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Abstract

Technology Acceptance Model (TAM) is the most commonly used theoretical understanding of technology adoption research and also the most powerful model applied to describe personal acceptance decisions. Prior studies fail to become comprehensive due to confining in one industry, so authors review top journal articles in mainstream service and tourism-related industries as well as identify the diverse trendy and similar grounds through a bibliometric analysis. Totally 16 top SSCI journals selected for this research and find all the articles mention TAM. After excluding 79 papers not based on the theory of TAM, 100 papers remain. The analysis focused on descriptive statistical analysis through CiteSpace and content analysis to distinguish similarities and differences between two diverse industries. This study contributes to visualizing the progress of TAM in two industries from a comprehensive perspective and provides clues for a future investigation related to TAM. This is the pioneer study to investigate TAM in two fields using qualitative and visualized bibliometric analysis.

Keywords: Technology Acceptance Model (TAM), Tourism & Hospitality, Culture tourism, Museum, mainstream service, CiteSpace.

Introduction

The tourism area is one subfield of the whole service industry, which attracts cooperation between multiple disciplines, especially the collaboration of high-tech researchers and tourism practitioners. TAM becomes the commonly accepted theoretical background when discussing technology acceptance (Yoon, 2016). Researchers in the tourism industry believe that tourists adopt innovations mainly depending on two foundational beliefs – perceived ease of use and perceived usefulness (Xiong et al., 2021).

By contrast, the mainstream service industry has broadly developed, co-created, and applied technology more than the tourism industry, and there is more research studying TAM in mainstream service journals. The larger body of knowledge in the services-related journals of the mainstream discipline becomes a valuable reference in the search for suggestions or orientations for future tourism studies. To better develop the TAM in Tourism-Culture-Museum (t-c-m) fields, this study aims to identify the differences in the TAM development process between the t-c-m field and mainstream service area. Meanwhile, this study is the first review article that combines the review outcomes in both two industries.

There is a limitation in that rare studies compare TAM studies both in mainstream services and the tourism industry. The result of the study contributes to understanding the gap between the two fields and enriching the antecedents in the t-c-m field. To follow the development of technology in recent years, this study investigates TAM-related research in both of t-c-m field and the mainstream service industry.

In light of the development, the investigation sets the following research objectives

1. To ascertain the evolving TAMs and their recent trends in both mainstream and tourism industries.
2. To recognize common constructs, mediators, and moderators of TAM specific to this study
3. To suggest research agenda in terms of TAM in both two fields.

Literature Review

Distinguished thrusts and generations of TAM in the evolvement process

The first generation 1970-1980

Fishbein and Ajzen created the theoretical framework in 1975 to explore an individual attitude toward behavior and then speculate on personal behavior intention. The primitive TAM embraces three main concepts: attitude, belief, and behavior. Attitude refers to the personal assessment of specific items; belief equals a connection between the item and several attributes; behavior is defined as an intention or real action. Attitude relates to belief in behavior, which is a kind of affective expression.

The design of a system or product is a stimulus from the external environment to impact user beliefs related to utilizing a system. Then, the salient beliefs influence user attitude about a behavior. Attitude theory is the rationale of the flow of causality which includes design features for attitude to usage behavior from the psychological perspective.

Another factor is subjective norms that come from the intimate community's attitude towards certain behavior (Lai, 2017). Subjective norm is a crucial determinant in the initial stage of innovation, especially for an inexperienced item. Compared with the voluntary situation, the subjective norm has more prediction power for intention but it becomes weaker over time.

The second and third generations 1980-2000

In the 1980s, Davis et al. (1989) brought academic attention by putting forward two external variables which influence Perceived Usefulness (PU) and PEU (Perceived Ease of Use). PU refers to the possibility that potential customers believe specific innovation enables them to improve their task performance in an institutional environment. By contrast, PEU is defined as the extent of effortless potential customer

consideration. Besides, unlike the first generation, the subjective norm is excluded as a determinant of behavior intention in this framework. Based on the practical results, TAM can predict 40% of stem usage (Adov et al., 2020).

Davis et al. (1989) considered there is uncertainty toward theory and psychometry, as it is hard to distinguish the direct effort of subjective norms on behavior intention from indirect influence through attitude. Furthermore, attitude may impact subjective norms according to the research result from Oliver and Bearden (1985). To prevent further matters, the initial TAM eliminates the subjective norm. Following this vein, Venkatesh and Davis (1996) proposed the adjusted version of TAM by deleting the construct of attitude. Contrary to the viewpoint in TRA, Venkatesh and Davis do not believe attitude can function as a full mediator within the relationships between PEU/PU and behavior. External variables consist of “computer characteristics, training, user involvement in the design, and the nature of the implement process” (Venkatesh & Davis, 1996, p. 453).

The fourth generation 2000-2010

In this generation, the development of TAM research is pre-dominated and led by Vankatesh’s series of models. In the early 2000s, Venkatesh and Davis (2000) further elaborated the TAM first by adding five sub-variables to the proposed main variable – PU in the early decade. The first sub-variable refers to the decision maker’s internal situation, which is coined as the norm that is close to the subjective norm stated by Fishbein and Ajzen in the 1970s. This factor – norm - is a variable factor affecting his/her PU of the new technology and subsequently affects his/her intention to use the technology. The decision maker’s norm is still subject to the influence of important referent’s thought and motivation by reward and punishment as raised by Ajzen (1991).

In 2003, Venkatesh and colleagues brought together eight important features (in the rectangular boxes) to establish a UTAUT model for understanding technology acceptance (Venkatesh et al., 2003). In the late 2000s, Venkatesh and other scholars developed and elaborated more sub-variables (or determinants) for the second major variable - PEU in his previously developed TAM. Venkatesh and Bala concluded that the third generation of TAM can provide a more abundant comprehension of constructs that positively impact user behavior, and then managers can proactively decide on applying the correct disposals to lessen confrontation to innovative information technologies and make the best use of the information technologies.

In 2010, Venkatesh had deeper research on UTAUT and explored that the explanatory power of these eight individual features ranges from 17 to 53% in various Information Technologies. The UTAUT includes four direct determinants (performance expectancy, effort expectancy, social influence, and facilitating conditions) and four moderators (gender, age, experience, and voluntariness). Performance expectancy is defined as the degree to which an individual believes that using the system will help him or her better attain significant rewards. Social influence is defined as the degree to which an

individual perceives those important others believe he or she should use the new system (Venkatesh & Zhang, 2010).

Several researchers believe TAM should add more components to increase the percentage of system use from 40% (Legris et al., 2003). Conciseness is both the advantage and disadvantage of the original TAM, as it can predict the acceptance but fail to understand and explain the acceptance. Therefore, oversimple TAM cannot attribute to design innovation characteristics for improving adoption.

The previously used constructs which encompass social cognitive theory, theory of reasoned action, and innovation diffusion theory, are employed in UTAUT development. In 2010, Venkatesh added price value, hedonic motivation (i.e. fun derived from using technology), and habit (i.e. intrinsic and automatic drive to learn) in UTAUT extension raising the explanatory power of variance in behavioral intention from 56 percent to 74 percent.

The fifth generation 2011-2015

Mortenson and Vidgen (2016) collect 3386 articles related to TAM to analyze the three dimensions of past studies: impact, structure, and content. Impact refers to the citation counts of researchers, articles, and publications; structure refers to the research community, such as the network of co-authors; content refers to the potential topics managed by topic modeling from electronic archives. As a review result, Venkatesh is the most influential researcher in the field, and one study conducted by his research partners is the most cited. Furthermore, the top 20 journals are ranked based on citation count and impact. The word clouds indicate the most frequently-used topics among 6159 researchers, including online learning, the old-age industry, health issue, enterprise resource planning (ERP), and demographic information (gender, age).

Trends related to UTAUT during this period are concluded by later researchers. In the early days, Chuttur (2009) deemed UTAUT seem to be incapable of totally replacing TAM. However, during the past years, UTAUT function as an indispensable role when it adds more significant variables to the model. Thereinto, social influence, facilitating condition, and other new determinants included in UTAUT, are external factors dependent on users and environment rather than only relying on the product or system directly (Kulzer, 2018).

The sixth generation 2016-2022

Trendy extensions in the post years of the 2010s

Based on the review, the first observed trend is featured as “model concretization”. Concretization refers to antecedents of studies in TAM rendering the model more specific. For instance, in the t-c-m area, PU is superseded by perceived benefits, while PEU is replaced by perceived barriers (Abou-Shouk et al., 2016). It is also worth noting that not all studies about TAM have to include PEU and PU as indispensable variables.

Perceived advantage is viewed as one of the most critical attributes in innovation acceptance, and PU and PEU are two perspectives of perceived advantages at the very beginning (Davis et al., 1989). As tourism researchers, Xu et al. (2019) describe perceived advantages as time-saving, money-saving, and convenience. On the other hand, concretization also appears in mainstream services. Butt et al. (2021) subdivide the quality into system quality, service quality, and content quality, and a more in-depth analysis of technology quality can be provided.

The second observed trendy direction is “model criticalness”. In prior studies before 2000, dimensions in TAM are always described with a positive perspective. And researchers are rare to consider the cost, risk, or input in the modeling decide on adoption. Nevertheless, Pavlou (2001) is the pioneer who adds perceived risk as an antecedent in TAM. Since then, more and more researchers consider it more critically; time input or financial input becomes frequent antecedents after 2001. Similarly, in mainstream service, researchers consider the impact of innovation from negative and positive perspectives dialectically (Lau et al., 2019; Schuster & Parkinson, 2022), which accords with the trend of “model criticalness”.

In addition, model contextualization is witnessed during this generation. As one of the most critical theoretical frameworks, TAM merges innovative dimensions based on specific characteristics of every technology used in different application areas. Regarding the adoption of robots in mainstream services, antecedents of TAM are more specific and detailed - such as robotic visibility, robotic competency, robotic performanism, robotic co-creativity, and robotic prominence are restricted in a robot-related range. Anthropomorphism is one of the exclusive characteristics of robotic adoption (De Keyser & Kunz, 2022; Van Pinxteren et al., 2019), and Vitezić and Perić (2021) propose evolved TAM based on the feature of human simulation. TAM also evolves according to particular stages. The tourism industry is being impacted by the pandemic seriously, and García-Milon et al. (2021) employ covid-19 as a moderator to compare the influences from antecedents on the intention of using smartphones before and after the pandemic. In sum, TAM researchers take different types of technologies, different contexts, and different stages into consideration.

Methodology

This present study aims to recognize the determinants particular to the intention of accepting innovations within the mainstream services and t-c-m contexts. Then, integrating past research achievement using a chronological and comprehensive review of TAM-related articles to recognize the stages and trends of TAM. Furthermore, this study is intrigued by the four commonly frequent-used constructs in t-c-m fields as well as the adoption of those variables in mainstream service. In this sense, the article is conceptual in nature and exploratory in purpose with its methodology rooted in the analysis of prior studies in both mainstream and t-c-m fields.

In terms of the studied periods, the ten-year interval is selected for the scrutiny of TAM studies because of the slower pace of innovation development in earlier stages. Nevertheless, since the speed of technological reformation and progress has become above a five-year interval between significant technological achievements (Sivagurunathan et al., 2021), this study selects the recent TAM studies in the past five years or so, that is 2016-2022 as another key focus of the investigation. The review result may be in favor of understanding the updated trend and cutting-edge information.

In order to review updated variables of TAM in the t-c-m and mainstream service industries, this study collects papers based on TAM in the period 2016-2022 in top-ranking journals. In terms of the t-c-m field, three subfields are discussed tourism & hospitality, cultural tourism, and museums. First, *Tourism Management*, *Journal of Travel Research*, *Annals of Tourism Research*, *Current Issue in Tourism* as well as *International Journal of Tourism Research* are the five top journals related to tourism and hospitality areas. As for the culture-related field, this review comprises the *International Journal of Culture Tourism*, and *Hospitality Research, Journal on Computing and Cultural Heritage*. The third subfield is the museum, and the *Journal of Museum Management and Curatorship* was selected as the core one in this field. However, the main studies in the journals about museums do not rely on TAM. To ensure there are enough papers used to analyze the tendency of TAM within museum-related journals, this study selects museum-related papers from other top tourism-related journals. Hence, this study selects relevant articles through the keywords - “technology acceptance model” and “museum” in the official websites of three journals - *Leisure Studies*, *Asia Pacific Journals of T Research*, and *Journals of Destination Marketing & Management*. In sum, there are all 11 tourism-related SSCI journals with high impact factors.

All selected articles are drawn thorough searching the keywords “technology acceptance model” on the journals’ official website to search for relevant research as long as the keywords appear in the articles. A total of 86 papers are found in all three subfields in the t-c-m area. However, some articles just briefly mention the TAM, and do not adopt TAM as the theoretical foundation. So, more careful content analysis was conducted to screen out studies that contain non-substantiated TAMs. Finally, just 45 studies in the t-c-m field as targets of the article review.

From the perspective of mainstream services, we identify the review scope based on past studies. Lim et al. (2022) identify five representative mainstream service journals, the *Journal*

of Service Management, Journal of Service Research, Journal of Service Theory and Practice, Journal of Service Marketing, and The Service Industries Journal, which are also selected as research resources in the present study. Five mainstream service journals consist of 93 papers. And 55 papers are remaining after eliminating 38 studies that underuse TAM.

This study is the mix method research which summarizes development trend, identify vital research result, and provide research orientation in both t-c-m and mainstream service fields. In terms of quantitative analysis, this study conducts a bibliometric analysis based on CiteSpace to identify the most significant author team, academic institutions and countries in the fields of t-c-m field and mainstream service respectively. On the other hand, content analysis is conducted to explore the most frequently-used variables in the TAM framework as the part of qualitative analysis.

Results

Firstly, CiteSpace indicates the most contributing authors in both of two areas, and the comparison result is shown in the Figure one. The author collaboration network includes 45 and 55 research respectively between 2015 and 2022. There are some obvious specialization differences between two subfields so that authors lack of connections or cooperations among two subfields. In the subfield of t-c-m, the top three contributors are Fevzi Okumus, M. Claudia tom Dieck, and Timothy Jung, while Kunz Wemer H, Paluch Stefanie and Gruber Thorsten are the most contributing authors in mainstream service field.

Correspondingly, the most significant institution of TAM research in two subfields are witnessed based on the institution collaboration network. By contrast, academic organizations in t-c-m area own relatively immaturity of the research community based on the relatively looser framework and fewer close relationships than organizations in mainstream service industry. According to the Figure two, the most actively involved research institutions are Egyptian Knowledge Bank and University Central Florida which devote to technology adoption in t-c-m field as well as RWTH Aachen university and Maastricht University which focus on mainstream service.

However, from national perspective, China, USA and UK are always the top three contributors in the TAM research field whatever in which subfields. Besides, Egypt, Malaysia and Italy own certain research result about technology acceptance in tourism-related field, while German and Dutch researchers pay more attention to the mainstream service field.

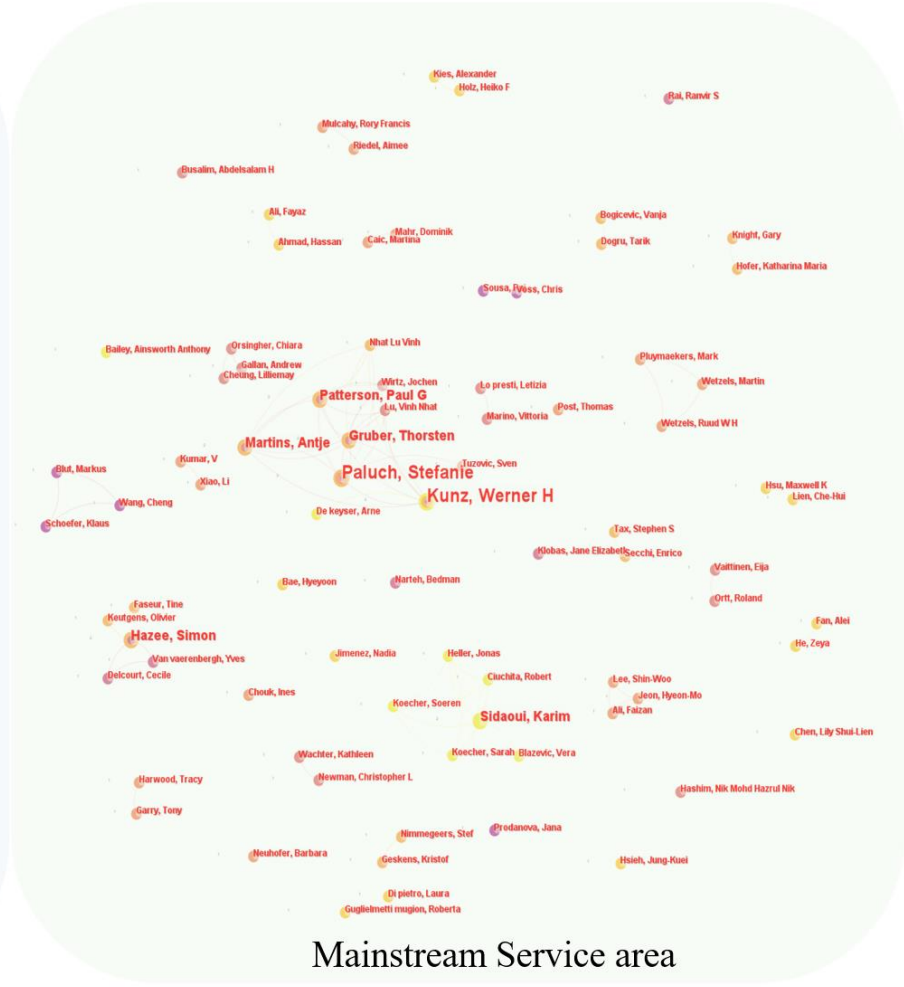


Figure 1. Bibliometric analysis result of authors in both t-c-m and mainstream service areas.

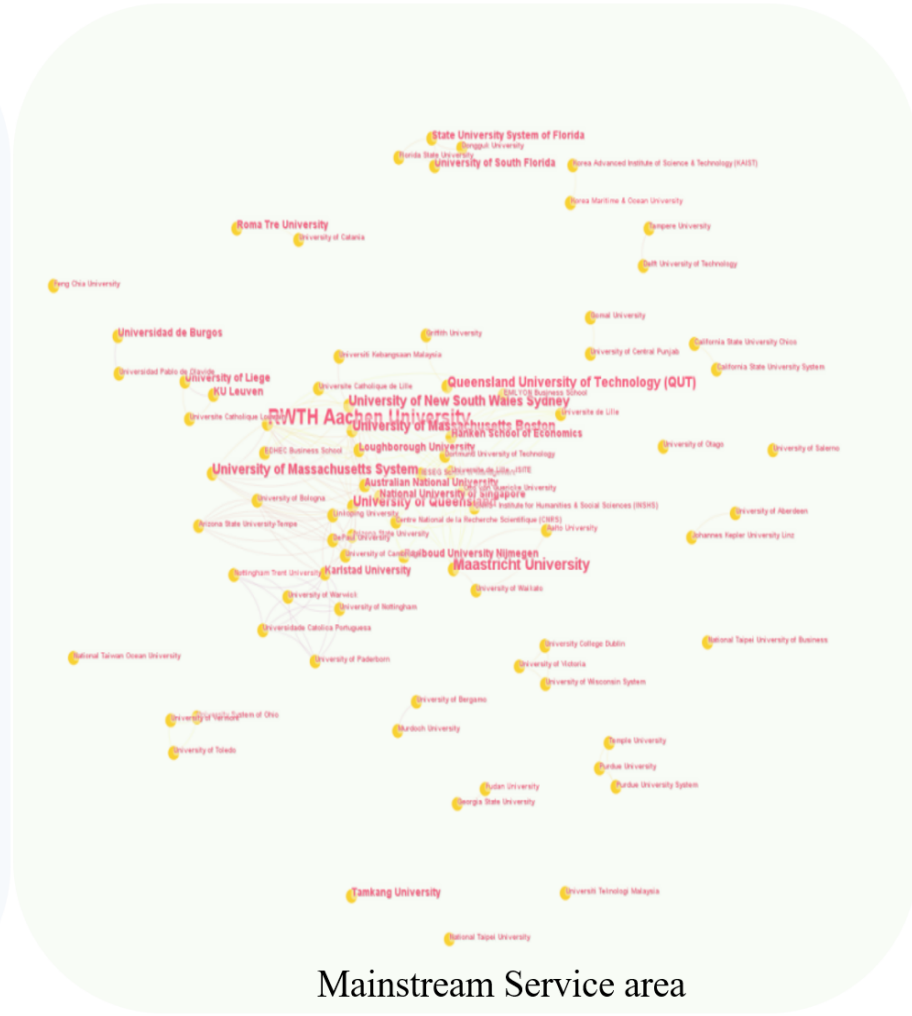
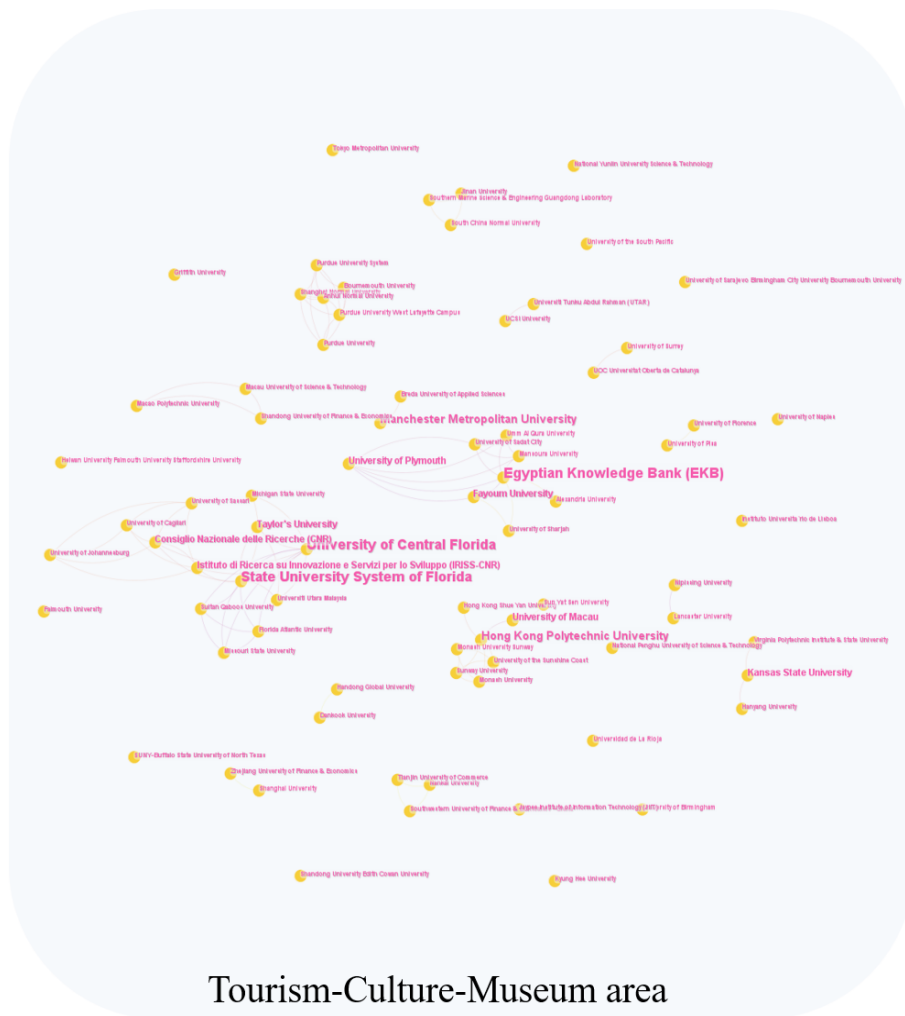


Figure 2. Bibliometric analysis result of institutions in both t-c-m and mainstream service areas.



Tourism-Culture-Museum area



Mainstream Service area

Figure 3. Bibliometric analysis result of countries in both t-c-m and mainstream service areas.

In terms of quantitative part, to analyze the TAM content in the t-c-m sector and mainstream services, this study indicates common ground between the two fields. Also, to make a comparison with t-c-m industries, the number and the name of 4E-related attributes. Efficacy (n=8), Enjoyment (n=8), Engagement (n=10), and Experience (n=6) are counted to have a deep analysis.

First, an analysis was conducted to recognize the most frequently mentioned variables in three subfields respectively. The result indicated that 1) Digitalization is the most valued characteristic when tourism or hospitality places adopt innovations; 2) In cultural tourism places, diversity is more addressed due to exhibition planer considering the different exhibition effects brought by various high-techs; 3) Most studies are relevant to museum pay close attention to the virtualization. It is a new trend that curators are willing to adopt augmented reality (AR), virtual reality (VR), or mixed reality (MR) when virtual technology is gradually mature recently.

As for the common constructs in all three subfields in the t-c-m industry, the experience becomes the most cited dimension which contains 12 papers in the t-c-m industry as well as 6 papers in mainstream services. Among all areas in service industries, customers expect a satisfied experience after adopting technologies.

The shared construct in both of tourism & hospitality industry and cultural tourism places is efficacy – the most frequently used concept, which means that visitors expect the technologies to be easy to operate, efficient, and time-saving. Meanwhile, there are 8 mainstream service studies that view efficacy as one of the critical indicators of technology acceptance.

In terms of cultural tourism and museums, enjoyment becomes the most striking dimension. Education is one of the most significant tasks in cultural tourism sites and museums, and edutainment makes the teaching process interesting, efficient, and interactive. Also, more studies in mainstream services believe in the significance of enjoyment.

Lastly, the importance of engagement in the activities in museums and tourism & hospitality contexts is generally acknowledged. Not only in the t-c-m area but in the mainstream service industry engagement play an important role in innovation adoption. Engagement is the most frequent variable of 4E in mainstream service, which means the mainstream is more concerned about the interaction between customers and service suppliers. In the mainstream, the 4Es get more attention and even gain more inputs than the t-c-m industries. It shows that the t-c-m industries makes the right decision in the past five years but need to put more effort into 4E.

Discussion and Conclusion

This study summarizes the most frequent variables in mainstream service and tourism-related papers. It is worth mentioning that studies in mainstream service explore more aspects that are not yet recognized by tourism-related researchers. This means that the existence of potential research directions deserves further exploration. For instance, most mainstream studies focus on AI or robots applied in the service industry, so anthropomorphism is an emerging antecedent in TAM able to be considered in tourism-related studies.

Also, based on the article review of mainstream service, a trend named model multistakeholder. In the mainstream, co-creating with other stakeholders becomes a novel topic, and co-creation is joined into TAM to identify the impact of collaboration with other actors on customer behavioral intentions. This change is going to become a potential evolutionary direction for t-c-m fields. With the development of technology, co-creation between different stakeholders is gradually crucial so that co-creation or co-creativity becomes a new variable and needs to be joined to more studies of different topics.

Besides, localization, ubiquity, and specificity are other variables for future attention. When deciding to adopt innovation adoption, various industries should take these identified potential variables into reference. It is also important to note that the three Es (Efficacy, Enjoyment, and Engagement) are commonly investigated components too in the mainstream studies of services in the recent period. This observation further reinforces the steering direction of coming studies toward these Es in the investigations of TAM specific to the TCM context.

The other trend in the post-2000s is termed contextualization. Increasing research put forward their antecedents according to their studies' contexts and research objectives. In 2016, research about the online travel agency employed switching costs, utilitarian belief, and intention to knowledge as research variables, matching the context of the investigated case. Particularly, after the pandemic, an antecedent named perceived physical risk appeared (Yang & Lee, 2022). The pandemic urges researchers to consider studies about TAM case by case. Mainstream service studies also design their research attributes according to their research contexts as well as targeted innovations.

In recent years, the review of the mainstream research shows that mainstream studies also investigate the attributes being employed in Roger's innovative diffusion and signal theory, data security theory, co-creation theory, and others. Thus, the recent five years of TAM development could be termed as a stage of hybrid modeling.

This study shows attributes uniquely adopted in mainstream service. Those variables are core concepts adopted in mainstream service studies but have not been widely concerned in t-c-m fields, so those concepts are research orientation shortly. Specifically, information credibility, localization & ubiquity, perceived complementarity, stickiness, and privacy assurance only emerge in mainstream service even thorough just one study adopts those attributes as a key concept in their study.

Furthermore, it is a trend that mainstream service researchers accept attributes in Roger's diffusion of innovation theory. Four attributes are integrated into TAM, which are trialability, relative advantage, complexity, and compatibility respectively. Few TAM studies of t-c-m fields chosen in this study combine diffusion of innovation theory to future TAM structure can be extended via joining the above theory.

The last part is associated with variables which popular in both two different fields. Except for 4E, the main findings in this study, sociality, control as well as negative impact get attention from both two fields. Sociality is an umbrella name that includes a maximum number of variables related to society, such as social influence (Amelia et al., 2022), social value (Wu et al., 2021), social connection (Marino & Presti, 2018), social distance (Lv et al., 2022), social

present (Hew et al., 2018) and so on. Control indicates a personal perception of taking charge of the interplay with innovations (Wei et al., 2019). As an innovative psychological contrast, control is in favor of stimulating positive emotion about innovations. Also, control is divided into internal control and external control. Internals consider that outcomes or events are controlled by skills, effort, and abilities, while externals regard chances or powerful others as keys of control. Finally, both researchers in two fields notice the importance of negative impacts from innovations, and risks (Lin, 2021), discomfort (Flavian et al., 2022), and insecurity (Treiblmaier et al., 2021) are the most frequently mentioned variables of negative impacts from innovations. It is necessary to consider both sides of positive impacts and negative impacts when extending the TAM framework.

In a nutshell, based on the above analytical review of prior studies and observed trends, the future agenda for both mainstream and t-c-m research about TAMs is to be summarized.

A recent review of mainstream services also revealed the diversified topics in the investigation of TAMs. These include the studied dimensions related to many components of various theories such as Optimism, Co-creation, Trialability, reduce information asymmetry, Information credibility, Localization & Ubiquity, Perceived complementarity, Stickiness, Perceived complexity, Privacy assurance, and Anthropomorphism. Such a wide range of initiatives are deserved to become the agenda of research in the tourism field as well.

This study only compares and contrasts tourism-related and mainstream studies. As the tourism industry contains many sub-segments such as airline, catering, retail, restaurant, and so on, the future investigation may extend to review their TAMs in the past and examine TAM specific to these sub-segments. In addition, future research may incorporate more TAM studies from different journals to enhance the representativeness and comprehensiveness of the investigation. These can also broaden scholarly views and stimulate theoretical development. Moreover, this study only contrasts tourism-related and mainstream studies, future research can divide more segmentations in the tourism industry or introduce different journals from diverse fields to understand the development process and stimulate theory development.

This study not only summarizes unique variables in mainstream service and uses them for reference but also improves intrinsic attributes in mainstream service. Antecedents are divided into two parts, negative influences and positive influences of innovations. Among positive variables, 4E are the most noticed constructs in t-c-m fields and draw great attention from mainstream service researchers. Negative variables are summarized from all 100 reviewed articles, including discomfort, insecurity, and risk. Perceived usefulness and perceived ease of use remain core variables in TAM. The moderators are token examples from the study of Blut et al. (2016). Emotional moderator enables to contain optimism, excitement, and joy. Social influence, social value, social connection, social distance, and social present can become social moderators in TAM. All the variables are divided into three types, which are original, integrative, and innovative. In consequence, it is convenient for future studies to cite and evolve the framework according to specific situations.

More constructs can be considered in future t-c-m TAM studies, such as information credibility, perceived complementarity, technology sickness, privacy risk, and optimization. Compare with articles in mainstream services, later studies enable us to place more attention on AI-related technologies, which is in favor of deepening the understanding of intelligent robots in the t-c-m context. Otherwise, in contrast to TAM, fewer studies are based on IDT as a theoretical foundation in the t-c-m area, and attributes in IDT such as trialability, relative advantage, and complexity are recommended to adopt as constructs in TAM studies.

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