



Refining Technology Adoption Model in Tourism-Culture-Museum and Mainstream Service Industries: A Bibliometric Analysis

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ABSTRACT

Information and communication technologies play a crucial role in the development of tourism and service industries. Continuous innovation and the extension of technological knowledge are essential for adoption. This study critically evaluates the evolving structure and latest trends of the Technology Acceptance Model (TAM) by reviewing relevant studies in tourism-related and mainstream service industries. Sixteen SSCI journals were selected, encompassing all TAM-related articles. The research employs descriptive statistical analysis using CiteSpace and content analysis to identify similarities and differences between the two fields. The longitudinal review spans five decades, identifying shared moderators, mediators, and variables in existing TAM research. Findings highlight the integration of TAM in notable studies using the 4Es (Engagement, Efficacy, Enjoyment, and Experience) attributes. Additionally, the study reveals differences between the tourism-culture-museum area, which focuses on Extended Reality (XR), and the mainstream service area, which explores diverse innovations. This study quantifies innovation applications, presents TAM thrusts and generations, and itemizes all TAM attributes. A novel TAM variant is proposed to refine the framework, embedding the 4Es and obstructive factors, and emphasizing emotional, social, and control factors.

KEYWORDS

Technology acceptance model; Tourism-culture-museum; mainstream service industry; bibliometric analysis

Introduction

Technologies are new drivers of economic and industry development, perceived as facilitators in the mainstream service industry. Technology adoption is the first step to harness its power, with theoretical underpinnings such as the Technology Acceptance Model (TAM), Theory of Planned Behavior (TPB), Innovation Diffusion Theory (IDT), and Unified Theory of Acceptance and Use of Technology (UTAUT) guiding adoption decisions (S. A. Lee, 2018). TAM, in particular, is continually evolving based on current innovations, with

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researchers enriching its antecedents and developing more evolved versions across various industries.

Tourism, a significant branch within the broader service industry, fosters collaborations across various sectors, particularly between high-tech producers and tourism researchers. The Tourism-Culture-Museum (t-c-m) model integrates the domains of tourism and hospitality, cultural tourism, and museums, encompassing key sections within the tourism industry. Innovative products, especially in museums, play a pivotal role in enhancing the cultural tourism experience through their educational functions (Jung et al., 2015). Immersive technologies, for instance, augment reality by superimposing images or videos, allowing tourists to deeply engage with historical architectures and activities, thereby making their journey more enjoyable and captivating (Jung et al., 2015).

In contrast, the mainstream service industry has extensively improved, collaborated, and utilized innovation, with a substantial body of research on TAM published in mainstream service journals. This extensive knowledge base serves as a valuable resource for future tourism studies, offering suggestions and research directions. To advance the development of TAM in the t-c-m fields, this study aims to discern the differences in the TAM development process between the t-c-m field and the mainstream service sector. This study is pioneering in integrating review findings from both industries, providing a comprehensive understanding of TAM's application in the t-c-m context.

Despite the significant advancements in both fields, limited research has compared the Technology Acceptance Model (TAM) in tourism and mainstream service sectors. This study aims to bridge this gap by enhancing our understanding of the differences and similarities between these areas, thereby supplementing the existing body of knowledge in the Tourism-Culture-Museum (t-c-m) domain. To keep pace with recent technological advancements, this research meticulously examines TAM-related studies from both tourism and mainstream service sectors.

In pursuit of theoretical advancements, this research establishes the following objectives.

- To investigate the evolving structure and newest trends of TAMs
- To identify shared moderators, mediators, and variables in TAM in both the mainstream and tourism industries.
- To refine TAMs in a novel variant.

This study aims to offer holistic and up-to-date knowledge about the evolving TAMs in two fields. The results would assist investigators to grasp better and operationalize the constructs to be applied in future research dealing with technological adoption or commercializing

innovative products. The results advance the TAM knowledge of the latest situation in two industries, trace the development process of TAM, and provide practical and academic recommendations for future studies.

Literature review

To address the knowledge gap regarding the milestones and periodic thrusts of TAM development in the post-2000s, this study extends the review of TAM research from the 1970s to 2022. The present study summarizes the trends in TAM studies, delineating the reviewed period into five generations, each characterized by distinct focal points and peculiar attention.

The 1st generation (1970–1980 as embryonic period)

In 1975, Fishbein and Ajzen developed the Theory of Reasoned Action (TRA) to investigate personal attitudes toward behavior and understand behavioral intentions. The original framework comprises three major constructs: attitude, belief, and behavior. System and product design serve as external stimuli that affect user perceptions regarding system utilization. These prominent perceptions, in turn, influence users' attitudes toward engaging in certain behaviors. The causal flow is posited on the rationale of the theory of attitude, encompassing design characteristics that influence usage behavior from a psychological standpoint.

In the mainstream service domain, Bansal and Taylor (1999) reviewed TRA-related studies from 1970 to 1980, highlighting the significance of perceived behavioral control in predicting behavior intentions and real actions. Evolved from TRA, the Theory of Planned Behavior (TPB) maintains both behavioral and normative belief-based structures (Taylor et al., 2006), emphasizing the level of difficulty or ease in performing the behavior. One construct in TPB is perceived behavioral control, which contains two aspects: self-efficacy and facilitating conditions. These notions are critical constructs in the subsequent development of TAM attributes in mainstream service and t-c-m studies after the 1980s. The incorporation of perceived behavioral control distinguishes TPB from TRA.

Ajzen (1980) further proposed subjective norms as another factor, based on viewpoints toward particular actions from the most intimate social circle. The concept of subjective norms is widely debated as a significant determinant of social influence (Y. Lee et al., 2006). Social influence heavily relies on input from individuals closest to us, who play a crucial role in shaping our decisions regarding technology adoption (Ikhsan, 2020). Particularly for inexperienced items, in the early stages, the subjective norms construct is a critical determining factor. In contrast to voluntary contexts, the subjective norms construct

exerts greater predictive capability for intention in mandatory situations; however, its impact gradually weakens over time.

Together with the above two attributes, Ajzen (1980) proposed that subjective norms as another factor is based on viewpoints toward particular action from the most intimate social circle. The concept of subjective norms is widely debated as a significant determinant of social influence (Y. Lee et al., 2006). SI heavily relies on input from individuals closest to us, who play a crucial role in shaping our decisions regarding technology adoption (Ikhsan, 2020). Particularly for inexperienced items, in the early stage, the subjective norms construct is a critical determining factor. In contrast to the voluntary context, the subjective norms construct exerts greater predictive capability for the intention in the mandatory situation; however, its impact is gradually weakening over time.

TRA and TPB are widely recognized models employed to elucidate individual behavior, while TAM represents an advancement of TRA specifically in the context of information technology adoption. TAM builds upon TRA and posits that Behavioral Intention comprises two key components: Attitude toward Behavior and Perceived Usefulness, as established by Davis' seminal research in 1985. According to TAM, when users exhibit a favorable Attitude and perceive high levels of Usefulness, their inclination to adopt a technology increases significantly, ultimately leading to its widespread acceptance.

Davis (1986) is the founder of TAM and his research team proposed two external variables in the 1980s, Perceived Usefulness (PU) and Perceived Ease of Use (PEU), which influence technology acceptance decisions. Based on actual usage outcomes, TAM can predict about 40% of technology adoption (Adov et al., 2020), thus further proving the validity of this theory by quantitative data.

However, theory and psychometrics are ambiguous as they pose a challenge to differentiate the direct influence of subjective norms on behavioral intentions from the indirect impact via attitude (Davis et al., 1989). Moreover, Oliver and Bearden (1985) suggested that attitude could potentially influence subjective norms. To address this issue, TAM omits the subjective norm, and subsequently, Venkatesh and Davis (1996) argued that attitude cannot fully mediate in the relationships between PEU/PU and behavior, so an adjusted version of TAM eliminates the construct of attitude.

Y. Lee et al. (2003) conducted a comprehensive review of mainstream related to TAMs development in chronological order before 2000. Y. Lee et al. (2003) conducted a comprehensive analysis of 101 articles, examining the evolution of TAM, highlighting previous discoveries, and outlining notable accomplishments. Their work marks an initial step toward utilizing this model to gain insights into decision-making processes related to the adoption of technological products. In Figure 1, TAM development in the mainstream from the 1980 to pre-2000 has been generalized into four

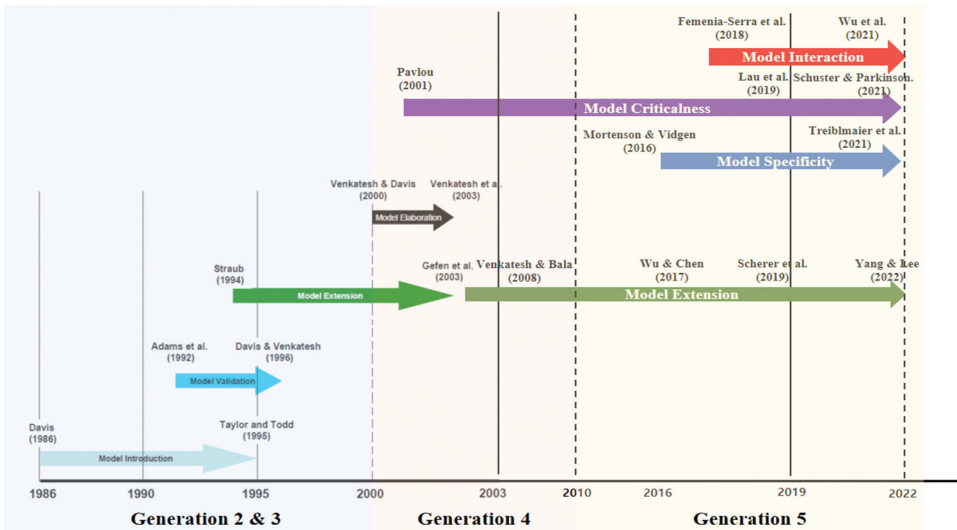


Figure 1. Key attention on the chronological progress of tam-related research 2.2 the 2nd and 3rd generations (1980–2000; dominated attributes – PU & PEU).

stages – introduction, validation, extension, and elaboration. During the third generation, prior studies merely stopped at forming the model and testing its feasibility. Lee observed that numerous studies on TAM only make small improvements through replication and minor modifications. Additionally, the focus on TAM diverts researchers' attention from other research topics and hinders the progress of alternative theories. The majority of TAM studies provides a limited level of contribution due to inadequate effort input, and the simplicity of TAM negatively affects its practicality as it solely focuses on exploring usefulness and ease of use, which may prove insufficient. Until 2000, TAM researchers realized the significance of extending the framework and evolving the model to match its practical application scenario.

The 4th generation (2000–2010; external attributes about PU)

TAM research is primarily driven and guided by a series of models developed by Venkatesh. Early in this era, Venkatesh and Davis (2000) introduced five additional external variables to the main variable – PU. One of sub-variables pertains to the internal situation of decision-makers, which can be linked to Fishbein and Ajzen's subjective norm concept from the 1970s. This factor – subjective norm is a variable that influences an individual's perception of usefulness toward new technology and subsequently impacts their usage intention. The decision maker's norm is still susceptible to external influences such as important referents' thoughts and motivations, as highlighted by Ajzen (1991).

Additionally, Venkatesh et al. (2003) consolidated eight crucial features to establish Unified Theory of Acceptance and Use of Technology (UTAUT) for understanding technology acceptance. During the late 2000s, additional external variables for another main variable – PEU are expanded and detailed (Venkatesh & Bala, 2008). They concluded that by utilizing the third generation of TAM, managers can effectively determine appropriate measures to reduce resistance toward innovative information technologies and maximize their utilization, thereby enhancing understanding of constructs that positively influence usage behavior. In 2010, Venkatesh conducted a comprehensive investigation on UTAUT and discovered that the explanatory power of these separate features varies from 17% to 53% when using different information technologies. UTAUT comprises four external variables and four moderating factors (Venkatesh & Zhang, 2010).

The UTAUT, which merges Innovation Diffusion Theory (IDT), Theory of Reasoned Action (TRA), and Social Cognitive Theory, incorporates constructs previously utilized in these theories. Venkatesh further extended UTAUT in 2010 to increase the explanatory power of variance in behavior intention from 56% to 74% by incorporating price value, habit, and hedonic motivation.

The 5th generation (2011–2022; specificity, criticalness, and interaction)

The incorporation of Roger's classical innovations theory (DIT) into the theoretical framework of TAM during this period has also embraced the concept of diffusion (Chen & Chen, 2021). Diffusion refers to the process by which technology is disseminated among members of a social system through various channels over time (Sahin, 2006). Many studies on diffusion often employ the term “innovation,” thus considering technology and innovation as interchangeable terms (Rogers et al., 2014).

Mortenson and Vidgen (2016) conducted a comprehensive review of 3,386 TAM articles and summarized theoretical development during the first recent five-year period. They examined the three aspects of previous research: content, structure, and impact. Their findings reveal that Venkatesh is the most prominent investigator in this domain, and a study conducted by Venkatesh and his partners ranks first. Additionally, the most cited 20 journals are hierarchized based on their citation number and impact. The word clouds reflect the most influential topics, encompassing online learning, the geriatric industry, health care, enterprise resource planning (ERP), and demographic data. Their studies indicate that TAM is more frequently used in a more specific context which prevails and is named *specificity* in this study.

Specificity means antecedents of TAM research which make the theory more specific. In the mainstream service area, perceived benefits take the place of PU, while perceived barriers replace PEU (Abou-Shouk et al., 2016). It also explains that PEU and PU are not necessary

variables in TAM. Perceived advantage is regarded as one of the most important factors in technology adoption, and PU and PEU are two early-existent aspects of perceived advantages (Davis et al., 1989). Xu et al. (2019) concretized perceived advantages into time-saving, money-saving, and convenience. As another example, Butt et al. (2021) categorized the quality into the quality of system, service, and content. Furthermore, there is potential for a more detailed analysis of technology quality.

Besides, “*specificity*” not only refers to each specific technology but also to each specific context explored in research. As one of the most crucial theoretical frameworks, TAM combines creative constructs based on the unique features of each innovation utilized in various applicable domains. Van Pinxteren et al. (2019) introduced robots into mainstream services, and the antecedents of TAM are more precise and elaborate. Furthermore, TAM’s evolution is contingent on specific events or stages. In t-c-m, tourism practitioners have been severely influenced by the pandemic, and García-Milon et al. (2021) viewed the pandemic as a moderator to compare the effects of antecedents on smartphone usage intentions in pre-pandemic and post-pandemic stages. In summary, researchers continuously improve the model by considering varying technologies, contexts, and stages.

The second trend pertains to “*model criticalness*.” Before 2000, the dimensions in TAM were consistently portrayed from a positive perspective. Rarely did researchers take into account the costs, risks, or inputs associated with decision-making in the modeling process. However, Pavlou (2001) was the first to incorporate perceived risk as an antecedent within TAM. Consequently, an increasing number of researchers have adopted a more critical approach; time and financial costs have become increasingly prevalent antecedents since 2001. It is not unique that in mainstream services, researchers from the tourism area now assess the impact of innovation dialectically, considering both negative and positive aspects (Schuster & Parkinson, 2022), in line with “*model criticalness*” trend.

Interaction is the third trend, drawing upon an overview of contemporary mainstream service studies, and Figure 1 introduces a novel trend referred to as the model interaction. Within mainstream service, collaboration with various stakeholders emerges as a groundbreaking concept, with co-creation incorporated into TAM to ascertain the influence of collaboration on customer behavioral intentions. This shift represents a potential evolutionary direction for the t-c-m section.

Meanwhile, there are more mediators and moderators than ever before, for instance, VR presence, perceived value, effort expectancy, facilitating condition, perceived risk, and interaction comfort. Besides, researchers tend to clarify different variables into one dimension. For example, Hoque et al. (2018) grouped relationship marketing, information

advertising, and ease of online banking into one dimension named communication factors, which contribute to the differences between similar variables.

Methodology

This study aimed to identify the determinants specific to technology adoption within two fields. Initially, due to the slower pace of technological development, a ten-year interval was selected to summarize and extract key characteristics of TAM studies from 1980 to 2010. However, given the accelerated pace of technological breakthroughs, now occurring approximately every five years (Sivagurunathan et al., 2021), this review focuses on top-ranking journals from the latest five-year interval, namely 2016–2022. This period is considered part of the 5th generation of TAM.

In service-oriented publications, we established the review framework based on past research. Lim et al. (2022) identified five top service journals: *Journal of Service Marketing*, *Journal of Service Management*, *Journal of Service Theory and Practice*, *Service Industries Journal*, and *Journal of Service Research*, which were also selected as research sources for this study. Out of 93 articles mentioning TAM within these journals, 38 were excluded for undersizing TAM, leaving 55 papers for analysis.

For the t-c-m section, based on the journal ranking results from Gursoy and Sandstrom (2016), this study selected five top-tier journals that equally consider tourism and hospitality: *Annals of Tourism Research*, *Current Issues in Tourism*, *Tourism Management*, *International Journal of Tourism Research*, and *Journal of Travel Research*. In cultural studies, key publications include *Journal on Computing and Cultural Heritage* and *International Journal of Culture Tourism and Hospitality Research*. To ensure a balanced analysis of TAM trends in museums, museum-based studies from other top tourism journals were included. Pertinent articles were identified via keyword searches focusing on “technology acceptance model” and “museum” across the official websites of three prominent journals: *Asia Pacific Journal of Tourism Research*, *Journal of Destination Marketing & Management*, and *Leisure Studies*. In total, 11 high-impact SSCI journals with a strong focus on tourism were included in the study.

Overall, 86 papers were identified across all three subfields within the t-c-m section. However, several studies only mentioned TAM without employing it as a theoretical basis. To exclude unsubstantiated TAM studies, a stricter content analysis was employed, ultimately selecting 45 studies for this review.

CiteSpace, a citation software, was used to analyze the landscape of these studies, including leading research groups, their institutions and regions, collaboration networks, emerging trends, and pivot points of several studies

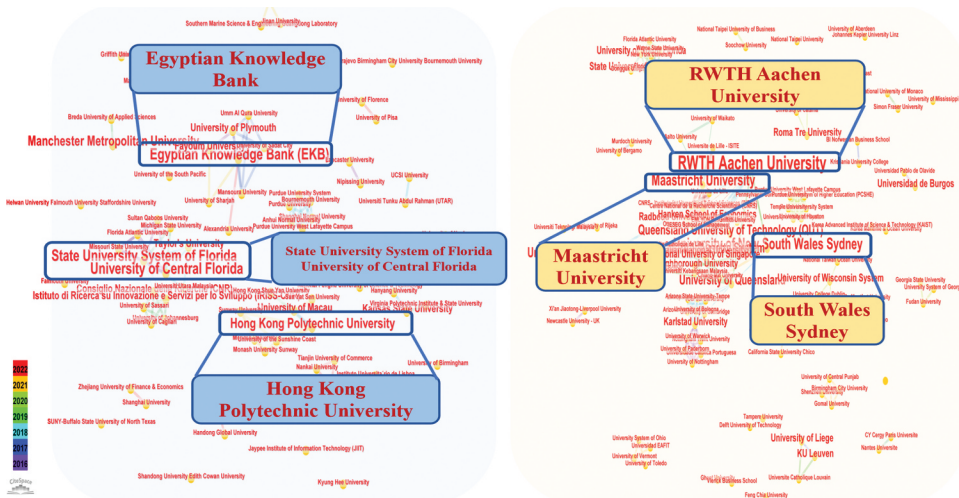


Figure 3. Co-network of institutions in t-c-m area (left) and mainstream service area (right).

service field, and all their counted citations are more than three. Second, compared to the t-c-m field, cooperation between researchers in the mainstream service field is closer, while the collaboration between t-c-m researchers is relatively loose based on the thickness of lines. Otherwise, several separate nodes in t-c-m area show that single-author research is relatively common. By contrast, there are few individual nodes in the right part of Figure 2, and mainstream service research prefer a collaboration rather than research alone.

Figure 3 shows the most actively engaged research institutions. For mainstream services, the University of Massachusetts and RWTH Aachen University are the active ones. While for the t-c-m field, the Egyptian Knowledge Bank, the University Central Florida, and the State University System of Florida are dedicated to technology adoption in the t-c-m field with similar and prominent influences. Nevertheless, the number of participating institutions in t-c-m is relatively less than the mainstream service as shown in the figure. The observed phenomenon probably ascribed to that academic organizations in the t-c-m area possess a somewhat immature research community, narrower framework, and less tight connection.

As for territorial interest in the TAM topic, researchers in Greater China (including Hong Kong, Macao, and Taiwan) (11), America (9), and Britain (9) consistently rank in the top three in these two fields as shown in Figure 4. Also, Egypt (4), Malaysia (4), and Italy (4) have specific research findings about technology acceptability in tourism-related fields, whereas scholars in Germany (14), Netherlands (10), and China (including Hong Kong, Macao, and Taiwan) (10) focus more on the mainstream service sector.

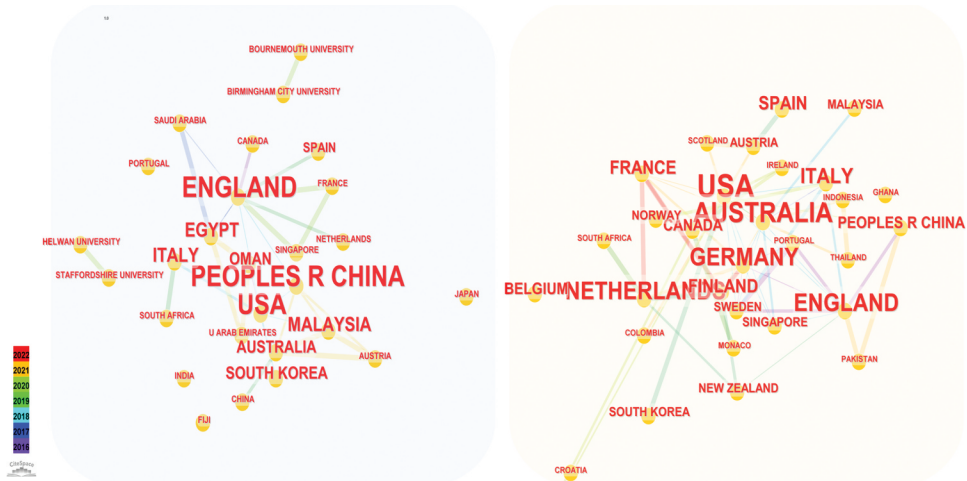


Figure 4. Co-network of countries/regions in t-c-m (left) area and mainstream service area (right).

Researched technologies in past studies of two areas

This study summarized the top ten technologies in the two fields investigated through manual review and CiteSpace analysis. Detailed outputs of these methods are found in Appendices 1 and 2.

There are clear differences between the two fields. Firstly, the most popular innovation in the t-c-m field is Extended Reality (XR), an umbrella term that includes AR, VR, and MR, while mainstream service industry researchers are most interested in AI. The smartphone is a critical innovation in both industries and has become the second most commonly studied technology in both fields. Nearly 20% of researchers aim to thoroughly investigate the usage of smartphones and their impact on users among 100 studies.

Several popular topics are shared by both areas, such as XR, AI, and online platforms. However, compared to the keywords in the t-c-m field, keywords extracted by CiteSpace in mainstream service are more specific, comprehensive, and detailed. The tourism industry continues to discuss the types of technology, but more attention should be paid to user interaction, enjoyment, self-efficacy, satisfaction, and other factors. Additionally, co-creation has become a critical topic in mainstream service, indicating a research gap that the tourism industry needs to address, possibly in cooperation with other industries. This implication echoes the findings of recent research (Guo et al., 2023).

In mainstream service, co-creation, AI, customer satisfaction, customer experience, and anthropomorphism are the most frequently mentioned keywords. According to the summary of innovation types used in the mainstream service area, AI is the most popular innovation, which aligns with the time zone view. The topic of AI peaked in 2018 and stimulated discussions about

anthropomorphism in 2019. Moreover, the mainstream service industry emphasizes customer satisfaction and experience, indicating that this industry is customer-oriented (Woo et al., 2021).

All manually counted technologies match perfectly with CiteSpace keywords in the t-c-m field. However, in the mainstream service field, studies of smartphone or application-related innovations lack keywords. This may be because the technology (the mobile phone) is too common, and researchers no longer emphasize the name of the technology in keywords. In terms of the number and percentage of innovations, the mainstream service industry has a much richer variety of technologies, resulting in a more even distribution of technology types.

Critical constructs in TAMs

During the review on the constructs of TAMs in two fields, the investigation observed and counted that recent research examined more on the 4Es as shown in Appendix 3. This study moved into a deeper content analysis on the determinants being probed in their research. A Venn diagram in Figure 5 shows the identified number of investigations on the intersections among the three disciplines or subfields of studies – tourism, museum and heritage. To conduct a thorough analysis, efficacy ($n = 9$), enjoyment ($n = 4$), engagement ($n = 5$), and experience ($n = 12$) were counted. It is worth emphasizing that the 4Es in Figure 5 correspond to keywords (integrated into the Venn diagram) extracted from CiteSpace, proving the reliability of this study.

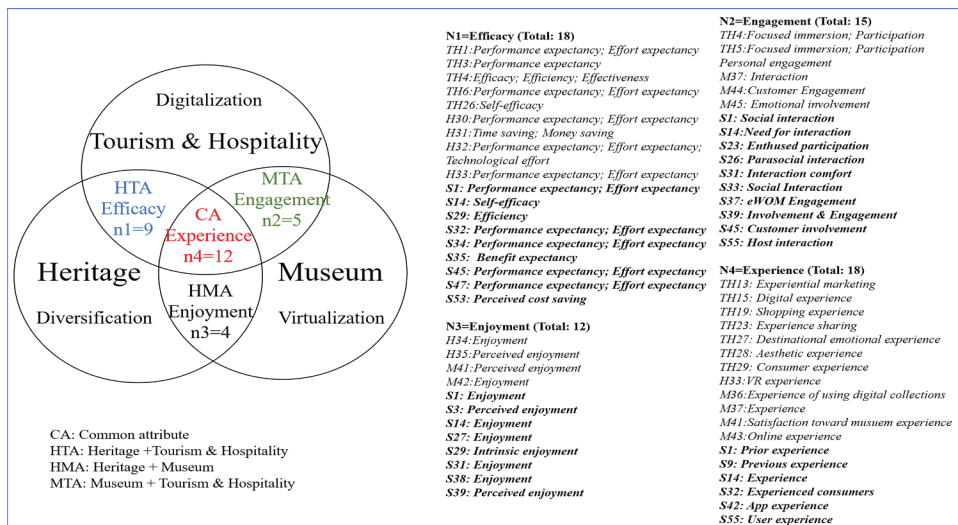


Figure 5. A venn figure of shared constructs in t-c-m filed and mainstream service industry 4.4 a new variant of TAM proposed by this study.

Because of a large number of constructs in TAM, it is difficult to showcase all constructs in this study. Thus, after content analysis, the authors summarized the features of three subfields' all constructs in one word. For the most frequently mentioned variables across three subfields, the content analysis revealed that 1) with the widespread use of smartphones, digitalization is highly emphasized when an organization of tourism or hotels accept technologies; 2) cultural tourism destinations tend to prioritize diversity, given that exhibition planners consider the varying effects that different high technologies can generate; 3) as XR is the most widely accepted technology, the majority of the museum studies emphasize the trend of virtualization.

Concerning the prevalent constructs across all three subfields within the t-c-m industry, experience emerges as the most frequently cited construct, encompassing 12 papers within the t-c-m sector and an additional 6 papers within the mainstream services. Namely, customers anticipate a satisfactory experience subsequent to the adoption of technologies in many aspects of the service industry. To enhance the quality of experience, there are five key aspects to consider: temporal dissociation, heightened enjoyment, control, curiosity, and participation (Wei et al., 2019). In virtual environments specifically, a sense of personal control is crucial for creating a strong sense of presence. Therefore, it is important to focus on enhancing the feeling of being in control while immersed in the virtual scene.

Moreover, efficacy is the most commonly utilized concept and a shared construct in both the tourism or hospitality area and cultural tourism. It implies that visitors anticipate technologies to be user-friendly, effective, and time-saving. Furthermore, eight mainstream service studies regard the efficacy as a significant indicator when discussing innovation adoption. Three main factors associated with efficacy are effort expectancy, performance expectancy, and generalized self-efficacy. These efficacy-related keywords primarily link to acceptance, including customer acceptance, user acceptance, technology acceptance, consumer acceptance, and UTAUT. Consequently, researchers in the field of TAM commonly examine innovation adoption from an efficacy standpoint.

With respect to cultural tourism and museums, the most noticeable dimension is enjoyment. Enjoyment serves as an inherent motivator, prompting customers to engage in an activity solely for the sake of the activity itself (Brüggen et al., 2019). With enjoyment playing a role, users are more inclined to embrace innovation driven by their internal motivation, even in the absence of external stimuli. As an innovative approach, the incorporation of edutainment as a strategic implementation introduces novel elements into educational activities, with a primary emphasis on enhancing enjoyment through gamification (Vanduhe et al., 2020). Edutainment contributes to a more entertaining, effective, and participatory educational process, which is especially crucial in cultural tourism sites and museums. Meanwhile, the increasing mainstream

services studies recognize the importance of enjoyment as eight studies integrate enjoyment into TAM.

Finally, the significance of engagement in museum and tourism and hospitality activities is widely recognized. Engagement refers to a mental state at work that is marked by energy, commitment, and deep involvement (Schaufeli et al., 2002). Scholars have defined customer engagement as an enthusiastic participation in various activities (de Kervenoael et al., 2020). For the purpose of this research, all synonymous terms related to engagement are consolidated under the term engagement. In the mainstream service context, engagement is the most frequent variable within the 4E framework (10 studies), indicating that the mainstream service industry places greater emphasis on the interaction between service providers and customers. In summary, the mainstream service industry brings even more attention to 4Es than the t-c-m field. The phenomenon unveils that the research about TAM in the t-c-m industry has still lagged behind the mainstream service in the studied area about 4 Es.

Apart from 4E, one primary finding is that sociality, control, and negative impact receive attention from both sectors (see [Appendix 3](#)). Sociality encompasses a broad range of variables associated with social interactions, including social presence, social influence, social distance, social connection, social value, and the like. Control, as defined by Wei et al. (2019), represents that an individual perception of their interactions with technologies is under control. As a novel mental factor, control is inclined to evoke positive emotions toward innovations. Furthermore, control is categorized into internal and external forms. Internal control connects to outcomes or events that are determined by skills, effort, and abilities, whereas external control such as chances or powerful others are dominant factors. Besides, scholars from both fields have begun to recognize the significance of innovation-induced negative impacts, such as risks, insecurity (Treiblmaier et al., 2021), and discomfort, which have become the most frequently mentioned variables associated with such impacts. When extending the TAM framework, the consideration of both pros and cons is crucial. More recently, research that focuses on the adoption of blockchain in the Asian tourism industry divided variables into positive groups and negative groups (Treiblmaier et al., 2021). It is an innovative method that makes use of critical thinking and helps the result become more reasonable.

Based on the review outcome, this research proposes a novel research framework for future t-c-m TAM studies (illustrated in [Figure 6](#)). The framework presents a summary of unique variables within the mainstream service; such a finding becomes a reference to future research. This study incorporates a research structure consisting of six key aspects, namely motivating factors, obstructive factors, core variables, moderators, behavioral intention, and protection behavior. These dimensions are intricately intertwined within the proposed framework. External variables are

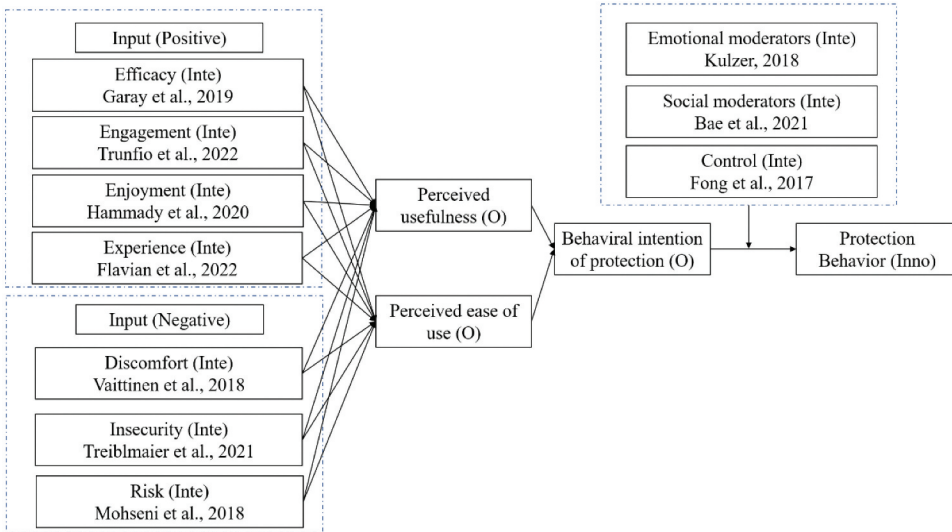


Figure 6. Suggested newTAM structure. * O: original; Inte: integrative; Inno: innovative

divided into two distinct aspects: motivating factors and obstructive factors generated by innovations. Among the positive external variables – the most prominent in the t-c-m field and has garnered significant attention in the mainstream service area. Negative external variables are summarized from the 100 reviewed articles; the results indicate that future studies may encompass discomfort, insecurity, and risk. Previous research has consistently failed to quantitatively verify the impact from obstructive effects of technologies, despite their crucial role in facilitating the adoption of innovation. Actually, these unfavorable consequences can lead users to promptly reject technology, sometimes even more swiftly than motivating factors.

The moderators are extracted from the study of Blut et al. (2016). Emotional moderators include excitement, optimism, and joy. Social presents, social values, social influencers, social distances, and social connections can act as social moderators when making adoption decisions. In the new TAM framework, all variables are categorized into three types: original, integrative, and innovative. Finally, protection behavior serves as an innovative factor that influences the adoption of technology in tourism industry. This novel construct enhances our comprehension of how innovation is embraced to protect heritages and contributes to the development of new variations of TAM.

As illustrated in Figure 6, the category of each construct and citation are introduced adjacent to the name of the dimensions. Consequently, this facilitates future studies to reference and adapt the framework depending on specific contexts.

Elucidate the mechanisms

The psychology-based technology acceptance model is employed to elucidate the adoption of information technology (Weerasinghe & Hindagolla, 2018). Various theoretical models such as TAM, TAM 2, TRA, TPB, SCT, IS success model, innovation diffusion theory, and decomposed theory of planned behavior have been examined to explore user adoption of information system (IS) and information technology (IT). The continuous evolution of TRA, TAM1–3 has led to the pinnacle development of UTAUT in 2010. In the future, there will be further exploration into additional antecedents and potential moderators or mediators. As evident from its timeline, TAM exhibits the characteristics of contextualization and concretization as it demonstrates adaptability when applied across diverse contexts or industries.

Influencing pathways

This study categorizes all identified variables from 100 studies into three main types, original, integrative, and innovative determinants. O is used to represent original determinants that have been carried forward from previous TAM research. Furthermore, this study endeavors to consolidate related attributes into cohesive dimensions. As an example, motivational factors encompass four constructs – Efficacy, Engagement, Enjoyment and Experience. All of which have consistently emerged as crucial components in technology acceptance across recent TAM studies conducted between 2016 and 2022.

As a critical contribution of this study, this study identified several obstructive factors as antecedence in technology acceptance research. According to Treiblmaier et al. (2021), unfavorable views on technology acceptance encompass issues related to usability, performance limitations, service gaps, instability, and lack of security. In order to maintain model conciseness, discomfort, insecurity, and risk as obstructive factors as obstructive factors are included.

Protection behavior is an innovative determinant proposed in this study. Conducting actual actions provides more valuable research insights compared to mere willingness to behave, thereby enhancing the significance of this study beyond solely focusing on behavioral intentions.

Based on the findings of the review, there is a noticeable increase in studies focusing on the role of moderators in TAM. This study identifies and discusses the integrative group of moderators that contribute to the understanding of technology acceptance, specifically emotions, social interactions, and controls.

Findings of the TAM model as revealed within the C-T-M field

All the studies included in this analysis were chosen from the period between 2016 and 2022, which corresponds to a span of approximately five years

(Sivagurunathan et al., 2021). The field of technology is experiencing rapid changes, leading to significant advancements every five years. Considering the typical decade-long timeframe for IT breakthroughs to materialize, this study specifically underlines the recent five-year period, which represents a more advanced stage of investigation into the fourth generation. By summarizing the frequently cited variables, the findings of this review contribute toward establishing dimensions for further research.

There is a total of 12 studies in the field of t-c-m that emphasize the importance of customer experience in accepting innovation. Compared to the mainstream service industry, experience is one of the most highly regarded themes in relation to TAM. According to statistical analysis, efficacy is identified as a key factor in both tourism & hospitality and cultural tourism contexts, receiving the highest number of citations. According to [Appendix 3](#), t-c-m industry highlights the significance of the 4Es in TAM, but mainstream service industry has hypothesized and verified more antecedences. There is a need for future studies to investigate more factors that influence the perception of ease of use and usefulness.

Conclusions

This investigation combines CiteSpace and content analysis to form a hybrid bibliometric analysis on t-c-m and mainstream service. One hundred relevant papers were shortlisted from 16 SSCI journals for broader and in-depth analysis. The review ascertained the research attention of technology adoption studies over the past five decades and identified the variables, moderators, and mediators of TAM in the latest decade. The study further integrated TAM with the remarkable studies on 4Es to propose a new model.

This study focused on the chronological progress of TAM studies and identified three new trends: model interaction, model criticalness, and model specificity. Moreover, the study found certain differences between the two areas. The t-c-m area pays more attention to XR, while the mainstream service explores more types of innovations. The analysis of keywords revealed that the mainstream service area has concentrated on more specific features of innovations, whereas the t-c-m area still discusses more on the selection of technology.

This review also provided a general understanding of the current situation regarding the adoption of technology, especially the identification of research attention on TAM over five decades. This study counted all constructs of TAMs investigated by service studies in mainstream and t-c-m studies in broader tourism. The review identified the most frequently used constructs – 4Es in mainstream service but relatively less mentioned together in t-c-m studies. Based on these findings, this study proposed a TAM variant embedding 4Es and obstructive factors when addressing the model for

adopting innovations and keeping emotional factors, social factors, and control as equally important. Therefore, the most significant value of the present study lies in proposing a novel variant of TAM which needs further investigation.

Limitations and future research agenda

This study endeavored to review previous studies from 16 high-ranking journals using an interdisciplinary perspective to provide more suggestions for future research. Future scholars should collect data from more related journals for a more thorough comparison and analysis. Additionally, although this study started to compare two fields, more knowledge domains could be linked to offer a detailed and comprehensive TAMs knowledge map. Additional empirical research is necessary to investigate and determine appropriate variables or factors within their respective contexts. To align with the evolving trend in TAM development, it is imperative to establish and validate an enhanced version of TAM. The generation of this new TAM should incorporate a wider range of inventive constructs, mediators, and moderators. Furthermore, when integrating TAM with other theories such as wow experience and co-creation, additional innovative elements should be considered. Therefore, broader databases, knowledge domains, and perspectives should be utilized to investigate the development process of TAMs as this theory is a pillar theoretical framework that contributes to the understanding of technology acceptance. Additionally, technology adoption should extend beyond individuals to include institutional and semi-mandatory contexts. Nevertheless, there is a scarcity of available data on TAM applicable to these particular situations. Institutions often encounter unique challenges, such as intricate decision-making processes involving multiple stakeholders with diverse interests and priorities. Exploring TAM within this context would yield valuable insights into how organizations can effectively integrate new technologies into their operations while considering these complexities. Similarly, investigating TAM within semi-mandatory contexts provides opportunities to comprehend how specific industries or sectors embrace technology due to regulatory requirements or industry standards. These scenarios may entail obligatory compliance with particular technological solutions or frameworks aimed at ensuring operability, security, or standardization across the sector.

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Figure A2.

Appendix 3. Comparison of determinants of TAM studies between mainstream service and tourism-related journals

Constructs [↵]	Mainstream [↵]	Tourism [↵]
Information credibility [↵]	Yusuf & Busalim, 2018 [↵]	[↵]
Localization & Ubiquity [↵]	Fang, 2017 [↵]	[↵]
Perceived complementarity [↵]	Hsu & Lin, 2021 [↵]	[↵]
Stickiness [↵]	Hsu & Lin, 2021 [↵]	[↵]
Privacy assurance [↵]	Hsieh & Li, 2021 [↵]	[↵]
Optimism [↵]	Flavián et al., 2021; Vaittinen et al., 2017 [↵]	[↵]
Co-creation [↵]	Çaiç et al., 2019; Femenia-Serra et al., 2018; Rai et al., 2018; Wu et al., 2021 [↵]	[↵]
Anthropomorphism [↵]	Keyser & Kunz., 2022; Van Pinxteren et al., 2019; Vitezić & Perić., 2021 [↵]	[↵]
Trialability [↵]	Blut et al., 2016; Bolton et al., 2018 [↵]	[↵]
Relative advantage [↵]	Chung et al., 2018 [↵]	[↵]
Complexity [↵]	Amelia et al., 2022; Chouk & Mani., 2019; Hazee et al., 2020; Narteh et al., 2017 [↵]	[↵]
Compatibility [↵]	Blut et al., 2016; Bolton et al., 2018; Chen & Chen, 2021; Hazee et al., 2020 [↵]	Garay et al., 2019 [↵]
Sociality [↵]	Amelia et al., 2022; Bae et al., 2021; Bailey et al., 2021; Bolton et al., 2018; Çaiç et al., 2021; Chen & Chen., 2018; Jeon et al., 2018; Lin, 2021; Van der Linden et al., 2020; Marino & Presti., 2018; Narteh et al., 2017; Paluch & Tuzović., 2019; Vitezić & Perić., 2021; Wu et al., 2021; Yusuf et al., 2018 [↵]	About-Shouk & Soliman, 2021; Fong et al., 2017; Garay et al., 2019; Garcia-Milon et al., 2021; Han et al., 2019; Hew et al., 2018; Ly et al., 2022; Rita et al., 2018; Sharma et al., 2021; Shephard & Pookulangara, 2020; Trunfio et al., 2022; Xia et al., 2018 [↵]
Constructs [↵]	Mainstream [↵]	Tourism [↵]
Control [↵]	Blut et al., 2016; Bolton et al., 2018; Lien et al., 2019; Paluch et al., 2021; Prodanova et al., 2021; Rai., 2017; Schuster & Parkinson., 2022; Sonia et al., 2016 [↵]	Lee & Jan, 2018; Wei et al., 2019; Fong et al., 2017; tom Dieck et al., 2018; Xiong et al., 2021; Yang & Lee., 2022 [↵]
Negative impact [↵]	Amelia et al., 2022; Blut et al., 2016; Bolton et al., 2018; Chouk & Mani., 2019; Flavian et al., 2022; Hazee et al., 2017; Hoque et al., 2018; Hsu & Lin., 2021; Lin., 2021; Narteh et al., 2017; Paluch et al., 2021; Schuster & Parkinson., 2022; Vaittinen et al., 2017 [↵]	Agag & El-Masry, 2017; El-Said & Aziz, 2022; Fong et al., 2017; Mohseni et al., 2018; Rita et al., 2018; Treiblmaier et al., 2021; Xiong et al., 2021; Yang & Lee, 2022; Zhuang et al., 2021 [↵]
Efficacy [↵]	Amelia et al., 2022; Bailey et al., 2021; Blut et al., 2016; Chen & Chen, 2021; Hsieh & Li., 2021; Jeon et al., 2018; Lin., 2021; Riedel & Mulcahy., 2019; Vitezić & Perić., 2021 [↵]	Fong et al., 2017; Garay et al., 2019; Garcia-Milon et al., 2021; Ly et al., 2022; Rita et al., 2018; Selmanović et al., 2020; Sharma et al., 2021; Wei et al., 2019; Xu et al., 2019 [↵]
Enjoyment [↵]	Amelia et al., 2022; Blut et al., 2016; Bolton et al., 2018; Brügggen et al., 2019; Van der Linden et al., 2020; Paluch et al., 2021; Riedel & Mulcahy., 2019; Van Pinxteren et al., 2019 [↵]	Hammady et al., 2020; Kang et al., 2018; Krzywinska et al., 2020; Lau et al., 2019 [↵]
Engagement [↵]	Amelia et al., 2022; Bae et al., 2021; Blut et al., 2016; Brügggen et al., 2019; Jeon et al., 2018; Lee et al., 2018; Marino & Presti., 2018; Van Pinxteren et al., 2019; Yen., 2017; Yusuf & Busalim, 2018 [↵]	About-Shouk & Soliman, 2021; de Kervenoael et al., 2020; Marasco et al., 2018; Trunfio et al., 2022; Wei et al., 2019 [↵]
Experience [↵]	Amelia et al., 2022; Blut et al., 2016; Fang., 2017; Flavian et al., 2022; Lin., 2021; Yen., 2017 [↵]	Agag & El-Masry, 2017; Chuang, 2020; Chung et al., 2018; Errichiello et al., 2019; Kang et al., 2018; Mohseni et al., 2018; Selmanović et al., 2020; Shephard & Pookulangara, 2020; Trunfio et al., 2022; Xia et al., 2018; Zhang et al., 2018; Zollo et al.,

Figure A3.