0.84 mAP by using Faster R-CNN and R-CNN networks to classify 20 different dog breeds. Raşo (2019) worked on the stock market forecast using machine learning methods and Investing.com's data between 01.01.2016 and 31.12.2018. Lévy and Jain (2016) conducted DL studies on breast cancer diagnosis using the Digital Database for Screening Mammography (DDSM) dataset. Yeong-gyu and Eui-Young (2016) ensured the classification of characters in the Korean alphabet with the dataset called PHD08. Singla et al. (2016) worked on a separation of the meals like “meal / not meal” using binary classification. Zhou et al. (2017) have developed a DL model that distinguishes whether drivers wear seat belts or not. With a set of 379 MRI data, Wang et al. (2019) worked on a DL model that tests whether a person is drunk or not. Almisreb et al. (2018) focused on the classification of people from ear visuals by applying modifications to the AlexNet model. Toprak (2018) has worked on the identification of individuals crossing railways using the Railway Pedestrian Dataset (RAWPED) in combination with learning DL models. Mehr (2017) worked with Kaggle and Data Science Bowl datasets on lung cancer diagnosis using AlexNet and GoogleNet models. Kılınç (2018) achieved a success rate of 85-90% by using the AlexNet DL model to identify individuals with Down syndrome. Ezel (2018) developed a DL model that translates Turkish Sign Language into

written language using AlexNet. Örs (2018) conducted studies on the AlexNet DL model for the classification of wheat types. Kadiroğlu (2019) used AlexNet and VGG-16 DL models for breast cancer detection. Akilotu (2019) conducted classification studies on AlexNet and VGG-16 DL models by using various signals (EEG, Oxygen / Carbon Dioxide) for the detection of obstructive sleep apnea. Seyfioğlu (2017) used GoogleNet, ResNet, and VGGNet models to classify Radio Frequency (RF) waves. Gürkaynak (2018) has worked on ship types classification with ResNet, AlexNet, and VGGNet DL models. Yaman (2018) predicted gender and age from ear images using FERET, UND-F, and UND-J2 datasets along with ResNet and VGG-16 DL models. Abhisheka et al. (2023) performed a comprehensive review of breast cancer detection and classification using DL. Alshmrani et al. (2023) developed a DL architecture in order to classify lung diseases using chest X-ray images. Gupta and Bajaj (2023) proposed a DL framework to classify the screening of COVID-19 from CT scans. Algani et al. (2023) used Ant Colony Optimization with CNN to identify the leaf diseases. Tahir et al. (2023) proposed a DL based skin cancer classification network, which they named CSCC_Net, and performed the tests on ISIC 2020, HAM10000, and DermIS datasets. Mira et al. (2024) developed a system for early diagnosis of oral cancer with using DL and data augmentation. Gupta et al. (2024) reviewed the studies on the prediction of the potato disease using IoT, Machine Learning and Image Classification.

MATERIAL AND METHODS

A wide variety of technological concepts are used in the management of tourism and holiday processes. Under this headline, we provided the materials and methods in this study as well as the relation between tourism and DL.

Deep Learning, in its most general form, is a machine learning field used in solving problems and performing actions such as analysis, inference, observation, and learning by using large amounts of data. Unlike traditional machine learning algorithms, DL models can be in different hierarchical structures (Kayaalp & Süzen, 2018). DL is the methods and models that learn the representations at different levels on data with complex relationships and it is a sub-field of machine learning. DL methods developed in recent years are influenced by signal and information processing techniques (Deng & Yu, 2013). DL is the subfield of Artificial Neural Networks (ANN). It is the type of ANN that works to get a certain output value from pure data with nonlinear transformations. It is used in

many applications such as natural language processing, image recognition and classification, real-time translation, etc. (Future of Privacy Forum, 2018).

In the literature review, several cases of use of DL in the tourism context were identified, such as demand forecasting, review sentiment analysis, price and availability regression, and user experience. DL and AI have the potential to benefit both guests and key stakeholders, including tourism agencies, hotels, booking platforms and other related parties. For guests, DL can provide accurate information and a significantly improved user experience. For other stakeholders, DL offers improved forecasting capabilities, better insight into availability and pricing trends, and valuable feedback from guest reviews. These technological tools and improvements ultimately lead to a better experience and outlook for everyone involved in the tourism industry.

CNNs are a type of multi-layer perceptron network (Multi Layer Perceptron - MLP). CNN is a DL architecture used for image analysis, classification, recognition, and segmentation. It is an architecture that works with the mathematical convolution (Şeker et al., 2017). It extracts information by passing the image, which has been taken from the input layer through different processes in other layers. An example of a convolution use case in CNN can be the removal or detection of the edges in the image data. It is possible to perform different operations by using pooling, dropout, etc. layers (Raşo, 2019). An example CNN model is given in Figure 1.

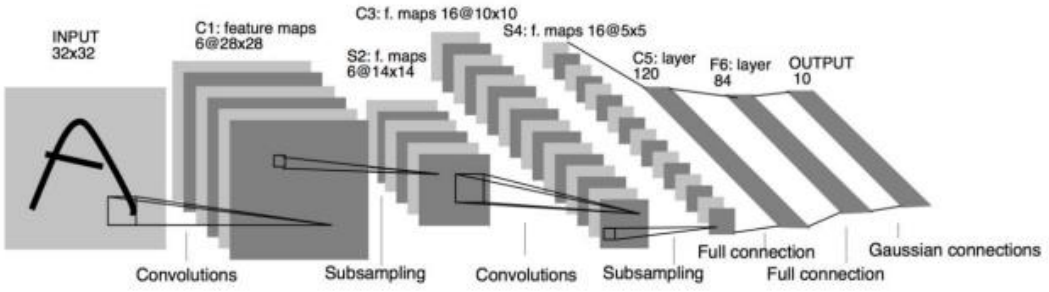

Figure 1. *An example CNN model*

Nowadays, DL networks with different layer combinations or different complexity rates are widely used in literature. The hardware and software that the DL network runs on have a direct effect on performance and efficiency (Shi et al., 2017). We used an appropriate computer in terms of up-to-datedness and cost for our DL training. We preferred TensorFlow

and Keras (2019) libraries, because they are easy to use. The DL computer that we used for this study is summarized in Table 4.

Table 4. *Hardware specifications used in the study*

Specification	Explanation
GPU	NVidia GTX 2080 Ti
CPU	AMD Ryzen ThreadRipper 2950X
RAM	64 GB
Operating System	Ubuntu Linux

In recent years, the number and awareness of successful DL models in the literature has increased with competitions. ImageNet Large Scale Visual Recognition Challenge (ILSVRC) competition, which has been held regularly every year since 2010, has become a standard benchmark in the field of object classification. Along with this competition, PASCAL Visual Object Classes (VOC) have an important place as well (Russakovsky et al., 2015). We chose to use the DL models ResNet, DenseNet, VGGNet, Inception v3, and NASNet for the following reasons;

- Widespread preference in literature: These DL models are widely preferred in the literature and have demonstrated reliable accuracy and loss results across various datasets.
- Objective dataset comparison: By introducing a new dataset in this study, we aimed to compare the accuracy and loss of these well-established DL models to evaluate our dataset as objectively as possible.
- Relevance to tourism studies: These DL models have been used in several tourism-related studies identified in our literature review, providing us with a solid basis for effectively examining and comparing our results effectively.

ResNet is a very deep network structure that can reach up to 152 layers and has configurations in different layer numbers. It won first place in the ILSVRC 2015 classification competition. In the training and backward propagation processes in DL network structures, there may be situations of vanishing and/or explosion. This is a problem caused by a very deep layer structure rather than an overfitting problem. The value obtained as a result of multiplying very small numbers may be zero, in this case, there is a vanishing. As a result of multiplying very large numbers, the value obtained may be extremely high, in this case, there is an explosion situation. The expectation is to get better training and testing processes in DL network structures. However, the examples and research from previous articles show different results. ResNet provides a solution to this problem with

shortcut connections. The *x* value obtained at one point in the model is added to the output value after several weight layers using these shortcut connections. In this way, even after a vanishing/explosion problem between weight layers, the *x* value from a few steps ago is preserved. It is observed that with this solution, the network can be optimized more easily, the complexity does not increase, and the accuracy result is better. In this study, the 50-layer structure of the ResNet model is preferred. A visual representation of the shortcut transfer process is presented in Figure 2 (He et al., 2016). ResNet is used for classifying tourism attractions and images in the tourism context, such as the study from Firdaus et al. (2018). ResNet is popular for image classification problems including the tourism context.

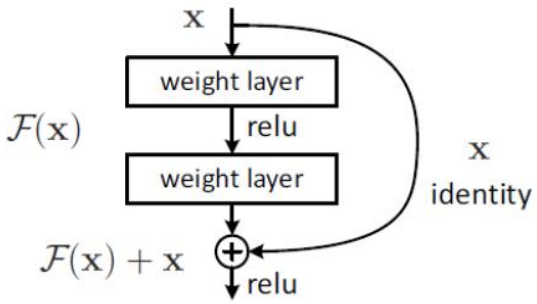

Figure 2. *The shortcut connections in ResNet*

The studies in Convolutional Neural Networks showed that direct shortcut connections made by layers close to the input to the layers close to the output offer better accuracy, efficient training, and deeper network structures. DenseNet, developed based on this observation, connects the output from each layer to other layers located in the forward direction. In classic network structures, *L* layers have *L* connections. But in DenseNet networks, *L* layers have *L(L+1)/2* connections. These forward connections, called Concatenation, allow feature maps to be transferred to other layers. Thus, each further layer receives common data from all previous layers. This allows the network to be thinner and more compact. In addition, it allows to use of a small number of channels and achieves efficiency in aspects of calculation and memory consumption. There are 121, 169, 201, and 264 layered versions of the DenseNet model. Figure 3 shows the connection structure in the DenseNet model (Huang et al., 2018). DenseNet is a different popular DL model for image classification studies, including the destination images creation & classification on social media for the tourism context (Zhao & Agyeiwaah, 2024).

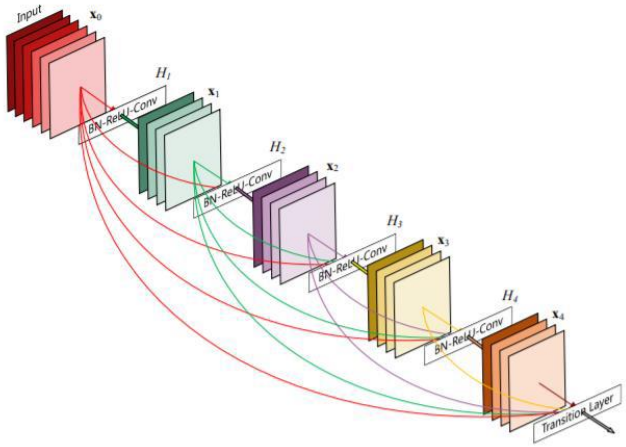

Figure 3. *DenseNet connection structure*

VGGNet is a model that achieved the runner-up first place in the ILSVRC classification task in 2014. In the VGGNet model, the importance of using small-size convolution filters and the depth of the network are shown. Unlike AlexNet and ZFNet models, which succeeded in 2012 and 2013 ILSVRC, VGGNet does not use 11 x 11 or 7 x 7 convolution filters. Instead, it uses 3 x 3 convolution filters with 1 step stride. Because a 3 x 3 convolution filter consisting of 3 layers can cover the same area as a convolution filter with dimensions of 7 x 7. This situation gives some positive benefits. There are 5 different configurations of the VGGNet model with different layer numbers. These are named A, B, C, D, and E (Simonyan & Zisserman, 2014). We preferred VGG-19 (E configuration – in Figure 4) in this DL study, because it is the biggest version of VGGNet. Besides that, VGGNet is preferred in several different tourism studies to classify rural areas, tourist attraction pictures and smart tourism tools (Xie, 2022; Yu, 2024).

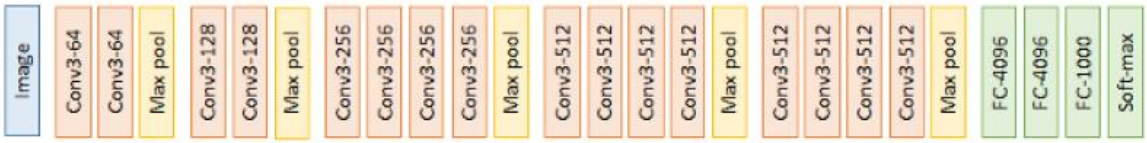

Figure 4. *VGGNet 19 (E) configuration*

The Inception architecture, also used in the Inception v3 model, came with GoogleNet. The GoogleNet model proposed by Szegedy et al. (2015) increases the depth and width while trying to keep the calculation cost at the same rate. For this reason, in this model, the outputs from different convolutional filters merge. The first GoogleNet model is also called Inception v1. Different convolutional filters are used in parallel with inception. The outputs from these filters combine and push to the next

steps. A 1x1 convolution matrix is also used in some steps to facilitate complexity and calculation. In addition to 1x1 filter sizes, it is possible to see 3x3, 5x5, and 7x7 filter sizes (Szegedy et al., 2015). The Inception v3 model targets the factorization of the convolution filters. It proposes to use 3 x 3 filters to avoid the cost and computational complexity of 5x5 and 7x7 filters. Instead of one 5 x 5 filter, it is possible to use three 3 x 3 filters. It is the same for 7 x 7 filters. Instead of one 7 x 7 filter, two 3 x 3 filters can be usable. It is possible to get a 28% gain from this factorization. Another thing proposed by Inception v3 is asymmetric convolution factorization. Instead of one 3 x 3 filter, it proposes to use two different convolution filters, the first 3 x 1 and the second 1 x 3. The number of parameters from the 3 x 3 convolution filter is 18. However, the number of parameters from 3 x 1 and 1 x 3 filters is 6. There is a gain of 33% in this factorization step. On the Inception v3, various updates and changes have been made in the Auxiliary classifier, grid system, and Inception modules. Accordingly, the Inception v3 model has maintained the same efficiency level with less cost (Szegedy et al., 2016). An example of the Inception module and an example of the performed filter factorization are given in Figure 5. Inception v3 is preferred in different studies for image classification and feature extraction. There are various studies in tourism field employed Inception v3 for classifying tourists' photos and exploring tourism destinations' images (Bozyiğit, 2021; Kim et al., 2021).

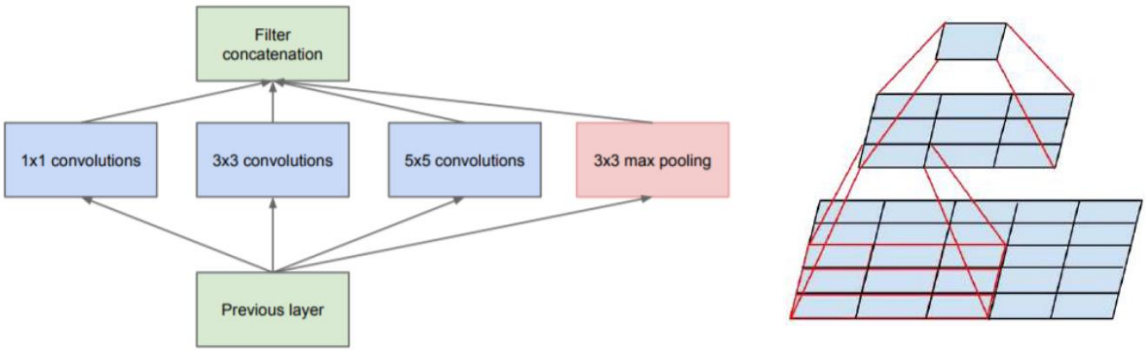

Figure 5. *Inception module (left) and a sample factorization (right)*

NASNet is a model developed by the Google Brain team for the CIFAR-10 dataset. With less complexity and a small model size, NASNet can give good results. The NASNet model does not consist of fixed-definition blocks or cells. Unlike supervised and unsupervised learning methods, it uses reinforcement learning methods. In the NASNet model, there are two different cell types: Normal Cell and Reduction Cell. Convolution operations are performed in normal and reduction cells.

However, the only difference is that the outputs from the reduction cells have a reduced size. With Recurrent Neural Network (RNN), the normal and reduction cells are searched in a search space. h_i and h_{i-1} states are transferred to each selected cell. These states are transferred from the previous layer or the input data. Considering these two states, RNN makes the prediction operations (Zoph et al., 2018). We decided to use the NASNet Mobile version for this study, because it is a lighter version than NASNet. NASNet is employed by different tourism studies for example landmark recognition models (Razali et al., 2023).

The dataset is a key parameter for the ML and DL projects. The quality of the dataset directly affects the success and error rates. The dataset was created specific for this study. The source of the data is a tourism reservations company based in Germany. An official permission from the tourism company was obtained by the researchers for processing their images and creating a dataset. More than 300,000 room images were taken from the company and cleared and labeled each of them individually. Labeling and clearing process have been achieved manually and took approximately 2 months to be completed. At the end of labelling and clearing process, 70,000 images were determined which can be used for training. 5 different labels were used; "kitchen, bathroom, bedroom, living room and garden". For test and validation of the data, the public room images from various visual media sources such as Flickr were collected. Flickr API Key was obtained in order to fetch images from Flickr. The descriptive statistics of the dataset are summarized in Table 5.

Table 5. *Descriptive statistics of the dataset*

Label	Training Data	Test Data	Validation Data
Kitchen	14,000	1,000	1,000
Bathroom	14,000	1,000	1,000
Bedroom	14,000	1,000	1,000
Living Room	14,000	1,000	1,000
Garden	14,000	1,000	1,000
Sum	**70,000**	**5,000**	**5,000**
General Sum	**80,000 (Including Test & Validation Data)**		

The images in the dataset mainly contain German holiday homes. In addition, there are holiday home images of other different locations, especially the USA (United States of America), Spain, and France. Most of the images in Germany are holiday homes on the Baltic Sea coast in the northern region. Images in the dataset have different labels as well as different qualities. For example, the dataset contains different numbers of images of untidy, tidy, or dirty rooms. Researchers tried to represent as

much as possible different qualities of data in the dataset. Sample images from the dataset are given in Figure 6.

Figure 6. *Sample images in the dataset*

A User Interface (UI) was developed to test the predictions of the DL models. The users can be able to easily see the results of the model predictions with this UI by selecting the images they want to test. It is given in Figure 7.

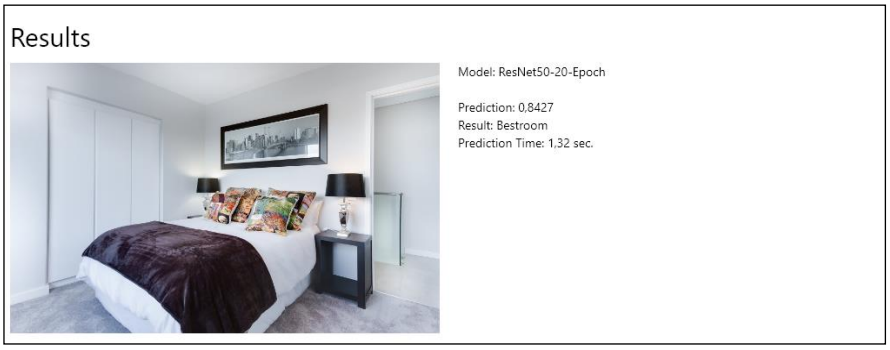

Figure 7. *UI preview for the prediction process*

APPLICATION

Information technologies are frequently used to solve various problems or achieve improvements in the tourism business. In this section, the application stages of the study are explained.

Nowadays in DL applications, the state of the dataset is a factor that directly affects the success of the study (Zhu et al., 2015). The dataset, which is described in the previous section of the study, belongs to a tourism

reservations company based in Germany. This dataset was created by extracting the data in the company database. Various problems have been encountered in the extraction process. The first problem (Problem 1) is that the images are dynamically tagged. It is not known exactly which label belongs to the image or not because users can tag the images with a free text area as they wish. For example, a kitchen image can be tagged with “General view of the kitchen”, “Dining table in the kitchen”, “Microwave oven” or various descriptions and wordings. The users can decide whether to use the word “Kitchen” or not in the tag definitions of the image. If the users wish, they may not use the word "Kitchen" at all, even leave this label field blank or name it in any language. Another problem (Problem 2) from the tagging is the differences in perspective. The homeowners can capture a photo of the garden from the kitchen window and name these kinds of photos in different ways. As an example, a photo of a balcony may contain labels such as "Overview from the kitchen", "View from the kitchen" or the word "kitchen" but not directly related to the kitchen. In this case, filtering the images by the word “Kitchen” can give different unexpected images and this causes data pollution. Another problem arises while extracting the images from single-room houses/apartments (Problem 3). A photo frame can contain items depicting the kitchen, living room, or different kinds of rooms. It is not possible to categorize these kinds of photos correctly. A different problem (Problem 4) was found during the extraction of the images for the garden category. Homeowners (users) can tag the images with “General view of the house”, “Front garden”, “Garden view” and so on. In these cases, the garden picture often contains a house, apartment, or concrete building in the captured image. Many garden images could not be added to the dataset due to this problem. The visual representations of the explained problems are presented in Figure 8.

Figure 8. *The visual representations of the problems (Left to right number 1,2,3,4)*

Approximately 300,000 images were extracted from the company database. Researchers faced the problems that are described above. The study continued with 70,000 images after the cleaning and labeling process and these images were used in the training set. All these selected images are only used for training. Test and validation sets created from various visual media sources like Flickr (from Flickr API).

As stated in the previous sections, this study used ResNet, DenseNet, VGGNet, Inception v3, and NASNet Mobile models with Keras and TensorFlow libraries. The ResNet model used in this study has a 50-layer structure and the DenseNet model has a 201-layer structure. Both models including VGGNet 19, Inception v3, and NASNet Mobile used together with the Adam optimizer, ReLU activation function, and Categorical Cross Entropy error function. The reasons for this decision are the training time and size limits. All models were trained as 10 and 20 epochs with a batch size of 8. The way of using the dataset in the training process is given in Figure 9 and the pseudo-code of this process in Figure 10.

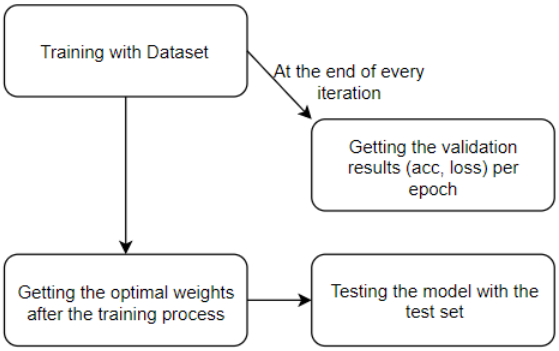

Figure 9. *Usages of the training, test, and validation sets*

```
import Keras
import TensorFlow // Including Keras, TensorFlow and other modules

train_data_generator = ImageDataGenerator(...) // flow_from_directory
validation_data_generator = ImageDataGenerator(...) //flow_from_directory

model = Model // Implementation of the model with layer blocks
model.compile(...)
model.fit_generator(...)
model.save(...)
```

Figure 10. *Pseudo code of the training*

ASSESSMENT

This section presents the findings of the training, testing, and validation processes of the DL models with the described dataset. Researchers determined the epoch number by the test on the ResNet 50 model. ResNet 50 model has been trained in 10, 20, and 50 epochs. The decision was made to do only 10 and 20 epochs of training according to the accuracy, error, and training time results. The reason for this decision is that there is a difference of 27,135 seconds between 20 and 50 epoch training, despite this difference,

a 1.38% better accuracy rate has been achieved. The outputs of the training processes are given in Table 6. Assessment was based on the accuracy and loss outputs of the models. The literature showed that accuracy and loss metrics are widely used for evaluation in similar studies. Therefore, these metrics were chosen to provide a clear, objective measure of model performance. The hyperparameter details of the models are presented in Table 7.

Table 6. *Comparison of 10, 20, and 50 epoch training results of the ResNet 50*

Epoch	Training Time (Second)	Accuracy (%)	Loss (%)
10	9,428	96.04	11.60
20	18,740	97.40	7.51
50	45,875	98.78	3.67

Table 7. *Hyperparameter details of the DL models (FC: Fully-Connected)*

Model	Hyperparameter Details
ResNet50	Input shape & Tensor: None
	Pooling: None
	FC-Layer: Yes
	Classifier Activation: Softmax
DenseNet201	Input shape & Tensor: None
	Pooling: None
	FC-Layer: Yes
	Classifier Activation: Softmax
VGGNet19	Input shape & Tensor: None
	Pooling: None
	FC-Layer: Yes
	Classifier Activation: Softmax
Inception v3	Input shape & Tensor: None
	Pooling: None
	FC-Layer: Yes
	Classifier Activation: Softmax
NASNet (M)	Input shape & Tensor: None
	Pooling: None
	FC-Layer: Yes
	Classifier Activation: Softmax

As a first step, the ResNet 50 model was trained for 20 epochs. This 20-epoch training lasted 18,740 seconds. On average, 937 seconds are required per epoch. At the end of the training process, an accuracy rate of 97.40% was achieved and a loss rate of 7.51%. Later, another training process was performed with 10 epochs on ResNet 50 using the same dataset, parameters, and conditions. This training process was completed in a total of 9,428 seconds. On average, 942.8 seconds are required per epoch. An accuracy rate of 96.04% was observed and a loss rate of 11.60% at the end of the training process. The accuracy–loss graphics of the 20 and 10 epoch training processes are summarized in Figure 11.

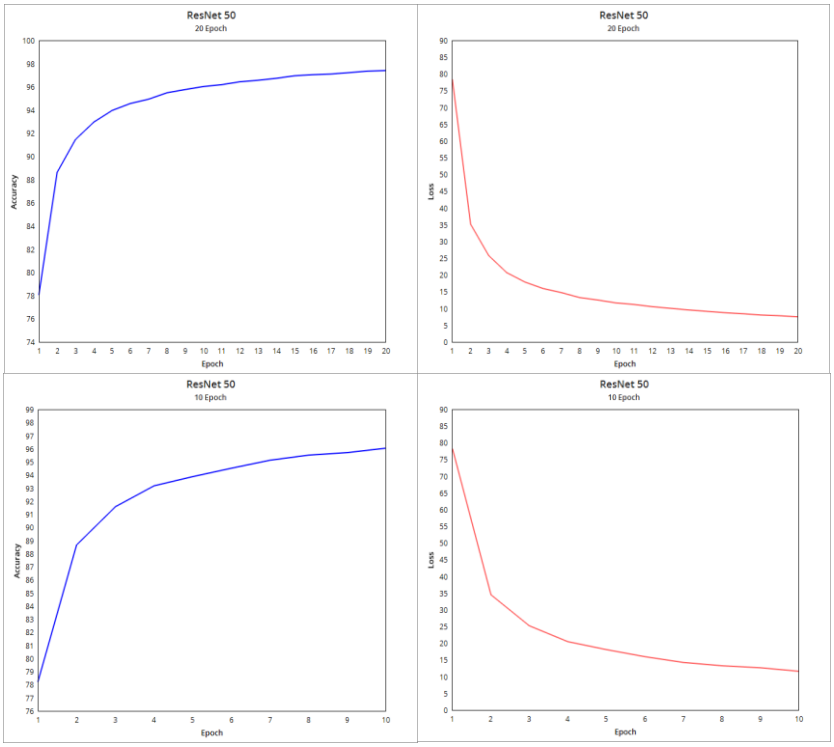

Figure 11. *ResNet 50 accuracy – loss graphics (20 epochs: above, 10 epochs: below, blue: accuracy, red: loss)*

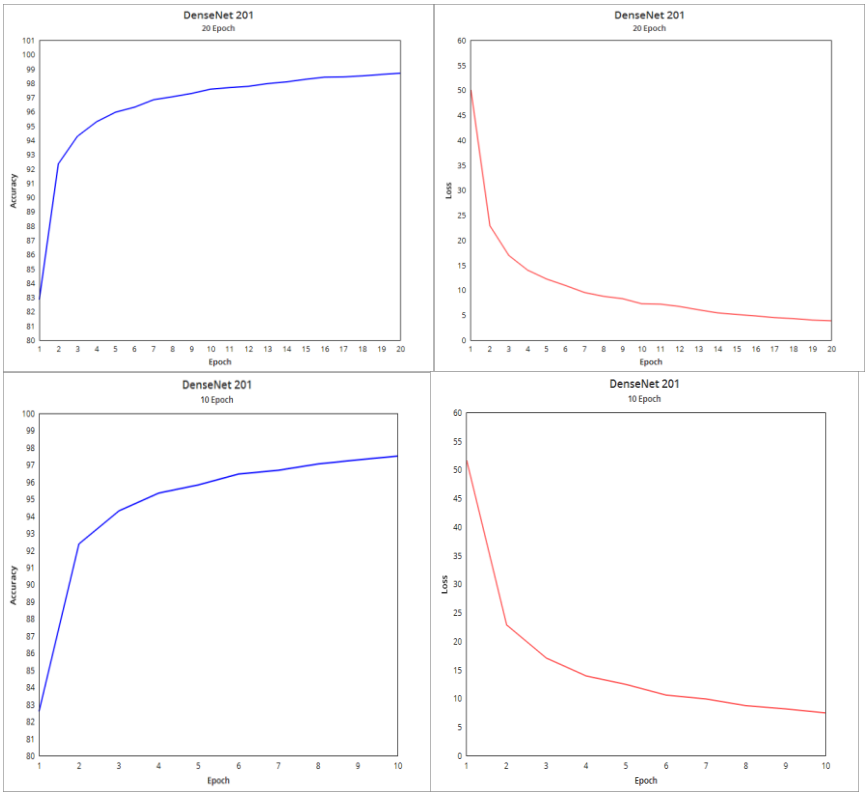

Figure 12. *DenseNet 201 accuracy – loss graphics (20 epochs: above, 10 epochs: below, blue: accuracy, red: loss)*

Moreover, the DenseNet 201 model was trained with 20 epochs using the described dataset and parameters in previous sections. The training took 30,060 seconds with a 98.69% accuracy rate and a 3.87% loss rate. On average, 1,503 seconds are required per epoch. In the second step, the DenseNet 201 model was trained for 10 epochs with the same parameters and conditions. The training has been completed in a total of 15,055 seconds. On average, 1,505.5 seconds are required per epoch. The accuracy-loss graphics of the DenseNet 201 model are summarized in Figure 12.

Following a similar approach, the VGGNet 19 version (E) was trained with 20 epochs as a first step. The training time finished in 16,782 seconds and the average training time per epoch was 839.1 seconds. A 97.31% accuracy rate and a 7.79% loss rate were achieved for 20 epochs of training. As a second step, 10 epochs training was performed on VGGNet 19. The 10-epoch training process was completed in a total of 8,409 seconds. On average, 840.9 seconds are required per epoch. The accuracy–loss graphics of the VGGNet 19 model are summarized in Figure 13.

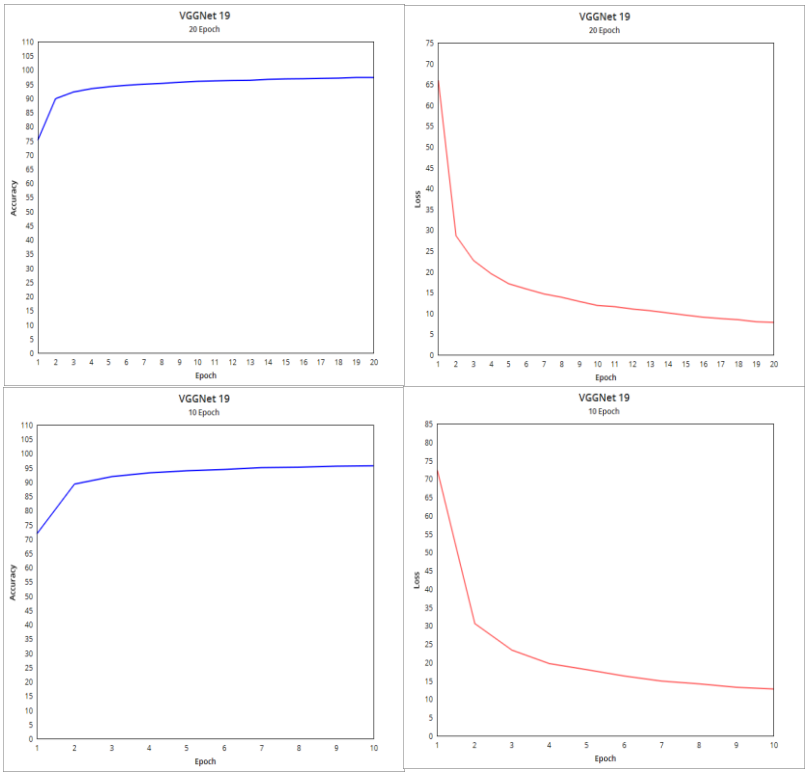

Figure 13. *VGGNet 19 accuracy – loss graphics (20 epochs: above, 10 epochs: below, blue: accuracy, red: loss)*

Later, the Inception v3 model with 20 epochs was trained as a first step. This training took 20,202 seconds in total. Training per epoch was 1,010.1 seconds (average). At the end of these 20 epochs of training, a 97.33%

accuracy rate was achieved with a 7.61% loss rate. The second step of Inception v3 training with 10 epochs was completed in 10,002 seconds. On average 1,000.2 seconds are required per epoch. We ended up with a 95.71% accuracy rate and a 12.38% loss rate for 10 epochs of training. The statistics of Inception v3 training are summarized in Figure 14.

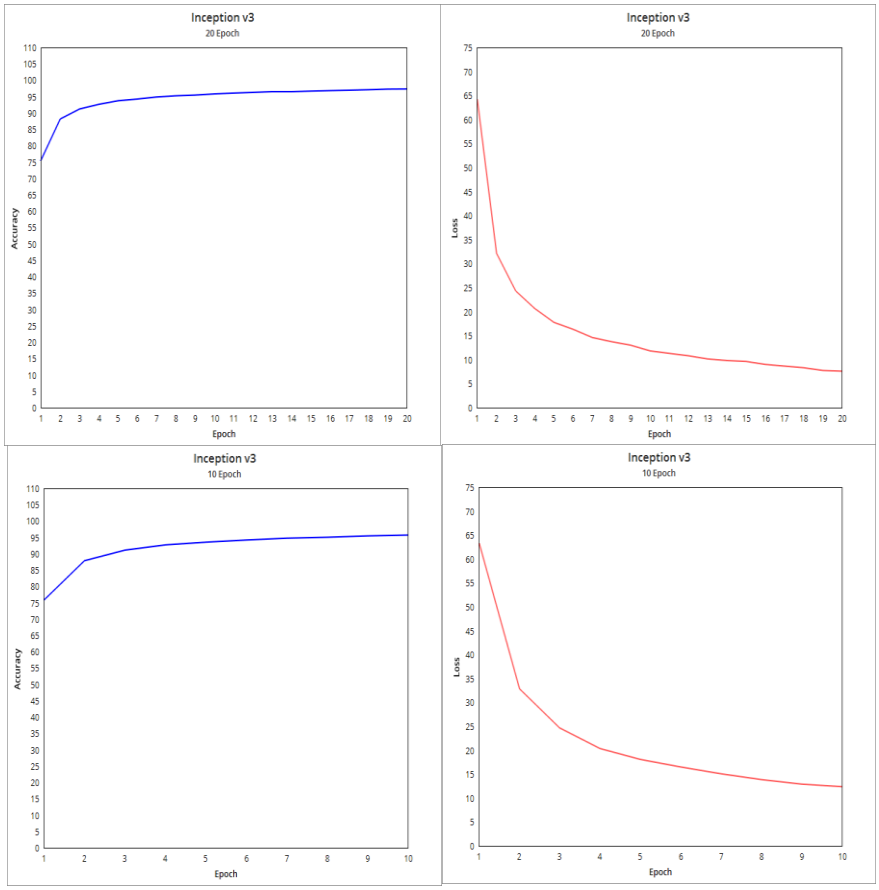

Figure 14. *Inception v3 accuracy – loss graphics (20 epochs: above, 10 epochs: below, blue: accuracy, red: loss)*

The NASNet Mobile model was trained for 20 epochs. This 20-epoch training lasted 34,241 seconds. On average, 1,712.05 seconds are required per epoch. At the end of 20 epoch training processes, an accuracy rate of 97.01% and a loss rate of 8.51% were obtained. 10 epochs of training on the NASNet Mobile model was also performed with the same parameters and conditions. This training has been performed in a total of 17,103 seconds. On average, 1,710.3 seconds are required per epoch. An accuracy rate of 95.41% was achieved with a loss rate of 12.98%. The accuracy–loss graphics of the 20 and 10 epoch training processes are summarized in Figure 15.

Lastly, a balanced dataset was created for the training and testing of the DL models. The aim was to see the quality of the dataset and perform a second test. 20 images from the test set were selected, and a prediction was

performed using the DL models we trained with 20 epochs. As a result, sufficient prediction results were obtained from all DL models. However, some DL models performed much better than the rest of the models. According to this testing, the Inception v3 model is slightly less successful than other models. The prediction outputs of these 20 images on the DL models are summarized in Table 8 (Balga, 2020).

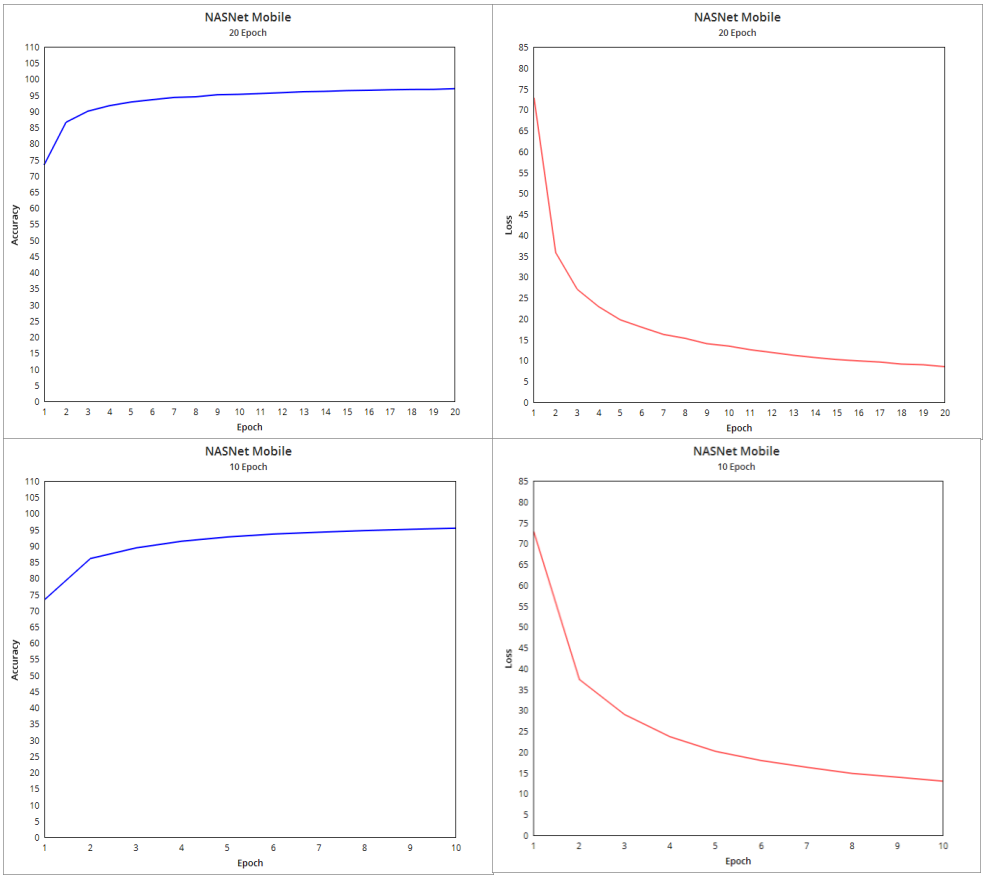

Figure 15. *NASNet Mobile accuracy – loss graphics (20 epochs: above, 10 epochs: below, blue: accuracy, red: loss)*

Table 8. *Predictions from the models (correct prediction / total image) ResNet and VGGNet performed better than other DL models*

Label	**ResNet**	**DenseNet**	**VGGNet**	**Inception v3**	**NASNet**
Bathroom	20/20	19/20	20/20	16/20	18/20
Living Room	19/20	20/20	19/20	17/20	19/20
Bedroom	19/20	14/20	19/20	13/20	19/20
Kitchen	20/20	20/20	20/20	14/20	20/20
Garden	20/20	20/20	20/20	20/20	18/20
Total	98/100	93/100	98/100	80/100	94/100

RESULTS

Many different types of tourism can be seen in the world. In general, tourism directly helps the economy of the region and/or the country. Density and activity in tourism regions increase or decrease depending on national and international holidays and seasonal differences (Martin et al., 2018). There are different types of accommodation possibilities in tourist regions such as hotels, holiday homes, etc. This study focused on the holiday homes. Holiday homes are areas of rented accommodation, usually short-term, located in a house or apartment, with a specific area and facility. It is possible to see different holiday houses depending on location, possibility, and budget (Scanlon et al., 2014).

There are sociological, economic, philosophical, and technological changes that have an impact on the tourism area and the behavior of consumers. There are different ways to book and access the accommodation possibilities and pricing options such as hotel/vacation home websites, reservation portals, agencies, and other internet platforms. Currently, about 25% of bookings in the world are made via the Internet (Crnojevac et al., 2010; Oskam & Boswijk, 2016). In addition, it is seen that various artificial intelligence applications, decision-support structures, chat assistants, and other technological applications take place in the tourism business. Online booking portals replaced face-to-face reservations in the past. In these online booking portals, there are a wide variety of applications and marketing strategies such as offering the best price and options to the customer, helping the decision process, personal offers, and price and location recommendations. Behind these applications, there are various technologies such as algorithms, big data, artificial intelligence, mobile applications, chat assistants, etc. (Zsarnoczky, 2017). Basically, this study identified different use-cases of DL and other technological improvements in the tourism context. These use-cases can improve the user experience and offer a better insights and forecasting.

The main objective of this study is to explore the application of DL models for classifying the holiday homes' images. Therefore, a unique dataset was created from a German-based tourism company for holiday homes' room classification, training models, and comparison based on the results with accuracy assessment. As a result, the study aimed to improve and optimize the user experience, data correctness, higher forecasting, and better overview options. Keras and TensorFlow libraries were used for the execution and development of the models.

As a first step, the data of the German-based tourism company was obtained. A dataset was created for this study. The problems and difficulties of creating your dataset by cleaning and labeling the data were explained. 70,000 room images were extracted and labeled from the tourism company. An additional 10,000 images were used for the test and validation set. The images for the test and validation set were collected from public sources like Flickr (using Flickr API) and other sources and APIs. At the end, we had 80,000 room images in the dataset.

As a second step, the decisions, comparisons, advantages, and problems of the DL models were explained. ResNet, DenseNet, VGGNet, Inception v3, and NASNet models were used. These models are frequently used in the literature as well as competitions like ILSVRC. The models were trained with 10 and 20 epochs on a high-end computer with Nvidia GTX 2080 Ti GPU. These models were implemented using Keras and TensorFlow.

Table 9. *Summary of the DL models' accuracy and loss outputs*

Model	Epoch	Accuracy (%)	Loss (%)
ResNet 50	10	96.04	11.60
ResNet 50	20	97.40	7.51
DenseNet 201	10	97.50	7.45
DenseNet 201	20	98.69	3.87
VGGNet 19 (E)	10	95.65	12.74
VGGNet 19 (E)	20	97.31	7.79
Inception v3	10	95.71	12.38
Inception v3	20	97.33	7.61
NASNet Mobile	10	95.41	12.98
NASNet Mobile	20	97.21	8.51

In general, successful accuracy and loss rates were obtained from the DL models. According to our findings, the ResNet, DenseNet, VGGNet, and NASNet models achieved better results than Inception v3. Moreover, researchers performed their prediction test on the 20 epochs trained models by randomly getting 20 room images from the test set and making the predictions on all models. ResNet and VGGNet models performed a 98% success rate on the prediction test. The summary of accuracy and loss rates of the DL models are shown in Table 9. To summarize, the experimental results of the deep learning models on different sets of room images were presented in Figure 16, with the corresponding statistics detailed in Table 10.

Figure 16. *Randomly selected different sets of room images. These images predicted on the five DL models and the results detailed in Table 10. From left to right, up to bottom we numbered the images numerically. The 1st image represents a bathroom and the 10th image represents a garden.*

Table 10. *Randomly selected images' statistical results from the five DL models. The predictions represent the predicted classes and prediction rate. The images shown in Figure 16 in a numerical order.*

Image No.	Label	ResNet Pred.	DenseNet Pred.	VGGNet Pred.	Inception v3 Pred.	NASNET Pred.
1	Bathroom	Bathroom (94.06%)	Kitchen (97.23%)	Bathroom (78.24) %	Kitchen (40.63%)	Kitchen (75.05%)
2	Bathroom	Bathroom (100%)	Bathroom (100%)	Bathroom (100%)	Bathroom (99.45%)	Bathroom (99.98%)
3	Living Room	Living Room (100%)	Living Room (100%)	Living Room (99.50%)	Living Room (45.80%)	Living Room (99.92%)
4	Living Room	Living Room (97.09%)	Living Room (99.51%)	Livin Room (99.88%)	Living Room (70.86%)	Living Room (85.30%)
5	Bedroom	Bedroom (10%)	Bedroom (90.79%)	Bedroom (99.99%)	Bedroom (100%)	Bedroom (99.99%)
6	Bedroom	Bedroom (100%)	Bedroom (100%)	Bedroom (100%)	Bedroom (96.60%)	Bedroom (99.99%)
7	Kitchen	Kitchen (99.96%)	Kitchen (100%)	Kitchen (99.99%)	Kitchen (84.59%)	Kitchen (99.99%)
8	Kitchen	Kitchen (99.99%)	Kitchen (100%)	Kitchen (100%)	Kitchen (80.69%)	Kitchen (99.92%)
9	Garden	Garden (99.98%)	Garden (99.99%)	Garden (100%)	Garden (94.61%)	Living Room (54.65%)
10	Garden	Garden (100%)	Garden (100%)	Garden (99.99%)	Garden (98.28)	Kitchen (51.30%)

Conclusions and Future Work

The main objective of the present study is to explore the room image classification related to holiday homes with DL models, which can support achieving the accuracy and efficiency of automated systems in the tourism industry. Therefore, a unique dataset was created, developed and designed. Five different popular DL models – ResNet, DenseNet, VGGNet, Inception v3 and NASNet Mobile – were trained on the dataset. Accuracy and loss metrics of these DL models were evaluated to determine their sustainability for applications in tourism industry.

Employing AI and technological tools for tourism applications can reduce the manual work and effort of guests, landlords and other partners such as online reservation platforms. Classifying the holiday home room images are a time-consuming task and requires manual work. It can be open to human-errors such as wrong classifications. This study presents new high accuracy holiday home image classification tool based on five different deep learning models and a unique dataset. The study further reduces the effort for holiday homes room images classification, increases the efficiency, and enhances the users' experiences, and boosts reservations in the tourism industry.

In every DL study, the size, quality, and diversity of the dataset are important factors as in this case study. The fact that the dataset is clean, diverse, and contains as much data as possible can give a positive result for the training. Besides that, the accuracy can be boosted by optimizing the hyperparameters or using different tools like Regularization techniques. A unique dataset was created specifically for this case study, which includes 80,000 room images. The training was performed on five different DL models, and a comparison was made by using this unique dataset. As a result, the study shows that the DL model structures have an effect on the accuracy of the task directly. The best accuracy result (98.69%) was observed with DenseNet 201 and 20 epochs training, the worst (95.41%) with NASNet Mobile and 10 epochs training. Having a high accuracy and low loss rate means a stable and successful image classification and this is also beneficial for tourism industry and applications. Results of the current work was compared with other most similar tourism related studies in the literature, in Table 11. According to this comparison, this research achieved similar or slightly better results than other works. Results of the study can be used as a real-world implication in the tourism industry.

Table 11. *Comparison of our results with the other most similar studies in tourism industry*

Study	Results	Our Results		
		Model	Epoch	Accuracy (%)
Bozyiğit et al. (2021)	VGG-16 84% Accuracy	ResNet 50	10	96.04
Chang et al. (2020)	CNN 97.73% Accuracy	ResNet 50	20	97.40
Xu et al. (2024)	SqueezeNet 85.75% Validation Accuracy	DenseNet 201	10	97.50
Marigliano (2024)	80% Accuracy	DenseNet 201	20	98.69
		VGGNet 19 (E)	10	95.65
		VGGNet 19 (E)	20	97.31
		Inception v3	10	95.71
		Inception v3	20	97.33
		NASNet Mobile	10	95.41
		NASNet Mobile	20	97.21

The accuracies can be adjusted with different options like hyperparameter selections, loss & optimizer functions, combinations with different models & algorithms, regularization approaches, and so on. Different models, data augmentation methods, RNN, and GAN based approaches can be studied as future work. It is also possible to combine different datasets, social media images for image classification tasks to boost tourism and destinations marketing. These aspects can be considered as future work. Different practical applications, such as ChatGPT and similar tools can be also combined with the image classification tasks in tourism industry. There are also different DL model frameworks for specific tasks as we have seen in our literature review. This aspect can be also studied as a future work and combined with different models and techniques (Balga, 2020).

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INDIVIDUALIZED TOURIST EXPERIENCE ROUTE RECOMMENDATION: İSTİKLAL STREET IN BEYOĞLU

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ABSTRACT

Linear tourist routes in cities are a significant obstacle to spreading social functions such as culture, trade, shopping, and entertainment. To address this issue, the study proposes a novel approach that creates personalized, multi-sensory experience routes to revitalize the interaction between place and tourist. The purpose of the study is to design a route-generation model that draws multi-sensory and personalized experience routes. In addition, the importance of multi-sensory experience associated with the concept of 4E (Entertainment, Education, Esthetic, and Escapist) in tourism is emphasized. The design of the model was carried out with datasets collected from 80 different small and medium-sized workshops in four different themes, each containing 20 points of interest (POI), located in Beyoğlu which is one of the important historical centers of Istanbul. In this way, the route generation model allows tourists to have a multi-sensory experience; it provides personalization according to the content, location, time, and budget preferences of the tourists, and experience routes are drawn. Newly proposed routes for historic city centers aim to provide a more personalized tourism experience by revealing hidden gems based on tourists' senses and 4E preferences.

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INTRODUCTION

The notion of tourism is about seeing and exploring new places, there is a substantial experience in itself. The tourist experience is complex since the way they interact with the place and people encountered, and how they understand it are varied (Sharpley & Stone, 2015, p. 199). A lot of research has been done to define and understand the nature of the tourism experience. Unforgettable or extraordinary experiences that have gained a place in tourists' minds during the journey are emphasized in literature (Cohen, 1979). The importance of the tourist experience carried out during, before, and after participation, increases in literature (Hoarau-Heemstra & Eide, 2016). Tourists become both creators and participants of their experiences. The concept of experience in tourism is closely related to the experience economy. According to Pine and Gilmore (1998), the experience economy consists of four realms: Entertainment, Education, Esthetic, and Escapist (4E). The four realms of experience are explained in detail under the title Route Experience.

At the beginning of the 21st century, a new sustainable, physical, and socially sensitive period started in tourism (Madjoub, 2015, p. 115). The new tourism concept appeals to individual interests rather than package group trips (Poon, 2003, p. 132). Within the framework of this new understanding, it is necessary to draw attention to the role of participants' senses in developing tourism experiences (Agapito et al., 2016; Mateiro et al., 2017; Rahmani et al., 2018). The tourist ceases to be a spectator and starts to become a participant. Therefore, standardized tourism content is replaced by experiences designed according to individual demands. In this new understanding, tourists are stripped of their traditional passiveness. It allows them to accumulate memories appealing to all their senses by communicating with the place and people who shape the experience (Andrades & Dimanche, 2014). A memorable tourism experience is created by encouraging visitors' personal participation based on senses including the individual's senses of taste, hearing, sight, touch, and smell, the situation, and the factors that affect their thoughts and behaviors regarding the city (Ballantyne et al., 2011, Meacci & Liberatore, 2018).

The process sometimes refers to route tourism which aims to link various attractions. The attractions, independently, cannot be able to entice visitors to spend time and money, however, several attraction points having a synergy effect of a route, have greater pulling power (Meyer, 2004). Route tourism also refers to the terms like "themed routes", "trails" and "scenic by-ways" (Hasriyanti et al., 2018; Murray & Graham, 1997). Regarding tourism

experiences, which Schmitt (1999) sees as dynamic, reflective processes, Urry (2002, p. 152) develops the concept of "sensory landscapes" by finding that tourism experiences that only include landscapes are insufficient. Urry demonstrates the importance of including not only landscapes but also other sensory forms in the tourist experience as sensory and perceiving bodies perform. Considering the multisensory nature of tourists' experiences, Dann and Jacobsen (2003) point out that successful tourism destinations should not be content with offering only visual stimuli but should attract visitors by allowing experiences that include all the senses.

When tourists explore the city, they can plan the process according to their goals, preferences, knowledge, economic situation, and time. Some guiding tools are needed to experience the route and to plan it in the best way. These tools can be mobile city guides, route planning applications, information on the websites of municipalities and ministries, travel blog posts, and social media applications (Wang et al., 2010; Yuan et al., 2019). Thus, tourists plan personalized experience routes, far beyond a basic sense of travel by providing personal discoveries where individuals enjoy the city they experience, explore genius loci, and develop intellectual capacities.

Tourism experience covers both senses and behavior (Fesenmaier & Xiang, 2017). This experience involves individuals' sensory and behavioral questioning by creating a relationship between the real world and tourists' self-identities (Aydın & Omuris, 2020; Handler & Saxton, 1988; Pine & Gilmore, 1998). Therefore, individuals need to experience a multi-sensory, memorable, and personalized experience in line with their desires and goals. In addition, it is predicted that the tourism experience which they can plan and personalize will impact accessible, inclusive, suitable, and positive consequences for their well-being. However, recent literature neglects the power of the senses in the tourism experience. Researchers have suggested that one or two senses are related to the tourism experience (Dann & Jacobsen, 2003; He et al., 2019; Kim & Kerstetter, 2016; Su & Zhang, 2020). The paper problematizes the tourism experience which neglects senses and/or focuses on the popular point of interest (POI). Moreover, in this paper, the importance of multisensory experience in tourism is emphasized, and multi-sensory experience integrates with the 4E concept of Pine and Gilmore. In this context, one of the most crowded areas of Istanbul, which has a lot of transformations from the past to the present and differentiated by its social, cultural, and economic structure, personalized experience routes will be drawn in Beyoğlu and Istiklal Streets.

The distant goal of the study is to include a multi-sensory tourist experience in route planning. Based on this goal, this paper aims to produce a route-based generation model and demonstrate the potential of this model. In this regard, the sub-objectives of the paper are;

1) To design a new tourism route generation model that generates personalized experience routes based on multi-sensory experience, location, and time preferences.
2) To produce datasets in Beyoğlu for the proposed route generation model.

The study consists of three main sections as theoretical background, methodology, and findings. Theoretical background focuses on Route Experience, Route Design and general information about (Beyoğlu) the study area. The research methodology reveals the stages of the study and contains the datasets, 4E schemes, and route generation model. The result section evaluates the findings of the multi-sensory tourism experience with the proposed model. In the conclusion part, some predictions and potentials of the proposed model are mentioned to inspire further research.

THEORETICAL BACKGROUND

Route Experience

Current tourism research emphasizes the value of participatory tourism. In tourism, there is a human-centered approach in socio-cultural and technological contexts that participates in all processes, focusing on the design of the tourist experience rather than the design of the destination (Fesenmaier & Xiang, 2017; Panagiotopoulou & Stratigea, 2017; Tussyadiah, 2013). Under the guidance of Smith (2007), who emphasizes that the senses are variable as a product of place and time and draws attention to the historical nature of the senses, the variability of the experiences consisting of these senses also comes to the agenda. While experiences are associated with the person's perception, cognitive processes, and past experiences, designing tourism experiences is associated with getting perceived value and meaning at the time of meeting tourists and destinations (Agapito, 2020; Tung & Ritchie, 2011). The nature of the tourism experience includes environmental, sensory, emotional, and behavioral dimensions (Fesenmaier & Xiang, 2017). Recent research has expanded on the desire of the tourist to relive that experience and share it with the people (Agapito, 2020; Lv et al., 2020). Planned tourism routes on sensory stimuli and experiences, their approaches have resulted in sustainable, more positive tourism experiences for everyone, with individual diversity (Pan & Ryan, 2009; Richards et al., 2010; Small et al., 2012). However, while previous

tourism studies focus on visualization and consumption in destination planning, researchers are now focusing on the fact that the tourist experience is so sense-oriented (Jiang, 2020). Because the senses are considered the basis for how individuals interact with their environment, these interactions determine the quality of experience and the process of making meaning (Goldstein, 2014; Rodaway, 2011). In that regard, senses have gained attention in the participation of tourists in tourism and the conceptualization of experience tourism.

Several events, involving the individual's senses, perception, and cognitive memory in the process of experiencing a destination, include key steps in the design of the tourism experience (Volo, 2009). The main factor influencing tourist satisfaction, engagement, and long-term memory is having a meaningful experience in exploring the area. Pine and Gilmore (1998) emphasize the importance of the experience approach in economics by saying that "The more senses an experience engages, the more effective and memorable it can be." and evaluated the experience economy in four dimensions. This concept has been interpreted concerning tourism and has been the focus of many discussions (Binkhorst & Dekker, 2009; Kim et al., 2012; Mehmetoglu & Engen, 2011; Oh et al., 2007). The importance of the tourism experience has been stated based on the experience evaluation of the individual (Kim et al., p. 13). In these studies, Pine and Gilmore's 4E concept was discussed, and the relationship between tourism and experience, memorable experience tourism, and multifaceted interaction with actors were explained.

Experience, which is relatively a new element in tourism, makes spending time on the routes more adventurous. So, in what sense is the concept of experience new? According to Pine and Gilmore (1998), this innovation is designing, producing (staging), organizing, estimating, and pricing of “experience”; innovation is hidden in the fact that experience has a fundamental strategic concern. According to them, the 4E are Entertainment, Education, Esthetic, and Escapist (Figure 1). They are categorized into two directions; one is from "Passive Participation" to "Active Participation" and the other one is from "Absorption" to "Immersion". Education and escapist experiences represent active participation while entertainment and esthetic experiences represent active participation. In the other direction, education and entertainment (absorption) experiences need to take guests' attention while aesthetic and escapist (immersion) experiences need tourists to be physically a part of it (Loureiro, 2020).

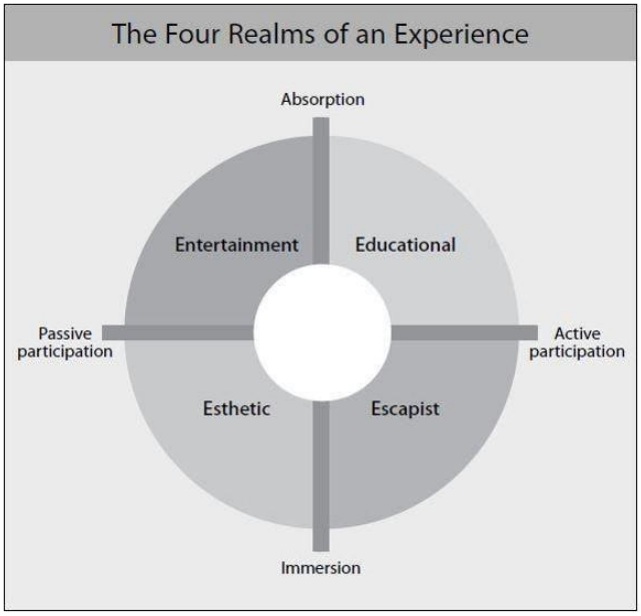

Figure 1. *4E Schemes*

There is a growing demand for the creation of experiences in which the tourist is more participant and interactive (Bruin & Jelinčić, 2016; Buonincontri et al., 2017; Morgan et al., 2009). The quality of experiences helps tourists improve their identity, increase their capabilities, their cultural levels, and explore their unknown values (Mehmetoglu & Engen, 2011; Morgan et al., 2009). Experienced designers need to increase tourists' interaction with destinations, dwellers, and other tourists, to enable tourists to explore a multi-sensory environment, to unlock their creative potential in their experience of tourism (Buonincontri et al., 2017; Cabiddu et al., 2013; Campos et al., 2015). Co-creating interaction between tourist and experience designers is explained in parallel with the "dynamism" of "experience design" (Richards et al., 2010). While the dynamism is increasing, the distinction between designers of experience and tourists is decreasing.

Experiences are first perceived by senses, from several filters (social, cultural values, previous experiences, memories, etc.) in the tourist cognitive process that makes sense or is interpreted (Kim & Fesenmaier, 2016; Tussyadiah, 2013). The process of decision-making and evaluation of the route experience is considered to be related to the experience. However, current research consists of sensory tourism experiences such as smell scapes (Dann & Jacobsen, 2003), soundscapes (He et al., 2019), taste scapes (Su & Zhang, 2020), and tactile, which include the singular or several senses. Although the importance of multi-sensory experience and inclusive tourism approaches is increasing (Agapito & Chan, 2019; Kim & Kerstetter, 2016), investigations into the tourist's multisensory experience are very

limited. The study aims to address this deficiency and to propose a route generation model, in which multiple senses are involved in the tourists' experience process.

Route Design

Nowadays with technology growing rapidly, the demand for tourists changes in both behavioral and experiential aspects (Panagiotopoulou & Stratigea, 2017). Their travel goals tend to experience meaningful, multi-dimensional experiences by switching from the need for "rest" to the demand for "experience and learn" (Small et al., 2012). This tendency is supported by information and communication technologies for tourists who want to explore new places, flavors, cultures, experience, design, and plan experiences. To provide a personalized, dynamic, and flexible multi-dimensional participatory route experience, it is necessary to understand tourist behavior and offer a personalized POI recommendation and travel route planning (Sørensen & Jensen, 2015; Wong & McKercher, 2012). Route personalization is a way to achieve active participation in the route determination process and to increase the quality of experience according to tourist behaviors and preferences.

The diversity between the changing demands and profiles of tourists choose their own set of routes, which they can personalize instead of pre-organized routes or tours (Rodríguez et al., 2012). However, to achieve a personalized route, tourists need to gather a lot of information and plan routes by evaluating many alternatives based on their contact profile. Despite the benefits of information and communication technologies, it is a very complex and challenging business (Rodríguez et al., 2012; Zheng et al., 2017). Many studies are carried out to facilitate routes and to determine the most accurate options between alternatives. Studies on this subject; POI lists are proposed according to different users and preferences and a route is created in this context (Mckercher & Lau, 2008; Tsai & Chung, 2012; Xia et al., 2011; Zheng et al., 2017). Within this scope, there are route planning studies with personalized preferences of tourists such as budget, time, and activity in many different venues and themes.

Lee et al. (2009) in Tainan, the personal choice route is recommended by rating the city's heritage values and gourmet culture based on its popularity. Batet et al. (2012) focused on how to provide personalized recommendations of cultural and leisure activities when tourists arrive at the destination. These and many other studies have focused on different cultural values and themes (Ardissono et al., 2011; Lu et al., 2016; Zheng et

al., 2020). However, the research was conducted on a limited scale, and popular POIs generally, which are regarded as negative in this study.

When the studies in which technology is used actively are examined; it is recommended to provide instant access to spatial, temporal, and POI information, information, and communication technology tools, especially with mobile devices, and to plan routes in line with personal profiles and demands, where the tourist can personalize their experiences. First, the GUIDE system was designed as a mobile tourist guide for Lancaster city tourists (Davies et al., 1999). Schneider and Schröder (2003) propose the "m-To Guide" project, a route is created between the starting and ending points of the travel, providing personal profiles, the purpose of travel, and the opportunity to exchange information for the tourist according to the type of transportation. Another study is "MoreTourism" by Rey-Lopez et al. (2011). This study gives information about tourist sources according to user profile, location information, activity, and time. In the study conducted by Tarantino et al. (2019), a mobile application named 'GENnArí', which can offer personalized multi-day tourist routes, was developed. As seen in the mentioned studies, various algorithmic methods are used in different scales and scopes. In addition, mobile applications are developed that offer route suggestions based on personal preferences based on the people's location and time values.

Furthermore, the most important deficiency in these studies appeals to specific community values when mentioning personal profiles and requests. But people are very diverse, they have different levels of perception, mobility, and cultural levels. To develop recommendations for all in a common language and inclusivity, it is necessary to prioritize perception. However, by creating databases across popular and large-scale POIs in all studies, personalization is recommended and experience quality and levels are ignored. In the context of this paper, the route planning system is being developed over small and medium POIs, focusing on exploring unknown values, rather than popularity, which appeals to multiple senses. In addition, budget, and time (short, medium, and long-term) route alternatives are offered, providing comments and feedback from tourist experiences that are another deficiency from many studies and a self-developing model proposal.

Beyoğlu District

Beyoğlu is one of the central districts of Istanbul, which has witnessed history with its socio-cultural, economic, and political layers, and has many

functions such as culture, art, entertainment, and business. It is at the upper part of Galata, the region determined by Istiklal Avenue, and the streets opening between Tünel and Taksim today (Tekeli & Eyice, 1994, p. 224). Having different ethnic groups throughout history, Beyoğlu has become a region where rich merchant mansions and luxury stores are. The district, which has been changing and transforming in every period of history, is one of the most frequent destinations of tourists with its impressive street structure, bearing the traces of history and the effects of various architectural styles. However, old town taverns, patisseries, passages, and coffeehouses have turned into institutions that bring more profit as a consequence of the change in the socio-economic situation, the increase in the population, and the acceleration of life (Cezar, 1991). Providing social, cultural, and artistic activities and shopping opportunities, where both service and trade units are located, Beyoğlu is offered for consumption with its historical and touristic features.

According to Tanyeli (2017), the inner connection of the actions of "demolish" and "construct"; the necessity of demolishing the old to construct the new, the conditioning of each new to the old, and the liquidation of the old reveals the reality of Beyoğlu. As days pass, Beyoğlu is detached from its historical context and culture; it loses its identity by damaging the sense of belonging. It has started to lose its functional continuity because of the changes in the physical structure of the district and gentrification attempts.

The main street of Beyoğlu is Istiklal Street, which has been called also 'Grand Rue de Pera' (big Street of Pera) and has had a lot of modifications from the 1990s until now. After the 2000s, Beyoğlu municipality led urban renewal projects and capital-oriented urbanization to come to the fore in Istiklal Street (Kartal, 2021). Spatial articulations, demolitions, and regeneration brought about by the social change in Beyoğlu caused the region to take on a new identity. Because the user profile is changing, social disconnections are observed as well. The most important factor at this point is the destructive and transformative effect brought by tourism. In this context, the study focuses on medium and small-scale Music, Art, Design, and gourmet-themed ateliers, which have to change place frequently or close down. They have the potential to reduce the destructive effects of tourism by the fact that they reflect Beyoğlu's unique values and identity.

METHODOLOGY

The method used in the present study consists of a literature review, creating data sets, and drawing the routes (Figure 2). The conceptual framework of the study was developed by researching the existing literature. To determine space boundaries and potential movement lines, a space syntax analysis is used which conducts connectivity and integrity measures of Beyoğlu. This analysis can examine spatiality on different scales, from urban texture to the building scale (Hillier et al., 1976). Spatial boundaries have been determined through "natural movement patterns" of human behavior and pedestrian movements (Hillier et al., 1993)

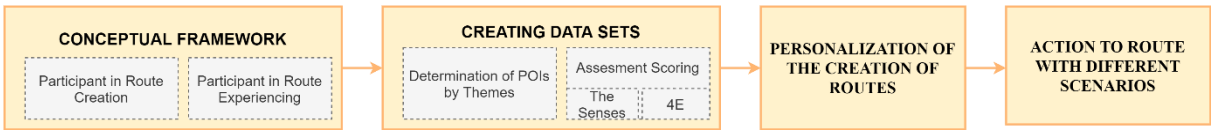

Figure 2. *Research Working Flow*

Accordingly, it is seen that the urban open spaces on Istiklal Street, from Taksim Square to Galata Tower, are well-connected to the surroundings. Within the examined network, physical accessibility and social interaction potential are higher in red, yellow, and green colors, while decreasing through the blue color (Figure 3). Thus, the boundaries of the study area are determined.

The popular POIs are concentrated on certain places (especially Istiklal Street) for tourists in the Beyoğlu district, and the standardized tourist demands prevent tourists from making discoveries about many unknowns of the district (Tekin & Gültekin, 2017; Uysal, 2013). It is observed that small-medium size POIs constitute an important place among these unknowns of the district. This is important for increasing the experience's quality and face-to-face interaction with the visitor (Apostolopoulou & Papadimitriou, 2014; Tzschentke et al., 2008). Norberg-Schulz (1980) named cities' specific characters as "genius loci" which is a phenomenological experience perceived with five senses. In relation, integrating five senses and 4E into the route experience signifies another theoretical limitation.

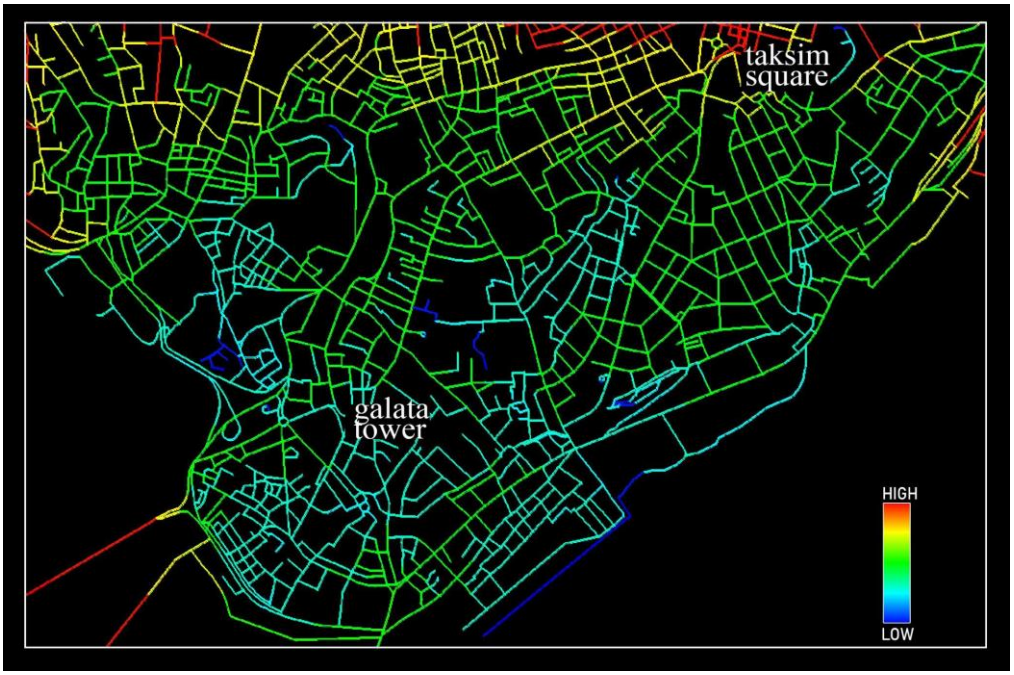

Figure 3. *Space Syntax*

As seen in Figure 4, four main themes were chosen in reference to the common public functions in Beyoğlu. The land use of Istiklal Street is mainly commercial consisting of mostly gastronomy, art, and designer shops. Commercial-residential mixed-use in nearby surroundings with small-scale stores on the ground floors (Beyoğlu Mekansal Strateji Planı, 2023). Consequently, spatial uses of Design, Gourmet, Music, and Art subjects came to the fore and they were chosen as themes of the study area.

Themes	POI (20 POI)	Location	Websites	Information	ASSESSMENT SCORING								
					- 1 2 3 +					0 (None) - 1 (Exist)			
					See	Hear	Smell	Touch	Taste	Education	Entertainment	Esthetic	Escapist
T1 _ Design													
T2_ Gourmet													
T3_ Music													
T4_ Art													

Figure 4. *Dataset Template*

Datasets are developed based on authors' observations concerning real-time and real-place experiences without further participants and 3-point Likert scale scoring system is used (Appendix 1). POIs of each theme are chosen from 20 different small and medium ateliers. Each POI was

evaluated specifically to five senses on a scale of 1-3 and 4E was evaluated on the scales of 0-1. In this manner, entire datasets were created.

About Datasets and 4E Schemes

Within the scope of the proposed model, information about 20 POIs selected in 4 different themes was collected in Beyoğlu and a database was created. In this section, datasets are shown on a map with related 4E schemes. For each dataset, POIs are shown on the map of Beyoğlu with a legend that explains the meanings of sense codes. In the map, each sense has its shape and color code that helps tourists understand which senses selected POI appeal (Wörndlet, Hefele & Herzog, 2017).

When the 4E chart of the Music dataset is created with the information collected from the study area analyzed, the sense of hearing comes to the fore in the entertainment section. Concerts are included in this section. It is also determined that some activities addressed the senses of seeing and hearing together. Instrument and sound training etc. were evaluated under the title of Education and it is observed that these activities can appeal to the see and hear separately and together. The music stores, instrument making, and repair workshops in Beyoğlu are perceived with hear and see senses and offer an esthetic experience to the tourist. Some events offer an Escapist experience. These activities are voice and percussion therapy, and recitals. The sensory combinations were determined as see-touch, hear-touch, and see-hear-touch (Figure 5).

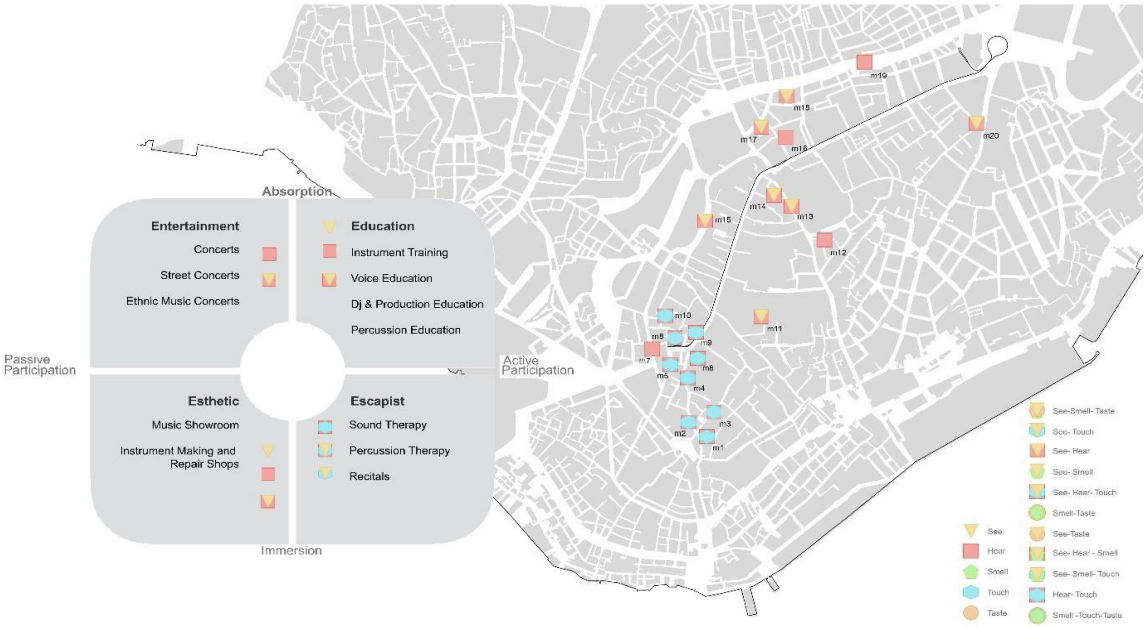

Figure 5. *Music Dataset and Music Route*

When the 4E chart of the Art dataset is analyzed, it is determined that watching a dance show and theatre activities in Beyoğlu are under the title of entertainment and they are perceived by see, hear, and see-hear combination. The activities, which are glass, ceramics education, etc. can be seen under the title of education experience. It has been determined that these activities are perceived mainly by the senses of see, hear, see-hear, and see-smell combinations (Figure 6). Painting, ceramics, etc. exhibition tours are under the title of esthetic experience and they are perceived with the sense of seeing. Dancing, acting, etc. are activities that offer an Escapist experience. These sensory combinations are determined as see-hear-touch, see-touch, see-hear-smell, and see-smell-touch.

Figure 6. *Art Dataset and Art Route*

In the 4E chart of the Design dataset collected in Beyoğlu (Figure 7), the activity that would appeal to the Entertainment experience could not be reached. When it comes to the education experience, jewelry-object design education, architectural design education, etc. are perceived with the senses of see, hear, and see-smell combination. It has been determined that the aesthetic experience can only be perceived with a visual sense in tattoo-piercing, leather exhibitions, fashion workshops, etc. Escapist experience can be experienced with the opportunity to be included in the design process offered by these workshops to tourists. Tourists experience the activity with their sense of see-hear-touch, see-touch, and see-touch-smell.

Figure 7. *Design Dataset and Design Route*

The rich gourmet contents of Beyoğlu reflect the 4E chart of the Gourmet dataset (Figure 8). The Entertainment experience section of the chart consists of local experiences, which are perceived by the senses of see and hear, such as going to the tavern and having a cup of Turkish coffee. On the other hand, activities like cooking and winemaking offer an educational experience that appeals to the see, hear, and smell. It has been determined that the aesthetic experience in the region consists of activities like historical bakeries, wine tasting, etc. These activities are experienced with the senses of see, taste, see-taste, and taste-smell. The tourist can pass from passive participant to active one, which means having an Escapist experience, by cooking local food and participating in activities accompanied by wine tasting. These activities offer experiences perceptible with see-touch-hear, smell-touch-taste, see-hear-smell, and see-touch-smell sense combinations.

About Route Generation Model

With the motivation of filling the gaps both in literature and touristic practices of daily life, a route generation model is proposed. The route can be personalized according to content, budget, time, and location limitations and POIs can be chosen from music, design, art, and gourmet datasets (Figure 9). Tourists are playing an active role both in the route design and route experience stages

Figure 8. *Gourmet Dataset and Gourmet Route*

● Content: Tourists can prefer one or several of the 4E concepts by associating them with the senses. According to their preferences, they will have possible routes that appeal to the feeling, mood, or activeness level that they wish to have.

● Budget: The amount of money that the tourist is expected to spend during the experience is determined by the application. The average budget is calculated for the required and optional expenditures on the route to be tracked. Like public transport fares and the fees for workshop activities that the tourist wants to participate in.

● Duration: Tourists can choose the most suitable time options for transportation, based on their travel period (hourly, daily, weekly) to have maximum experience time.

● Location: Tourist's location and POI locations are determined by application on the map.

The model's main inputs are content, budget, duration, and location limitations. When a tourist chooses any of the 4E concepts, the system retrieves all possible POIs that meet the concept. As the user continues to make choices, the route is drawn according to the user's preferences, and the final generated route is displayed afterward.

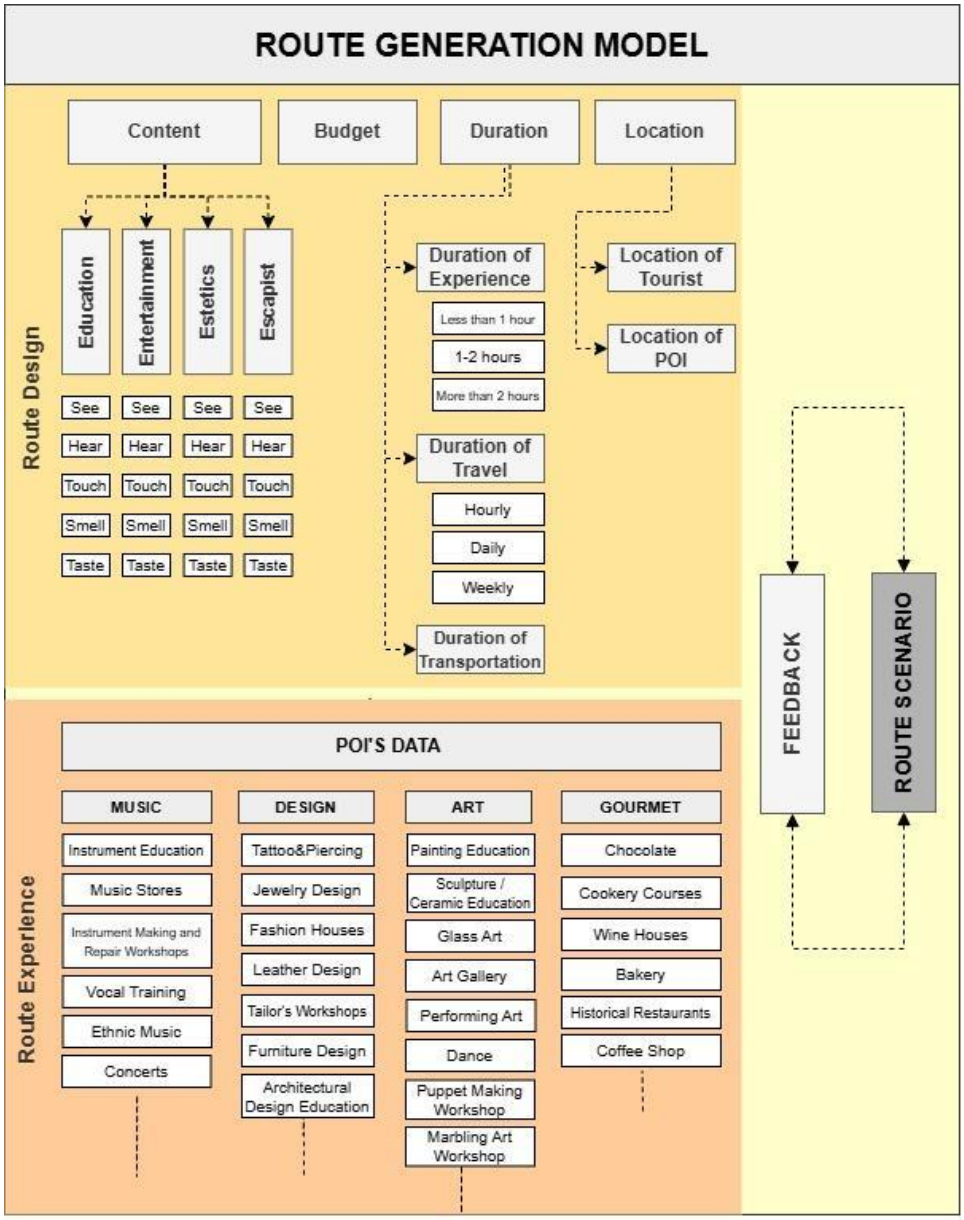

Figure 9. *Two Phases of Route Generation Model: Route Experience and Route Design*

With route preview, it is possible to access general information about POIs, budget, time information, comments, and evaluations made by tourists. This allows the POIs on the route to be moved, added, and removed. To complete the projected processes of the model, the tourists are asked to give feedback to the system with their evaluation and comments (Figure 10). The personalized route generation model, which itself is an element of design, is a kind of application that provides tourists with a multi-sensory experience.

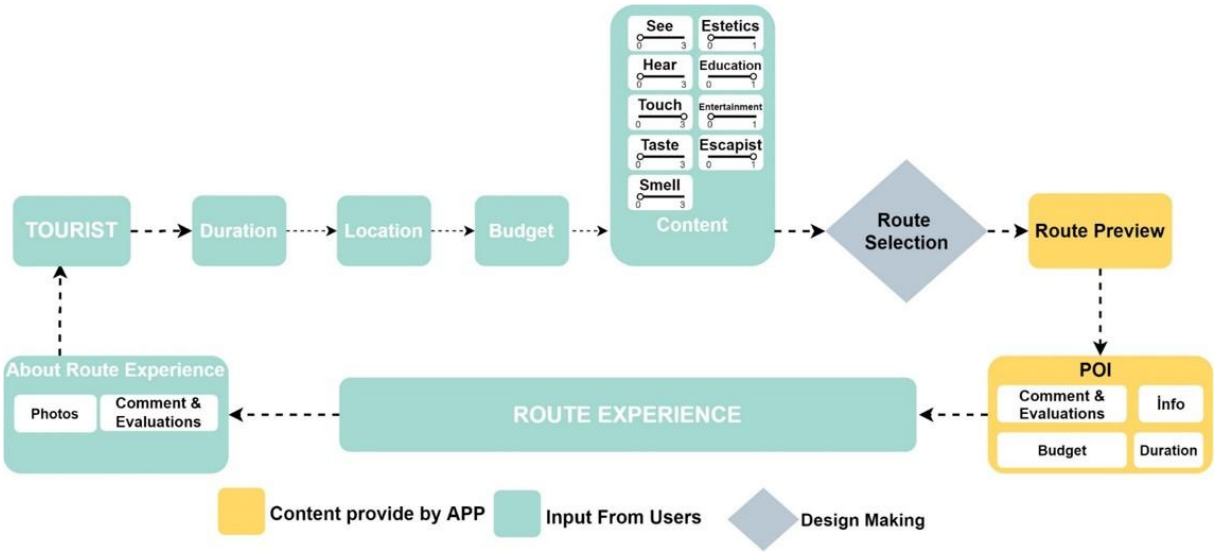

Figure 10. *Route Generation Model Working Flow*

Inspection of SCCs in the study area will be based on Doxey's Irritation Index and Butler's TALC model, which are often taken as bases in the literature (see e.g., Çavuş, 2002; Akdu & Ödemiş, 2018) as depicted in the small red bordered set of studies concerning case areas having both natural and/or cultural characteristics.

FINDINGS

Each dataset of four different themes has the feature of being a route alone. It is also possible to create a route that addresses multiple senses by personalization. Figure 11 shows a possible route scenario that could be generated by using the proposed model. It is a personalized route which is filtered by touch sense and active participation (education and escapist experience) , which is drawn by using the proposed route generator to show how the model works. As can be seen in Figure 11, "Touch" filtering was performed in the POI dataset. Then, POIs were filtered by active participants (Education and Escapist). As a result, a route consisting of 7 different POIs was created by the proposed route generator model for Beyoğlu. It can also continue to filter the route according to other preferences like budget, time, and location. In this way, more personalized routes can be generated with different preferences.

Implications from the dataset and 4E charts created within the scope of the study are:

- Activities of the study area perceived by "touch" sense generally offer an Escapist experience. It is seen that touch sense is mostly ignored in tourism however it has the potential to carry an experience in the most

immerse-active point. The experience of immersive participation with the touch sense creates a more memorable effect. The desire to share the experience with other people and re-experience increases.

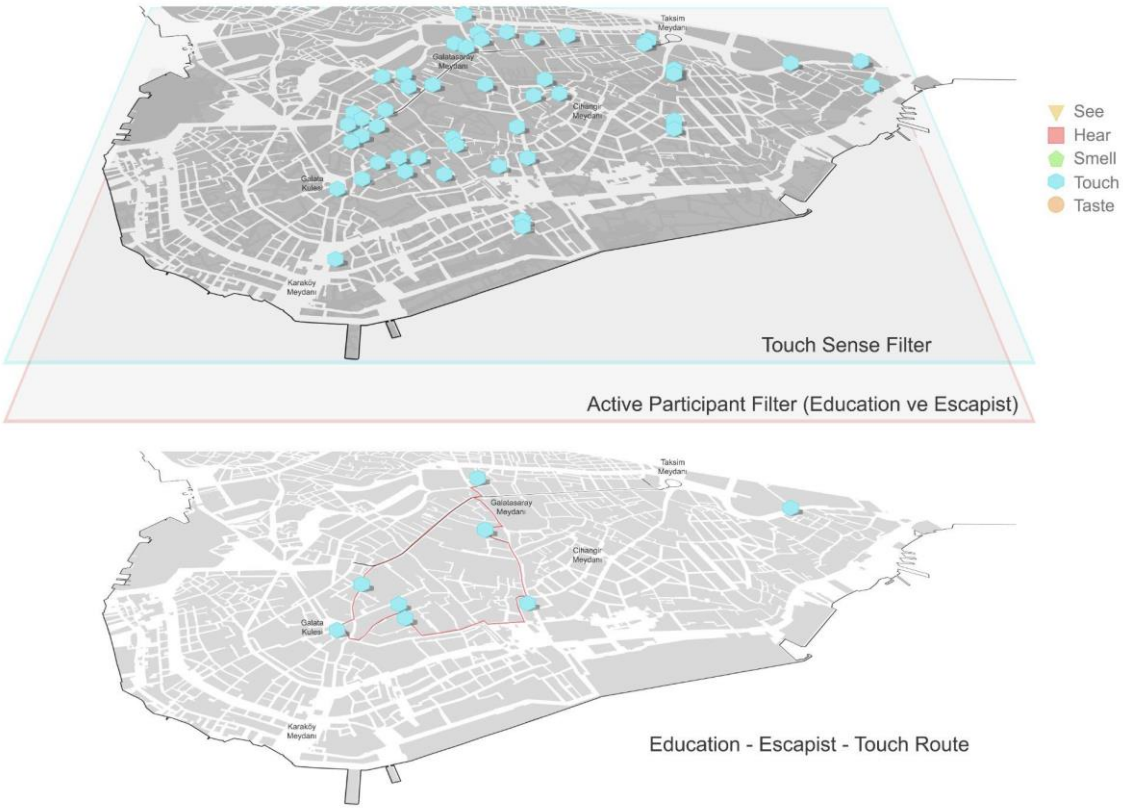

Figure 11. *A Route Scenario Generation (filtered by touch sense and active participation)*

- Activities in Istiklal Street perceived with the senses of see, hear and see-hear combination generally offer Entertainment experience. In this regard, the memorability of the experience and the willingness to re-experience is very low. To improve the entertainment experience in Beyoğlu, it should be supported with a variety of facilities (restaurants, coffee houses, etc.) and see-hear activities.
- Activities perceived by more than two senses generally constitute the Escapist part of the route experience. The tourist interacts with the city as a part of the space in the Escapist experience. By feeling the genius loci, the experience begins to occupy memory and creates a more persistent effect.
- No activity was observed in the Entertainment section of the design dataset. Various supportive and alternative organizations such as fashion weeks and shows, design festivals and biennials, architectural weeks, and arts and crafts festivals should be planned in Beyoğlu.

- Esthetic experience is perceived by only seeing in the themes of art, and design dataset.

In the route generation model, the interaction between Beyoğlu and tourists increases. The findings result in a higher recognition of tangible and intangible values in Beyoğlu as well as provide the city with a competitive advantage and economic improvement. This new route generation model enables tourists to discover unknown values and reduce the devastating impact of tourism in Beyoğlu.

CONCLUSIONS

A tourist route is no longer a simple trip, but an experience that is shaped according to the personal preferences of tourists and includes sensory dimensions. In this sense, the study proposes a prototype which is a new approach for tourist route planning in terms of its applicability in many areas for future studies. It has the importance of being an interdisciplinary study by using today's technologies to offer a better urban experience to tourists, improve the quality of route experience, store, and share information, and add new routes. In this context, the study results are as follows:

- Active tourism requires escapist experience as it supports multiple senses

- Personalized tourism experience draws attention to strengthening the connection between the built environment and the senses.

- It is not just a single sensory stimulus that shapes the experience process, but the interaction of all senses; in this way, tourists have a more comprehensive experience with route designs that allow different combinations of the 4Es.This model, customized according to each tourist's own preferences, has gone beyond standard tourist experiences and created more individual and meaningful results. It has the potential to reduce the negative effects of tourism in the region and contribute to sustainable tourism. The reduction of pressure on popular tourist areas and the discovery routes spread over a wider area have helped to protect the region.

- Tourism experience design should include a comprehensive and holistic multi-sensory approach rather than targeting only one sense, thus creating routes that suit each tourist’s personal preferences and sensory perceptions.

In the future, this model will be tested with more participants and it will superimpose various senses with the help of feedback from tourists. Furthermore, with the proposed route generation model, it is planned to develop a mobile application. The quality of personalized experience routes will be evaluated by the tourists to design a more flexible and more sustainable route generation model with their feedback. From this date onward, the proposed model is ready to be tested in other tourism contexts and cities.

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ENHANCING TOURIST LOYALTY IN PREDOMINANTLY MUSLIM DESTINATIONS: INTEGRATING RELIGIOSITY AND SENSE OF COMMUNITY INTO THE QVSL MODEL

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ABSTRACT

This study explores the formation of tourist loyalty among visitors to predominantly Muslim destinations by integrating the Quality-Value-Satisfaction-Loyalty (QVSL) chain model with the concepts of religiosity and sense of community. Data were gathered from 442 inbound Muslim tourists visiting various destinations in Indonesia. Using Partial Least Squares analysis, the study reveals that incorporating religiosity and sense of community into the QVSL chain model enhances predictions of tourist satisfaction and loyalty. The analysis indicates that tourist loyalty and satisfaction are primarily driven by the quality of experiences at attractions and a sense of community. Additionally, religiosity influences tourist loyalty by strengthening their experiences with halal services and products as well as fostering a sense of community. Theoretically, the extended QVSL chain model, which includes religiosity and sense of community, provides new insights into predicting tourist loyalty to predominantly Muslim destinations. From a managerial perspective, the study recommends that destination managers leverage the benefits of tourists' sense of

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community and religiosity, in addition to offering a comprehensive quality experience.

INTRODUCTION

Halal tourism, which aligns services and products with Islamic principles, has emerged as a significant tourism market in recent years (Ekka, 2023; Juliana et al., 2022). In 2023, the industry was expected to cater to approximately 140 million outbound tourists, valued at over US$ 220 billion (Bahardeen, 2023; Belopilskaya et al., 2020). Reports indicate that around 59% of outbound Muslim tourists visited predominantly Muslim destinations, with only 8% travelling to popular destinations in Europe and the Americas (Bahardeen, 2023; Tan, 2021). Further, among the top 20 Muslim-preferred destinations, only two - Singapore (ranked 11th) and the United Kingdom (ranked 20th) - are not predominantly Muslim (Bahardeen, 2023). Despite the clear preference of Muslim tourists for predominantly Muslim destinations, limited studies have examined this phenomenon. Understanding Muslim tourist satisfaction, which drives their loyalty, is crucial for destination management to develop effective strategies to better serve Muslim tourists (Fajriyati et al., 2022).

Having satisfied and loyal tourists is essential for any business in the tourism industry. In halal tourism, due to the need to adhere to religious teachings, tourists' holistic experiences with both the attractions and the halal products and services offered at the destination are pivotal in creating perceived value, satisfaction, and loyalty (Preko et al., 2020; Suhartanto et al., 2022). The literature on halal tourism indicates that religiosity significantly influences tourist behaviour (Abror et al., 2020; Juliana et al., 2022). Although holistic experiences and religiosity have been reported to impact Muslim tourist behaviour, this behaviour is multifaceted. Past studies (Fajriyati et al., 2022; Han et al., 2019a; Juliana et al., 2022) suggest the need to further explore tourist loyalty and satisfaction within the halal tourism context.

Considering these recommendations, it is argued that not only holistic experiences and religiosity affect tourist loyalty and satisfaction, but also the emotional affiliation with a community, known as a sense of community (McMillan & Chavis, 1986). This concept is relevant as Muslim tourists, despite coming from diverse cultures and countries, share common religious values and principles (Amin et al., 2022; Muflih, 2021). These shared values make Muslim tourists feel connected to predominantly Muslim destinations, fostering a sense of cohesion that influences their behaviour, including their consumption of services and products (Cappelli

et al., 2022; Guachalla, 2022). Therefore, in halal tourism, it is expected that the sense of community plays a significant role in influencing Muslim tourist behaviour.

Driven by these research gaps, this study aims to predict Muslim tourist loyalty and satisfaction when visiting predominantly Muslim destinations by using the QVSL chain model, incorporating religiosity and a sense of community. The QVSL chain model (Cronin et al., 2000; Zeithaml et al., 1996) has been widely used due to its predictive capability across various study contexts (Bhat & Darzi, 2018; Keshavarz & Jamshidi, 2018; Petrick, 2004). This study focuses on Muslim inbound tourists to Indonesia for two reasons. First, Indonesia was ranked as the most preferred halal destination globally in 2022 and 2023 (Bahardeen, 2023). Second, with approximately 234 million Muslims, about 54% of whom are considered middle-income (BPS, 2021), Indonesia's tourism industry benefits significantly from a workforce engaged in halal tourism. Despite being a key market for halal tourism, studies on tourist behaviour in Indonesia are limited. Therefore, examining the context of halal tourism in Indonesia is crucial.

LITERATURE REVIEW AND HYPOTHESIS

Loyalty Theoretical Framework

This study, focusing on Muslim tourist loyalty behaviour, utilises the Expectancy-Disconfirmation Model (E-D) (Oliver, 1980) as its grand theory. This theoretical model explains how the comparison between an individual's pre-consumption expectations and post-consumption experiences of a product or service can result in feelings of satisfaction or dissatisfaction (Oliver, 1980). If the actual experience exceeds prior expectations, the individual experiences positive disconfirmation, leading to satisfaction. Conversely, if the experience falls short of expectations, negative disconfirmation occurs, resulting in dissatisfaction. Compared with other grand theories in the fields of marketing and services, such as Relationship Marketing Theory and Service-Dominant Logic, the Expectancy-Disconfirmation Model is considered more capable of explaining the dynamic influence of expectations and perceptions on satisfaction (Favero et al., 2024). This model effectively elucidates the relationship between expectations, perceptions, and satisfaction, providing a comprehensive understanding of tourist behaviour (Wang et al., 2021).

However, the E-D Model has been noted for its focus on individual experiences and its lack of consideration for external factors that can affect satisfaction with products and services (Granados et al., 2021). Therefore, using this grand theory to explain Muslim tourist loyalty behaviour necessitates complementing it with a more applicable mid-range theory. The author believes that the Quality-Value-Satisfaction-Loyalty (QVSL) Model (Cronin et al., 2000; Zeithaml et al., 1996) is a suitable framework for explaining Muslim tourist loyalty behaviour. Among the mid-range models available to explain loyalty, such as the four-stage loyalty framework (Oliver, 1999) and the tripartite theory-based loyalty model (Li & Petrick, 2008), the QVSL chain model is regarded as both comprehensive and validated by numerous recent studies across various contexts, particularly in the tourism industry (El-Adly & Jaleel, 2023; Granados et al., 2021; Suhartanto et al., 2022).

The QVSL chain model postulates that customer experiences with quality directly influence their perceived value, satisfaction, and loyalty. A tourist's experiential assessment during a visit serves as an implicit evaluation of the ability of tourism services and products to fulfill their travel needs. Consequently, experienced quality directly influences perceived value, satisfaction, and ultimately loyalty (Fajriyati et al., 2022; Petrick, 2004). This step-by-step progression of the QVSL model helps businesses understand how each stage influences the next, allowing targeted improvements (Chen & Chen, 2010; Rombach et al., 2023). Consequently, this model is versatile and applicable across various industries, including both product and service sectors (Keshavarz & Jamshidi, 2018; Petrick, 2004). Nevertheless, while previous studies have highlighted many strengths, the model has been criticized for oversimplifying the complexity of consumer decision-making (Lai et al., 2009; Suhartanto et al., 2022). Thus, various extensions have been developed to improve the predictive power of this model according to study context (Hasan et al., 2020; Lee & Han, 2022; Rombach et al., 2023). In line with the existing studies employing the QVSL chain model, the authors argue that including religiosity and a sense of community in this study, could strengthen the QVSL chain model's predictive power within the context of halal tourism.

Experience Quality in Halal Tourism

Travelers' engagement with a tourism attraction serves as a stimulus that elicits a reaction, manifesting as their experience (Suhartanto et al., 2021). This experience comprises both rational and emotional responses, and

overall enthusiasm for the attraction (Preko et al., 2020), which together influence future behaviour. When examining the experiences of Muslim tourists at a destination, unique motivations come into play. Compared to general tourists, Muslim tourists have a dual motivation: seeking recreation and leisure, as well as appreciating God's creations (Fajriyati et al., 2022; Suhartanto et al., 2021). These driving forces are holistic and inseparable. Therefore, high-quality recreation experiences combined with quality experiences involving halal products and services offer the most experiential potential for Muslim tourists (Abror et al., 2020; Rahman et al., 2020). Empirical studies (Brien et al., 2022; Suhartanto et al., 2022; Suhartanto et al., 2021) report that experience quality from a Muslim perspective consists of two distinct experiences: the experience with the tourist attraction and the experience with halal products and services.

Experience with the Tourist Attraction

Seeking leisure to find a refreshing experience is among the major objectives for visiting a tourist destination. These experiences, focusing on cultural, natural, spiritual, and other attractions, have the potential to refresh a tourist's mind (Preko et al., 2023). Rahman et al. (2020) suggest that unique experiences are necessary for tourists to gain memorable and enjoyable experiences, leading to an increased inclination to revisit and recommend the destination. Past studies investigating halal tourism confirm that a tourist's experience at an attraction significantly shapes their future behaviour (Fajriyati et al., 2022; Suhartanto et al., 2021).

Experience with Halal Products and Services

Based on tourism consumption theory, leisure is complex and influenced by various aspects, including an individual tourist's characteristics and their experiences before and during their visit (Woodside & Dubelaar, 2002). According to this theory, the choice of destination is influenced by the tourists' beliefs, which impacts their evaluations and future behaviour towards that destination. This concept applies to the dual leisure/halal motivations of Muslim tourists. When they seek halal services and products during their visit, the availability and quality of these products and services shape their perceptions, assessments, and attitudes toward the destination. Scholars (Battour et al., 2017; Han et al., 2019b) have reported that religion-related attributes in destinations, such as accessible religion-compliant accommodation and food, significantly impact tourist behaviour. Similarly, studies in Indonesia (Fajriyati et al., 2022; Juliana et al., 2022; Wardi et al.,

2018) highlight the importance of the availability and characteristics of halal products and services in influencing Muslim tourist behaviour.

Perceived Value in Halal Tourism

Tourist perceived value denotes the overall assessment and satisfaction that tourists derive from a particular travel experience or destination relative to the costs incurred (Chen & Chen, 2010). For Muslim tourists, it is a subjective evaluation based on their preferences, expectations, and holistic experiences with both attractions and halal services and products while travelling (Ekka, 2023). Additionally, perceived value is a crucial concept in tourism because it influences tourists' decision-making processes and their likelihood of returning to or recommending a destination (Keshavarz & Jamshidi, 2018).

The QVSL chain model (Cronin et al., 2000; Zeithaml et al., 1996) posits that the quality of the overall tourist experience plays a significant role in shaping how tourists evaluate the value they receive from their trip. Since perceived value is a subjective assessment based on personal experience at a tourism destination, it often results in positive evaluations when the benefits gained from the experience outweigh the costs. Scholars (Juliana et al., 2022) have emphasised that Muslim travelers are more likely to perceive the value of their visit when their experiences with both halal services and products and the attractions are enjoyable and leave lasting impressions. Lastly, quality experiences often create positive emotional connections between tourists and the destination, contributing to a more favourable perceived value (Chen & Chen, 2010; Suhartanto et al., 2022).

H1: Attraction experience quality favourably impacts on perceived value.

H2: Halal experience quality favourably impacts on perceived value.

Tourist Satisfaction

Tourist satisfaction refers to the overall contentment, pleasure, and fulfillment that tourists experience from their travel and tourism activities (Chen & Chen, 2010). This subjective assessment is based on tourists' perceptions and expectations regarding various components of their trip. For Muslim tourists, satisfaction is influenced by several factors, including the quality of services, accommodations, attractions, activities, and the overall destination experience, which encompasses halal services and products (Abror et al., 2020; Suhartanto et al., 2021).

While the QVSL chain model suggests that quality impacts satisfaction indirectly through perceived value, this study argues that experience quality also directly affects tourist satisfaction. This argument is because satisfaction is a subjective evaluation rooted in perceptions and experiences. Therefore, tourists' experiences with the destination are likely to influence their overall satisfaction (Chen & Chen, 2010; Dean & Suhartanto, 2019). When Muslim tourists have positive and enjoyable experiences with both the attractions and halal products and services, they are more likely to express satisfaction with their overall trip. Additionally, if the experience exceeds tourists' expectations and evokes favourable emotions such as excitement, joy, and contentment, this also contributes to their satisfaction (Abror et al., 2020; Granados et al., 2021).

H3: Halal experience quality favourably impacts on satisfaction.

H4: Attraction experience quality favourably impacts on satisfaction.

The QVSL chain model suggests that the perceived value of a visit significantly influences tourist satisfaction. Satisfaction is a subjective assessment based on a person's expectations and experiences, and perceived value plays a crucial role in shaping this assessment (Oliver, 1999). When a Muslim tourist believes they have received good value from a visit, they tend to feel satisfied (Abror et al., 2020; Han et al., 2019a; Suhartanto et al., 2022). A satisfied customer is also more likely to become a repeat and loyal customer (Oliver, 1999). When a Muslim tourist has a positive experience and is satisfied with their visit, they are inclined to endorse the destination and choose it for future vacations (Preko et al., 2020; Wardi et al., 2018), which are strong indicators of loyalty.

H5: Perceived value favourably impacts on satisfaction.

H6: Satisfaction favourably impacts on loyalty.

Sense of Community

The sense of community theory, developed by McMillan and Chavis (1986), describes "a feeling that members have of belonging, a feeling that members matter to one another and to the group, and a shared faith that member needs will be met through their commitment to being together" (p. 9). These scholars suggest that a sense of community is a complex notion comprising elements of influence, group membership, need fulfillment, and emotional connections. This concept encapsulates a social process that leads to increased involvement in a community, resulting in members being more

engaged, supportive, and unified with others (Guachalla, 2022; McMillan, 1996). This sense of community can manifest in various social groups such as organisations, neighbourhoods, and both online and offline communities, including religious groups. Individuals attached to a social group tend to identify not only with the group but also with the group's location, strengthening their willingness to support group interests (Tsai, 2016).

A positive emotional connection with the community can be fostered through a sense of involvement (Guachalla, 2022; Peterson et al., 2008). When Muslim tourists feel connected to a predominantly Muslim destination, they are more likely to associate positive emotions with their experiences at the tourism attractions and with halal products and services, resulting in an overall favourable holistic experience. Additionally, a sense of community strengthens trust among its members (Jason et al., 2016). Therefore, when Muslim tourists feel part of the community at a destination, they may place higher trust in the halal products, services, and tourism attractions, enhancing the overall quality of their tourist experience.

H7: A sense of community favourably impacts halal experience quality.

H8: A sense of community favourably impacts attraction experience quality.

An emotional connection between an individual and an aligned community can be strengthened by fostering a strong sense of community (Lardier Jr et al., 2022; McMillan, 1996). A Muslim tourist who feels a sense of belonging and attachment to a predominantly Muslim destination is more likely to develop positive emotions associated with that destination, thereby contributing to a deeper level of loyalty. When tourists perceive a strong sense of community, they are more likely to become repeat customers (Rosenbaum et al., 2005). Empirical evidence from the online food industry (Suhartanto et al., 2023a) shows that having a strong sense of community positively impacts behavioural intentions. Thus, in halal tourism, it is expected that positive experiences and connections with the predominantly Muslim destination community will foster a desire to revisit the destination, thus increasing loyalty.

H9: A sense of community favourably impacts on loyalty.

Religiosity

Religiosity, as defined by Clayton and Gladden (1974), refers to the level of religious commitment an individual dedicates to the daily practice of their chosen faith. This definition implies that religiosity reflects one's devotion and adherence to God's commands, influencing their thoughts and behaviours (Shah et al., 2020; Tang & Li, 2015). The model of religiosity and consumer decision-making (Islam & Chandrasekaran, 2020) suggests that both attitude and behaviour are affected by religion. The role of religion influencing consumer behaviour has been documented in various contexts (Fajriyati et al., 2022; Suhartanto et al., 2023b). In halal tourism, a Muslim tourist who strongly identifies with their religion may feel a connection and affinity with destinations that share the same religious identity (Souiden & Rani, 2015).

For instance, tourists with a high level of religiosity may feel a kinship with predominantly Muslim destinations due to their shared faith. These destinations typically offer opportunities for religious practices, such as participating in prayers, engaging in religious rituals, and providing halal products and services. These experiences contribute to a Muslim tourist's spiritual well-being and can enhance their loyalty to a destination (Fajriyati et al., 2022; Rahman et al., 2020). Moreover, religiously motivated tourists often seek destinations that align with their ethical and moral values (Muflih, 2021). If a predominantly Muslim destination is perceived as upholding Islamic ethics and principles, Muslim tourists with strong religiosity are likely to feel a greater sense of loyalty to the destination.

H10: Religiosity favourably impacts on loyalty.

Tourists with a strong sense of religiosity adhere to religious guidelines, including dietary restrictions and lifestyle choices (Ekka, 2023; Vargas-Sánchez & Moral-Moral, 2019). In predominantly Muslim destinations, such as many regions in Indonesia, halal services and products are ubiquitous. Muslim tourists tend to have a more positive experience in these destinations as they align with their religious observance and demonstrate cultural sensitivity and respect for Islamic principles (Juliana et al., 2022). Consequently, halal food, lodging, and services offered in these destinations are perceived as valuable and enhance Muslim tourists' spiritual comfort, resulting in a positive overall experience.

H11: Religiosity favourably impacts halal experience quality.

A predominantly Muslim destination is more likely to provide an environment where common religious practices are observed. Tourists with high religiosity may feel at ease and develop a sense of attachment when they witness and participate in familiar religious rituals and practices. Furthermore, Muslim tourists who share religious values and traditions with the locals are likely to experience positive interactions (Fajriyati et al., 2022; Suhartanto et al., 2022). Shared religious beliefs create common ground and facilitate more meaningful and friendly exchanges between tourists and locals, fostering a sense of community. This emotional bond enhances the feeling of connectedness and belonging with the destination, making the experience more enriching and positive for the tourists.

H12: Religiosity favourably impacts on sense of community.

Figure 1 presents the conceptual model for this research, summarizing the proposed relationships between the evaluated variables.

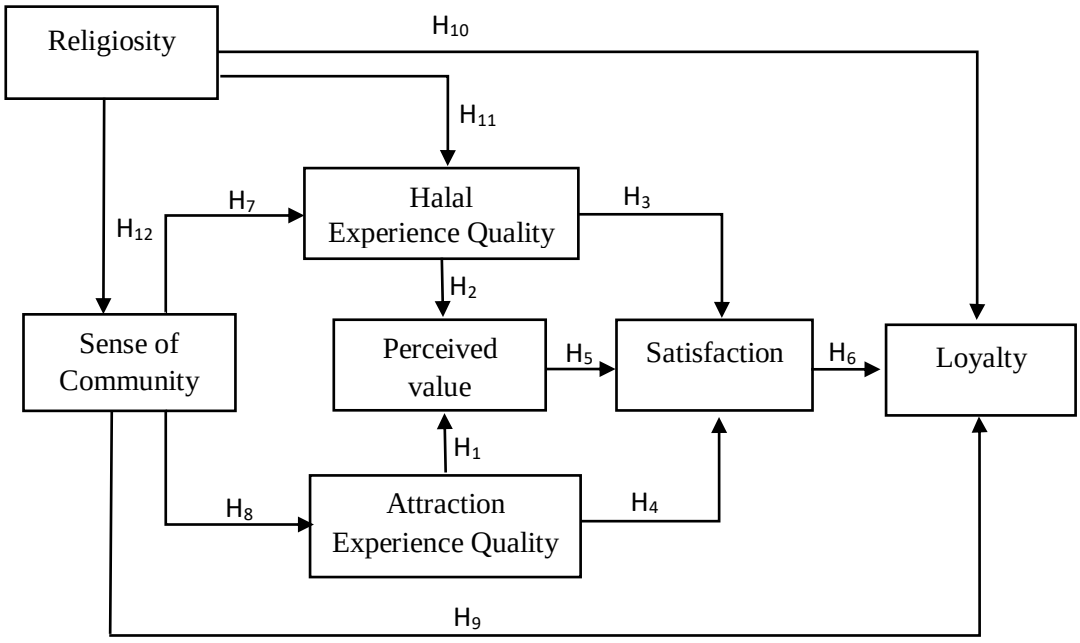

Figure 1. *The extended QVSL chain model in halal tourism*

METHODOLOGY

This study employs a quantitative approach aimed at advancing our understanding of Halal Tourist satisfaction and loyalty, drawing from previous empirical research. The constructs under investigation are rooted in prior studies, with their measurement relying on the development and

validation of items and scales from existing literature. Five indicators adapted from Chen and Chen (2010) assess the quality of tourist experiences with attractions, while the quality of the Halal experience is evaluated through six indicators (Suhartanto et al., 2021). Additionally, tourist loyalty is gauged using four items reflecting intention to revisit and endorse (Fajriyati et al., 2022; Leo et al., 2021). Perceived value and satisfaction are measured with three indicators drawn from prior research (Fajriyati et al., 2022; Suhartanto et al., 2022), while religiosity is assessed using five items adapted from the work of scholars (Abror et al., 2020; Souiden & Rani, 2015). Furthermore, a sense of community is captured through seven indicators in line with existing studies (Kim, 2019; Suhartanto, Dean, et al., 2023).

To ensure the validity of the measurements, the construct items were initially reviewed by three expert scholars in this research area. The questionnaire (Appendix 1) underwent pretesting and piloting with 20 Muslim inbound travelers in Indonesia to ensure clarity and appropriateness. Minor adjustments were made to some instructions and items based on the feedback received during this process, ensuring that the questionnaire effectively aligns with the study's objectives and is easily understood by participants.

The current study focuses on inbound Muslim tourists in Indonesia and employs purposive sampling. Data was collected from three main tourist destinations: Batam, Bali, and the Jogjakarta region. Data collection took place using the attraction intercept method, where questionnaire surveys were administered to tourists exiting attractions in these destinations from June to July 2023. Prospective inbound tourists were approached immediately following their visit to the attraction, and the questionnaire was available in both tablet and printed forms to accommodate respondent preferences. Out of 511 respondents approached, 442 provided usable replies, with 57% opting to respond via tablet and the remainder choosing the printed version. Among the respondents, 48% were Malaysian and Singaporean, with others from Pakistan, Saudi Arabia, Turkey, and other countries. The sample comprised 53% males and 47% females, with 60% aged between 17-29 years, 32% aged 30-40, and the remainder over 40 years old. In terms of education, 13% were high school graduates, and 87% had attained a university level education.

The objective of this study is to examine Muslim tourists' loyalty by integrating the QVSL chain model with religiosity and sense of community. Therefore, this research assesses a theoretical QVSL chain model and its extension in halal tourism, focusing on predicting and testing the

relationships between the construct variables. Accordingly, based on the assertion by scholars such as Hair, Hult, Ringle, and Sarstedt (2017) and Manley, Hair, Williams, and McDowell (2021), the current study applies partial least squares (PLS) modelling to assess the proposed research model and test the hypotheses. PLS modelling was chosen in part to accommodate the abnormally distributed data (Manley et al., 2021), as indicated by skewness and kurtosis values that substantially deviated from zero (see Table 2). Finally, sample summary statistics were computed using SPSS.

RESULTS

Measurement Model

Following suggestions from Kock and Lynn (2012), this research applied a full collinearity VIF to assess common method variance, resulting in a VIF value of 3.791, indicating that collinearity or common method variance was not a significant issue. In evaluating the proposed QVSL chain model (Figure 1), the current study conducted a two-step assessment. The first step aimed to appraise whether the variables used were reliable and valid by assessing the measurement model (Appendix 2). The findings, detailed in Table 2, demonstrate that the validity and reliability requirements for the construct variables are fulfilled (Hair et al., 2017). All items' factor loadings were significant and above the cutoff value of 0.6. Moreover, Cronbach's Alpha and composite reliability (CR) values exceeded 0.7, and the average variance extracted (AVE) was above 0.5. Lastly, discriminant validity checks using the Heterotrait-Monotrait ratio resulted in acceptable values of less than 0.9 (Henseler et al., 2015). This discussion confirms that the validity and reliability requirements of the construct variables employed in this study have been adequately met.

Table 1. *Result of the Measurement Model Check*

Variable/Indicator	Factor Loadings*	Cronbach's Alpha	CR	AVE
Loyalty (Mean: 4.089, Sk.: -1.907, Ku.: 7.128)		0.868	0.910	0.716
- I intend to revisit the destination on my next trip	0.820			
- The destination is a favored choice for my next trip	0.851			
- I intend to endorse the destination	0.871			
- I intend to say positive things about the destination	0.842			
Attraction experience quality (Mean: 4.102, Sk.: -1.646, Ku.: 4.143)		0.866	0.903	0.651
- The attractions were engaging	0.836			

- I had an exceptional experience	0.794			
- The staff offered outstanding services	0.795			
- Enjoying the attractions was invigorating	0.827			
- The attractions offered a new understanding for me	0.780			
Halal experience quality (Mean: 4.514, Sk.: -2.013, Ku.: 5.889)		0.858	0.894	0.585
- I found the halal facilities (e.g., prayer room) easily	0.769			
- The halal facilities were clean	0.759			
- I found halal food & beverages easily	0.787			
- The halal food & beverages suited my taste	0.714			
- The service was consistent with Islamic law	0,772			
- The staff had positive attitudes toward Muslim tourists	0,786			
Perceived value (Mean: 4.003, Sk.: -1.947, Ku.: 6.912)		0.819	0.893	0.735
- Visiting the destination was a fair value for money	0.889			
- The fees for attractions in the destination were reasonable	0.840			
- The attractions in the destination were high-quality	0.843			
Religiosity (Mean: 4.132, Sk.: -2.107, Ku.: 6.170)		0.875	0.909	0.666
- I believe in Allah's existence	0.807			
- I live in according to Islamic teaching	0.776			
- I devote myself to prayer	0.817			
- I believe in Allah's will on everything	0.838			
- I believe that only Allah knows what will happen	0.840			
Satisfaction (Mean: 4.132, Sk.: -1.316, Ku.: 3.105)		0.854	0.911	0.775
- Visiting the destination made me happy	0.891			
- The visiting experience exceeded my expectation	0.843			
- Overall, I was satisfied with the destination	0.905			
Sense of community (Mean: 4.011, Sk.: -2.327, Ku.: 7.801)		0.909	0.928	0.649
- I can fulfil my leisure needs by visiting a Muslim country	0.782			
- I prefer to visit Muslim countries	0.687			
- I feel happy if a Muslim country is prospering	0.824			
- I feel welcome in a Muslim country	0.837			
- What happens to Muslim countries affects me	0.840			
- I partake in any program to back Muslim countries	0.795			
- I feel connected with Muslim countries	0.863			

**significant at p<0.01, Sk. = Skewness; Ku. = Kurtosis

Structural Model

Based on the PLS-SEM analysis with 5,000 bootstrapping iterations, the model exhibits a goodness of fit of 0.563, indicating satisfactory model (Hair et al., 2017). The R^2 for loyalty in the complete model is substantial at 61.1%, suggesting that the constructs in the model explain a significant portion of variance in loyalty among Muslim tourists in predominantly Muslim destinations (Manley et al., 2021). Excluding religiosity and sense of community slightly reduces the explanatory power, with R^2 for loyalty decreasing to 58.6%. The predictive relevance (Q^2) values for Satisfaction (Q^2 = 0.381) and Loyalty (Q^2 = 0.401) indicate that the model has strong predictive power (Hair et al., 2017). Additionally, the average full collinearity variance inflation factor (VIF) of less than 3.3 suggests no issues with multicollinearity among the variables (Hair et al., 2017). Overall, these results indicate that the integrated QVSL chain model, incorporating religiosity and sense of community, effectively explains tourist loyalty.

Table 2. *Result of Testing Hypothesis*

Relationship (Hypothesis)	***β***	**t-value**	**Decision**
Attraction EQ => Perceived value (H1)	0.629	15.356**	Supported
Halal EQ => Perceived value (H2)	0.207	4.479**	Supported
Halal EQ => Satisfaction (H3)	0.133	3.043**	Supported
Attraction EQ => Satisfaction (H4)	0.413	7.981**	Supported
Perceived value => Satisfaction (H5)	0.360	7.465**	Supported
Satisfaction => Loyalty (H6)	0.642	15.756**	Supported
Sense of community => Halal EQ (H7)	0.715	21.279**	Supported
Sense of community => Attraction EQ (H8)	0.626	15.820**	Supported
Sense of community => Loyalty (H9)	0.190	4.116**	Supported
Religiosity => Loyalty (H10)	-0.002	0.052	Rejected
Religiosity => Halal EQ (H11)	-0.040	0.686	Rejected
Religiosity => Sense of community (H12)	0.335	4.609**	Supported

**significant at p<0.01; EQ: Experience Quality

Table 3 illustrates the significant effects of attraction experience quality (β = 0.629) and halal experience quality (β = 0.207) on perceived value, supporting hypotheses H1 and H2. Similarly, both attraction experience quality (β = 0.133) and halal experience quality (β = 0.413) significantly influence satisfaction, thereby supporting hypotheses H3 and H4. Furthermore, the impact of perceived value on satisfaction (β = 0.360) and satisfaction on loyalty (β = 0.642) are also significant, reinforcing

hypotheses H5 and H6. Moreover, the effect of a sense of community on halal experience quality (β = 0.715), attraction experience quality (β = 0.626), and loyalty (β = 0.190) is significant, verifying hypotheses H7, H8, and H9. However, the impact of religiosity on loyalty (β = -0.002) and halal experience quality (β = 0.040) is not significant, whereas its impact on a sense of community (β = 0.335) is significant. Therefore, hypotheses H10 and H11 are not supported, but H12 is supported. These findings underscore the critical roles of attraction and halal experience quality, perceived value, satisfaction, and a sense of community in influencing Halal tourist behaviour and loyalty.

To comprehensively understand the impact of determinant variables on satisfaction and loyalty, a total effects analysis was conducted. The results in Table 3 demonstrate that while all determinants have a significant total effect on satisfaction and loyalty, attraction experience quality, sense of community, and perceived value are particularly influential.

Table 3. *Total Effect of Determinant Factor*

Determinant factor	Satisfaction		Loyalty	
	β	t-value	*β*	t-value
Attraction EQ	0.640	13.826**	0.410	9.456**
Halal EQ	0.207	4.416**	0.133	4.416**
Perceived value	0.360	7.465**	0.231	6.689**
Religiosity	0.175	3.667**	0.175	2.643**
Sense of community	0.548	12.958**	0.542	12.958**

**significant at p<0.01

DISCUSSION AND IMPLICATIONS

Firstly, an important finding of this research is that the QVSL chain model (Cronin et al., 2000; Zeithaml et al., 1996), both in its original form and when expanded, demonstrates adequate goodness of fit. For Muslim tourists visiting predominantly Muslim destinations, this suggests that positive experiences, including those from tourism attractions and high-quality halal products and services, enhance perceived value and satisfaction. These positive experiences build tourists' commitment, intention to revisit, and willingness to promote the destination. The study's results align with previous research in various tourism contexts (El-Adly & Jaleel, 2023; Granados et al., 2021; Suhartanto et al., 2022). Additionally, the extended QVSL model highlights the crucial role of religiosity and a sense of community in shaping Muslim tourist satisfaction and loyalty. This research shows that religiosity and a sense of community positively impact

Muslim tourists' satisfaction, with religiosity's impact on loyalty mediated by its influence on community sense and experience quality related to halal products and services.

Secondly, the study emphasises that Muslim tourists' loyalty to predominantly Muslim destinations is most influenced by a sense of community, despite all model drivers having a favourable total impact on loyalty. This outcome corroborates past research in service contexts (Rosenbaum et al., 2005; Suhartanto et al., 2023a), suggesting that shared cultural and religious values with the destination create comfort and a sense of belonging. The availability of halal services, products, and religious facilities such as mosques, which align with their beliefs, enhances the travel experience (Battour et al., 2017; Rahman et al., 2020). This finding implies that Muslim tourists prioritize destinations that respect and integrate their values and beliefs into the local culture. Travelling to a destination where the majority shares their religion provides emotional and social connections, reducing potential discomfort and enriching the overall travel experience (Fajriyati et al., 2022; Preko et al., 2020).

Thirdly, the study reveals that the quality of tourism attractions has a stronger impact on loyalty and satisfaction than the quality of halal services and products, aligning with previous studies (Fajriyati et al., 2022; Suhartanto et al., 2022; Suhartanto et al., 2021). While halal products and services are crucial for fulfilling religious needs (Battour et al., 2017; Juliana et al., 2022; Wardi et al., 2018), Muslim tourists prioritize the overall leisure quality. They seek a holistic travel experience that includes immersion in local attractions, traditions, and culture, which can be achieved through visiting tourist sites and participating in cultural activities. Although halal products and services and perceived value remain important, the desire for enriching, high-quality travel experiences lead Muslim tourists to prioritize the quality of their interactions with tourism attractions in predominantly Muslim destinations.

Lastly, the study provides important insights into the role of religiosity. While it does not have a significant direct impact on loyalty, as reported in past studies (Juliana et al., 2022; Muflih, 2021; Suhartanto et al., 2023b), its total effect on loyalty is significant, though smaller compared to other determinants. The research suggests that the effect of religiosity on tourist loyalty is less important than other factors. This can be explained by Indonesia's rich cultural, natural, and manmade attractions, which may attract Muslim tourists primarily for leisure reasons such as exploring historical sites, enjoying natural landscapes, and engaging in recreational

activities. Since leisure is a primary motivation, the appeal of these diverse offerings may outweigh the influence of religiosity. Nonetheless, Indonesia, being a predominantly Muslim country, is well-equipped to meet the religious needs of Muslim tourists with widely available prayer facilities, halal food, and other religious accommodations (Abror et al., 2020; Juliana et al., 2022). Since these religious services are ubiquitous in predominantly Muslim destinations, they are often considered basic services and thus less significant in influencing loyalty on their own.

Theoretical Implications

Several key theoretical insights can be drawn from this study. First, it confirms the application of the QVSL chain model (Cronin et al., 2000; Zeithaml et al., 1996) in the context of halal tourism. This study supports the suitability of this model, extending its application beyond general products and services to a tourism context, specifically halal tourism. An important contribution of this research is that the expanded QVSL chain model demonstrates acceptable goodness of fit, indicating that including factors such as religiosity and sense of community improves the original QVSL chain model. Theoretically, this expanded model is significant as it enhances the prediction of loyalty, a direction that previous studies have not explored.

Second, this study offers important implications for the sense of community theory (McMillan & Chavis, 1986). It confirms that, for Muslim tourists visiting predominantly Muslim destinations, a sense of community influences loyalty behaviour, aligning with findings from past studies (Rosenbaum et al., 2005; Suhartanto et al., 2023a). This research goes a step further by highlighting that the influence of a sense of community on loyalty is both direct and through the enhancement of the tourist experience related to attractions and halal services and products. Lastly, the significant effect of religiosity on the sense of community is another noteworthy contribution. Theoretically, this finding broadens the understanding of the antecedents of the sense of community construct, extending beyond the general values, self-efficacy, and social identification identified in previous research (Kutek et al., 2011; Mannarini et al., 2019).

Managerial Implications

First, the data analysis in this study highlights that the quality of attraction experiences is a crucial factor in fostering loyalty among tourists to predominantly Muslim destinations. These findings provide essential

guidance for destination managers to enhance tourist loyalty by focusing on improving the quality of attraction experiences. To achieve this, it is recommended to create attractions that are not only engaging but also educational and enriching. Practical steps include incorporating interactive exhibits, offering guided tours with professional guides who provide deep cultural insights, and ensuring that facilities such as prayer rooms and halal food options are readily available. Additionally, it is essential to train staff to deliver exceptional service to ensure that every interaction with tourists is positive and memorable. By focusing on these areas, managers can create a holistic and high-quality travel experience that resonates with Muslim tourists, thereby increasing their satisfaction and loyalty.

Second, this study underscores the importance of the sense of community in building loyalty among Muslim tourists to predominantly Muslim destinations. These findings provide direction for destination managers to foster a sense of community by creating an environment where Muslim tourists feel valued and connected. Practical steps include organizing community-centered events and cultural programs that highlight shared values and experiences, such as religious festivals, cultural tours, and activities that involve residents and tourists. Active participation in these activities will enhance tourists' sense of belonging and commitment to the destination. Providing religious facilities such as prayer rooms and halal food options, as well as having staff who are sensitive to tourists' needs, is also crucial. By creating an inclusive atmosphere, managers can strengthen the emotional and social bonds between tourists and the destination, ultimately increasing satisfaction and encouraging repeat visits and recommendations.

Third, perceived value is another important factor influencing the satisfaction and loyalty of Muslim tourists. These findings suggest that destination managers should focus on providing high-quality attractions at reasonable prices to ensure that tourists feel they are getting substantial value for their money. Key strategies include regularly evaluating and adjusting pricing to remain competitive, offering bundled packages or discounts for families and groups, and continuously maintaining and improving the quality of attractions. Transparent pricing and clear communication about what are included in the ticket fees can also enhance perceived value. By ensuring that tourists feel they are receiving excellent value, managers can increase satisfaction and encourage repeat visits and positive word-of-mouth recommendations toward predominantly Muslim destinations.

Limitations and future research

While providing valuable insights into the loyalty of Muslim tourists visiting predominantly Muslim destinations, this study has several limitations. First, the generalizability of the findings is limited because the study sample is not fully representative of all Muslim inbound tourists in Indonesia. Future research should re-test the model with samples from diverse geographical areas. Additionally, assessing the proposed model in other religious contexts, such as Christianity, Hinduism, and Buddhism, would enhance our understanding of the expanded QVSL chain model. Lastly, the R^2 value suggests that other factors could potentially explain tourist loyalty. Therefore, incorporating elements such as trust, destination image, and demographic factors (Gayo, 2022; Jason et al., 2016) could further expand the loyalty model and improve its explanatory power.

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APPENDIX 1: THE QUESTIONNAIRE

Please provide your approval for the following statements.

1. Strongly disagree.
2. Disagree
3. Neither agree nor disagree
4. Agree
5. Strongly agree

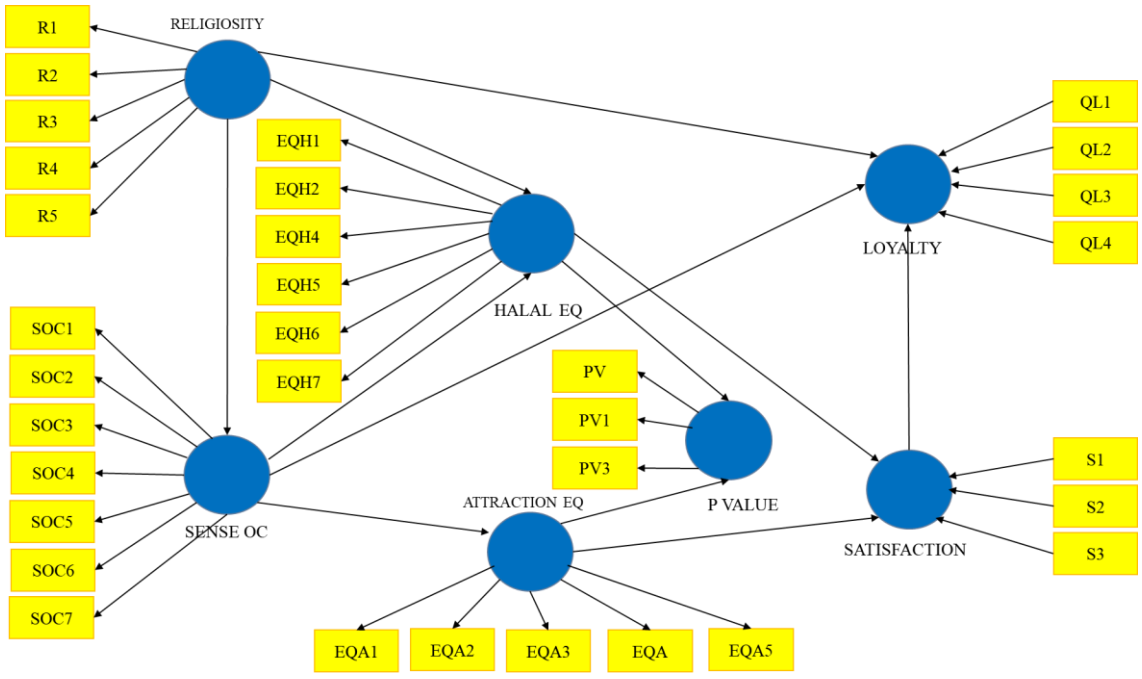
Your attraction experience	1	2	3	4	5
1. The attractions were engaging					
2. I had an exceptional experience					
3. The staff offered outstanding services					
4. Enjoying the attractions was invigorating					
5. The attractions offered a new understanding for me					
Your perception on halal experience	1	2	3	4	5
1. I found the halal facilities (e.g., prayer room) easily					
2. The halal facilities were clean					
3. I found halal food & beverages easily					
4. The halal food & beverages suited my taste					
5. The service was consistent with Islamic law					
6. The staff had positive attitudes toward Muslim tourists					
Your perceived value	1	2	3	4	5
1. Visiting the destination was a fair value for money					
2. The fees for attractions in the destination were reasonable					
3. The attractions in the destination were high-quality					
Your religiosity	1	2	3	4	5
1. I believe in Allah's existence					
2. I live in according to Islamic teaching					
3. I devote myself to prayer					
4. I believe in Allah's will on everything					
5. I believe that only Allah knows what will happen					
Your sense of community	1	2	3	4	5
1. I can fulfil my leisure needs by visiting a Muslim country					
2. I prefer to visit Muslim countries					
3. I feel happy if a Muslim country is prospering					
4. I feel welcome in a Muslim country					
5. What happens to Muslim countries affects me					
6. I partake in any program to back Muslim countries					
7. I feel connected with Muslim countries					

Tour satisfaction	1	2	3	4	5
1. Visiting the destination made me happy					
2 The visiting experience exceeded my expectation					
3 Overall, I was satisfied with the destination					
Your loyalty	1	2	3	4	5
1. I intend to revisit the destination on my next trip					
2. The destination is a favored choice for my next trip					
3. I intend to endorse the destination					
4. I intend to say positive things about the destination					

Demographic Factor:

1. Gender
2. Age
3. Education
4. Country of Origin

APPENDIX 2: PLS MODEL



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