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Social content as a key factor for the efficiency of digital tourism systems

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ABSTRACT

BACKGROUND AND OBJECTIVES: Due to the development of Information and communication technologies, data clouds produced by several sources containing vital information about cities, give more opportunities to tourists to access more information and services. Tourists can overcome challenges such as movement and finding information and services by improving the digital Tourism System's efficiency. Digital tourism system can help tourists to move and to live in unfamiliar destinations, know different cultures, and buy services and productions more easily and independently. Therefore, digital tourism systems and their efficiency are a significant concern, which this research aims to address by evaluating the position of digital tourism systems and identifying the dimensions and influential factors affecting their efficiency.

METHODS: This study was a quantitative research and its target population consists of tourists or residents of the city of Mashhad use digital tourism systems. Due to the large population size, encompassing nearly 3 million residents and 20 million tourists annually, and considering the methods for determining the sample size for this study due to limitations arising from COVID-19, online questionnaires were utilized for data collection. Out of a total of 778 distributed questionnaires, 389 questionnaires were fully and accurately completed. The collected data was analysed using SPSS data analysis software to assess the analysis and relationships between the factors affecting the efficiency of digital tourism systems in Mashhad.

FINDINGS: The results showed that more than 82% of respondents are using digital tourism system for managing their travels and three main functions of digital tourism system mentioned by tourists are "reservation services" (41%), "take information" (31%), "moving, find destination" (28%). Additionally, in brightness of this study, it demonstrated that digital tourism system usually uses smart recommender systems to personalise its recommendations, which need tourists' information. However, many of tourists (56%) are unwilling to share their personal information. one of the most important finding of this research is that receiving social content significantly correlates with users' confidence in digital tourism system for sharing their personal information.

CONCLUSION: The findings showed that digital tourism system can optimise its personalisation process by using social content. It can ameliorate the users' confidence in digital tourism system for sharing their personal information, which will increase the efficiency of digital tourism system. This finding cannot only be a solution to overcome tourists' challenges but also is a key factor for tourism companies that are the beneficiaries of digital tourism system to achieve their business goals. Moreover, it is a wake-up alert for the public sector to accept its responsibility for legislating, monitoring and producing social content in digital tourism systems.

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INTRODUCTION

The increasing use of new information and communication technologies, such as Artificial Intelligent (AI), the Internet of Things (IoT), and block chain technology, is speeding up the global technological and industrial revolution (Zhang and Lu, 2021). Information and Communication Technologies (ICT) has transformed tourism globally and offers a range of new opportunities for development (Muneta et al., 2013). Governments, industries, and academia have all given artificial intelligence much attention. The internet and digital technology have substantially impacted our lives throughout the past two decades. tourists book trips online, talk to friends back home, and travelers can visualize distant locations in images, texts, or virtual realities, all of which have had a significant impact on the tourism industry. The ubiquity of internet-enabled devices has also significantly impacted infrastructure and communication (Zhang and Lu, 2021), which have made possible using Digital Tourism Systems (DTS). DTS (including websites, applications, etc.) allows tourists or tourism management to access mass information produced by three sources: (1) Users (e.g., online reviews); (2) Devices (e.g., mobile and GPS data); and (3) Operations (e.g., website traffic, Google Trends, and online booking data) (Li et al., 2018). However, the quantity of data in the current world is enormous, and big data analysis has gained popularity recently. Many organizations from a wide range of industries depend more on users and more on the knowledge produced from massive volumes of data created over the course of their operations. However, traditional data approaches and platforms are not well suited for big data analytics to analyses the tremendous amounts of structured and unstructured data to create correlations and predict trends across datasets (Gavighan et al., 2019). When it comes to real-world situations where customer engagement and customer service are at the heart of decision-making, these restrictions are more difficult to overcome (So et al., 2021). The tourism and hospitality sectors are not an exception. The interpretation and analysis of massive amounts of data, including multimodal datasets (numerical, categorical, time-series, picture, and text), is becoming increasingly important to the hospitality and tourism industries (Samara et al., 2020). The vast volume of data accessible makes information

extraction more difficult and necessitates the use of sophisticated analytical tools (Doborjeh et al., 2021). Thereby, personalization is essential to DTS to find the best information tourists request according to time and location. To achieve this goal, DTSs use AI in their Smart Recommender Systems (SRS) to "identify desires", "cloud processing", "find useful information", and "offer personalized information" to tourists (Rana and Deeba, 2019). However, while DTS needs tourists' personal information to improve the efficiency of its Smart Recommender System, a study revealed that tourists are not willing to share their personal information (Oliveira et al., 2020). This is one of the significant challenges in the data personalization process to improve the efficiency of DTS's functions. The lack of user involvement in improving the efficiency of digital systems is a major challenge that cannot be overcome solely by technical solutions. The theoretical foundations of this research indicate that most studies in the field of digital systems focus on improving their technical performance and programming (Rana and Deeba, 2019; Mohamed et al., 2019; Ghazanfar and Prugel-Bennett, 2010). However, in this study, an attempt was made to address the improvement of DTS performance by emphasizing the user's contribution. The findings of this research demonstrate that alongside the use of innovative technical methods, user feedback is indispensable in improving the efficiency of DTSs. This research, concentrating on DTSs' function, and tries to find the main challenges against DTSs' efficiency in Mashhad. Therefore, an online survey was conducted among 389 respondents (tourists and inhabitants who use DTS). Results confirmed the importance of DTS among respondents in Mashhad as the first priority in travel tools for managing their travel. Analyzing the DTSs given suggestions to tourists draw out that the main challenge of DTSs is the lack of trust of tourists in DTSs. However, variables correlation analyzing demonstrated a direct and significant correlation between "receiving social information" and "Willingness to share personal information". The findings of this study can be helpful for commercial sectors that have more shares of DTSs' productions to improve commercial benefits and efficiency of their contents. In addition, it can open new fields of research in future about the social effects of the digital tourism era and the new social demand related to the public sector to be more active in content creation,

observation and legislation in DTSs. This research has been conducted in 2020 in Mashhad.

Theoretical framework

Regarding scientific study and practice in tourism, information is crucial to the tourism industry, as has been well-demonstrated (Buhalis, 1998; Gretzel, 2011). As a result, it was reasonable to anticipate that ICTs would be widely adopted in the tourism sector (Koo et al., 2015; Law et al., 2014). The adoption of ICTs resulted in significant changes (Buhalis and Law, 2008; Xiang et al., 2015) and a wide range of new risks and possibilities for tourism businesses and organizations. The information about tourist destinations and their associated resources, such as accommodations, restaurants, museums or events, among others, is commonly searched by tourists in order to plan a trip. Thus, in this way, Digital Tourism Systems (DTS) (like websites, applications, etc.) have vital roles. The "informatization" of the entire tourism value chain (Werthner and Ricci, 2004) and the creation of the concept of Travel 2.0 (Oklobdžija and Popesku, 2017; Schmallegger and Carson, 2008), that is, websites that permit visitors to express their opinions about any travel-related content publicly, have been made possible by the evolution of Internet websites into applications known as Web

2.0 applications. These applications, which have long dominated how travelers use the internet, are opening the way for employing even more advanced intelligent systems in the tourism sector (Fotis et al., 2012; Gretzel, 2011). However, the list of possibilities offered by Web search engines (or even specialized tourism sites) may be overwhelming, and the evaluation of this long list of options is very complex and time-consuming for tourists in order to select the one that fits better with their needs (Borrás, Moreno, and Valls, 2014). DTSs make it simple for travelers to locate, personalize, and buy tourism-related goods. They also help tourism businesses become global by supplying tools for creating, administering, and distributing tourism services globally (Buhalis and O'Connor, 2005). Thus, aided by the exponential increase of online information, travelers' tendency to search for recommendations online is now a constant and growing reality (Xiang and Gretzel, 2010). The interest in this area is high because it constitutes a problem-rich research area and because of the abundance of practical applications that help users to deal with information (Lakshmi and Lakshmi, 2014). DTSs try to find the best information according to time and location, by creating Intelligence Monitoring, Analyzing and Recommender Systems for their users (Fig. 1).

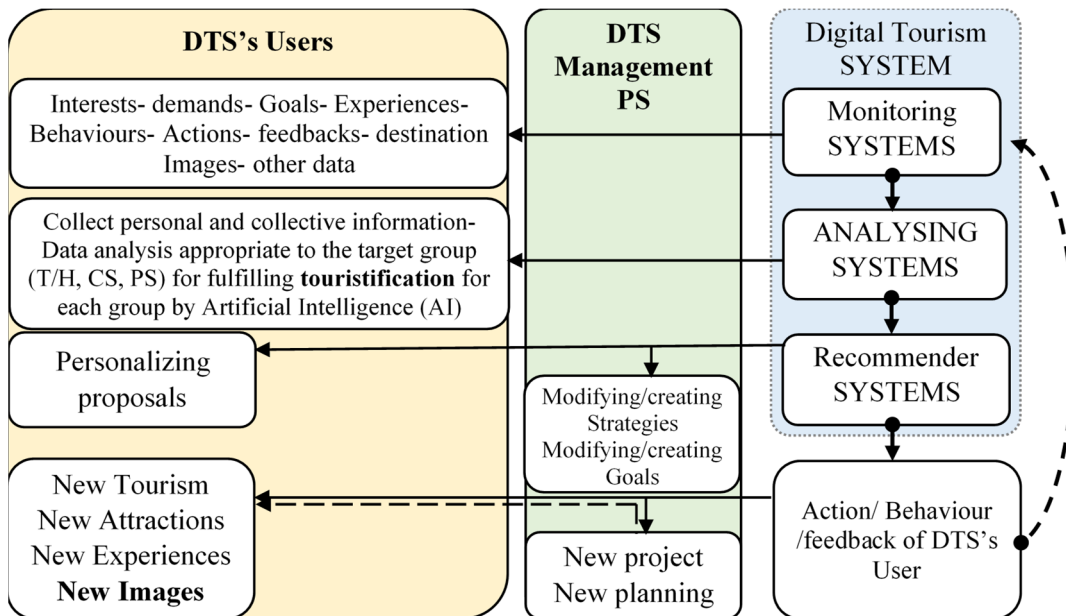


Fig. 1: The functional process of the Digital Tourism System

However, the high volume of data poses a significant challenge in terms of monitoring, analysis, and presenting personalized proposals. In this regard, AI has proven to be a great help to learn human skills, including learning, judgment, and decision-making and uses computers to simulate intelligent human behavior (Da Xu *et al.*, 2021). The main objective has been the exploitation of this accumulated information: integration of information from a broad spectrum of suppliers; development of customer databases; matching of information for the delivery of personalized services, and cost and time savings (Stamboulis and Skayannis, 2003). AI as a knowledge project that uses knowledge as its target, obtains information, analyses and investigates knowledge's modes of expression, and then applies these techniques to simulate human intellectual activity (L. Duan and Da Xu, 2012); combines computer science, logic, biology, psychology, philosophy, and many other fields which is essential to the advancement of society and has produced ground-breaking improvements in labor productivity, labor cost reduction, human resource structure optimization, and employment demand creation (N. Duan *et al.*, 2019). The growth of artificial intelligence has tremendously boosted humankind's economic well-being, and improved all facets of life while also significantly advancing social development and ushering in a new age of social development (Lu and Xu, 2019). The two essential characteristics of intelligent systems are the ability to detect the environment and the capability to learn from experiences to optimize performance in attaining specific goals (Gretzel, 2011). Thus, DTSs progressively adopt artificial intelligence (Riccio *et al.*, 2016) to comprehend the situation, learn and store information, recommend conclusions based on past experiences, and act rapidly and effectively in response to a new circumstance, which sets them apart from non-intelligent systems (Rudas and Fodor, 2008).

Consequently, Smart Recommender Systems (SRS) has an important role in DTS's efficiency. (Lakshmi and Lakshmi, 2014; Zhang and Lu, 2021). One of the distinctive characteristics of recommender systems is personalization, and Recommender systems are typically evaluated on their ability to provide items that satisfy the needs and interests of the end user. Many studies have proved that users would not use recommender systems if they believed such systems

were not providing items that matched their interests (Abdollahpouri, 2019). The recommender system examines massive data of objects and compiles a list of those objects that would fulfil the tourists' requirements (Rana and Deeba, 2019). Thereby, knowing more about the user can improve the quality of recommendations, while Digital Tourism Systems (DTSs) face challenges in filtering, prioritizing, and providing accurate recommendations (Adomavicius and Tuzhilin, 2005; Lakshmi and Lakshmi, 2014). Based on the literature, a complete SRS contains three main parts: user resource, item resource and the recommendation algorithm. In the user model, the consumers' interests are analyzed; similarly, the item model analyses the items' features. Then, the characteristics of the consumer are matched with the item characteristics to estimate which items to recommend using the recommendation algorithm. This algorithm's performance affects the whole system's performance (Rana and Deeba, 2019). Generally, recommender systems use three models to improve their accuracy: content-based filtering, collaborative filtering, and demographic filtering. Ghazanfar and Prugel-Bennett (2010) propose the fourth model, the Cascading Hybrid recommender system that uses and combines all recommender system techniques and has all advantages of the three last techniques: content-based filtering, collaborative filtering and demographic filtering. It is applied to eliminate redundant records problems with the recommendation system (Ghazanfar and Prugel-Bennett, 2010). However, there are still many challenges to improving the accuracy of recommendations. Most of the research conducted to overcome these challenges has focused on technical solutions to enhance the functions of algorithms or models used to forecast user preferences (Mohamed *et al.*, 2019; Rana and Deeba, 2019), sometimes overlooking the role of user participation. The paper by Hariri *et al.* (2013) suggests learning context information through explicit user queries as well as implicit learning. Another crucial factor in enhancing the efficiency of recommender systems is "context-awareness," which aids in better understanding user behavior and consequently improves recommendations (Hariri *et al.*, 2013; Hu and Ester, 2013; Saranya and Sadhasivam, 2012; Tang *et al.*, 2013). Thus, in any kind of recommender system, it is essential to have precise information about the

user's interests stored in her profile (Borrás et al., 2014). While, the main empirical findings indicate that tourism demand forecasting based on tourists' online review data can substantially improve the forecasting performance of tourism demand models (M. Hu et al., 2022), many tourists are unwilling to share their personal information or accept cookies (Oliveira et al., 2020). Tourists need to know which information is required to recommend items to them preferentially and how it is applied (Mahmoud et al., 2018). Many studies have shown that privacy and security are one of the most significant deterrents to sharing personal information (Gunn, 2017; Preece et al., 2004; Sun et al., 2014; Yoo and Gretzel, 2011) and it is a big challenge for a recommender system. To overcome this challenge, DTS need to connect directly with tourist as a (person) and gain trust to improve the personalizing process (Fig. 2). Therefore, Dialogue in pseudo-modernism has been replaced with a monologue in modernism by DTSs, like applications, websites, etc. That way, tourists receive their personalized proposals from these recommender systems. Moreover, it can provide feedback on the suggestions offered. This dialogue can enhance the system's understanding of the user and improve the efficiency of the recommender system, thus enhancing the efficiency of the DTS (M. Hu et al., 2022; Song and Li, 2008).

Pseudo modern as a practical approach by using new ICT innovations like AI, Big Data, Clouds and Analyzing Systems (for enhancing the smartness of tourism), tries to fulfil the maximum individualism and personalism. By learning from the data, AI algorithms can discover in-depth patterns that may be utilized to forecast and detect occurrences. For this reason, the monologue approach in modernism was replaced with a dialogue approach that respects variety and personality (Fig. 2). As a result, anyone

can go anywhere they like at any time, can do any experience they like, and can choose between many options. Therefore, tourist behavior, interests, needs and demands are observed all time by new technology like smart wearables, smartphones, Social Media, and cookies, and finally, smart recommender systems by AI propose many alternatives every moment for everyone, uniquely and quickly. Currently, DTS utilizes AI technology that simulates human cognitive functions like learning and problem-solving (Michalski et al., 1985). This has had a significant impact on various industries including psychology, space exploration, healthcare, finance, tourism, and marketing (Doborjeh et al., 2021; Sanders et al., 2021). All in all, more precise personalized recommendations can increase the user's willingness to share more personal information (Abdollahpouri, 2019). This means that if the suggestions provided align with the demands and interests of tourists, it can contribute to building confidence in DTSs. This chain of sharing personal data will lead to the enhancement of the efficiency of DTS (Fig. 3).

In this study, efforts have been made to identify the challenges facing the efficiency enhancement of DTSs by understanding their position in Mashhad. Additionally, key factors for enhancing the efficiency of DTSs are identified. Given that results may vary due to differences in target communities, this research has focused on Mashhad as a case study.

The spatial context of the case study: Mashhad (Iran)

Mashhad is the second biggest city in Iran. It has more than 3 million habitants and more than 20 million arriving tourists yearly. The extensive presence of this volume of tourists has presented significant challenges for tourism management in Mashhad (Kalantari et al., 2014; Amirfakhrian and Mobini, 2018). Therefore, tourism is the city's most essential

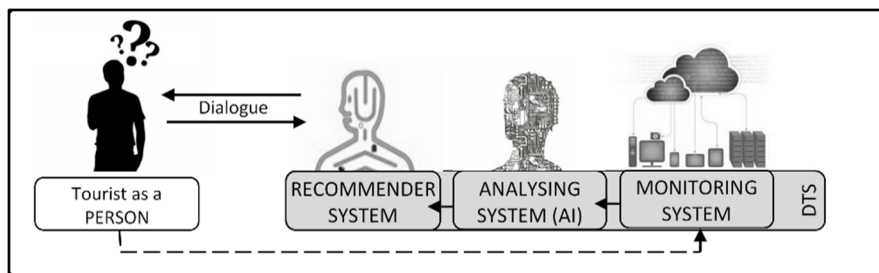


Fig. 2: The Dialogue between tourists and the Digital Tourism System by recommender systems

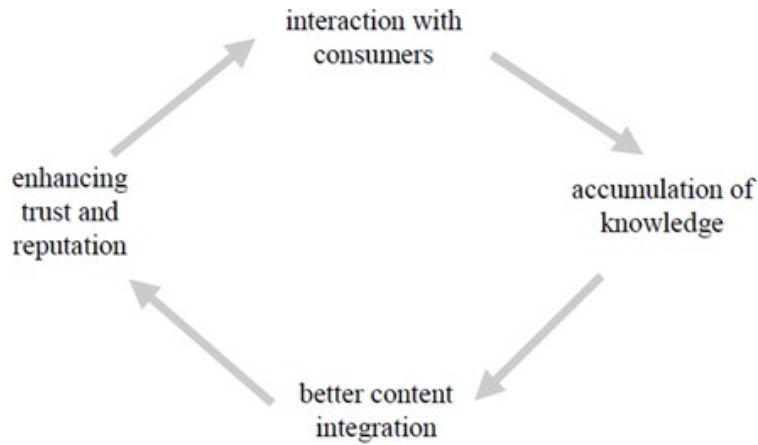


Fig. 3: The virtuous cycle of user-based interactive learning (Stamboulis and Skayannis, 2003)

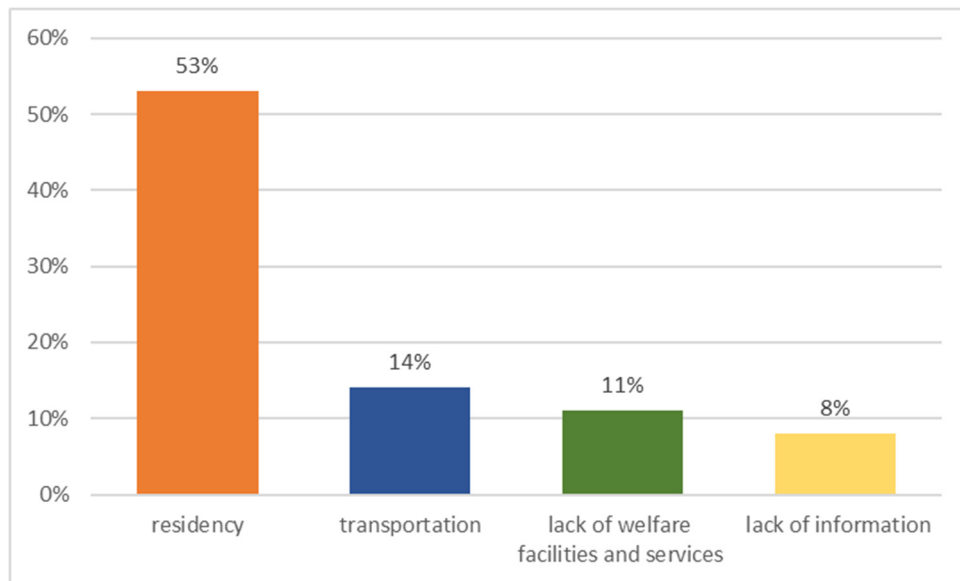


Fig. 4: The share tourists' problems in Mashhad (Jadroudi, 2014)

characteristic, and there are many accommodations and services in Mashhad. In 2014, [Jadroudi \(2014\)](#) questioned 100 tourists about the most critical problems for tourists in Mashhad. This study showed that "residency" is the main challenge for (53%) of tourists in Mashhad. Moreover, transportation (14%), lack of welfare facilities and services (11%) and lack of information (8%) were other main challenges against tourists in Mashhad ([Fig. 4](#)). However, by leveraging the potential of DTSs and enhancing their efficiency, it is possible to mitigate these challenges.

MATERIALS AND METHODS

This study aims to improve the efficiency of DTS and find the challenges ahead to help tourists in Mashhad to overcome challenges in Mashhad. For this purpose, this study used quantitative methodology. Therefore, to achieve this goal, this study utilized a questionnaire-based approach to directly inquire about users' interactions with DTSs for data collection. Since different local and regional dimensions are affected by tourism and make it challenging to generalize the results, to increase the

accuracy of obtained data and the applicability of the results to provide operational solutions, Mashhad was selected as a case study and the questionnaire was based on those reported in the literature and adapted for case study's context and tourists' challenges in Mashhad.

Determining variables and preparing survey:

In the first step of this research, using existing research literature, the variables of DTS efficiency were determined. In the next step, based on the extracted variables, the survey was prepared. The objective of this survey was to evaluate the position and effectiveness of DTS among users (tourists/inhabitants) and identify future challenges. Therefore, a questionnaire was prepared to clarify the "priority of DTS as travel tools," "the functions of DTS in tourism," "the level of trust of tourists in DTS for sharing personal data," and to determine "the level of trust in the information provided by DTS". This questionnaire consisted of 16 questions, and all elements of each question were measured on a five-point scale, ranging from "very low" (1) to "extremely high" (5).

To test the survey, a pilot test was first conducted with a group of five users. This initial test aimed to improve the questions and eliminate any unclear and/or ambiguous elements in order to refine the content and structure of the survey. The initial evidence presented reliable and valid questions. However, a questionnaire is, by definition, a standardized method with all the advantages and disadvantages that entails. The major advantage is that it provides a measure allowing for comparisons across space and time. However, this method is often criticized for truncating and biasing information (Goeldner et al., 2010).

Research community and sample size:

The target population for this research included both tourists and residents of Mashhad who used DTSs for their tourist activities, constituting a population of over 23 million individuals. This includes 3 million residents and 20 million tourists annually. Therefore, according to Cochran's sample size determination method, a minimum sample size of 385 individuals was determined to achieve statistically meaningful results with a margin of error less than 0.05 (Samimi, 2024).

Conditions and Procedure for Completing the Questionnaire

The online survey was conducted during the pandemic (COVID 19) because it was tough to do face-to-face interviews. Thus, we gathered the data using an online survey. The questionnaire link was sent through social networks, SMS and emails. In order to ensure the universality of the answers, an attempt was made to include the equality of age, gender, and education groups in the statistical population. We submitted our survey through "Porsline.ir" between April 2020 and May 2020. Due to the difficulty of fixing the sampling frame, there was no systematic sampling.

Statistical Information of Respondents:

The online survey was released and ultimately viewed by 778 individuals randomly, and finally, we had 389 valid responses that accounting for 48% of them (185 respondents) were male, and 52% of them (204 respondents) were female (Fig. 5). Moreover, 31% of respondents were tourists in Mashhad, and 69% lived in Mashhad but used DTS. All in all, more than 82% of respondents were using DTS. Since

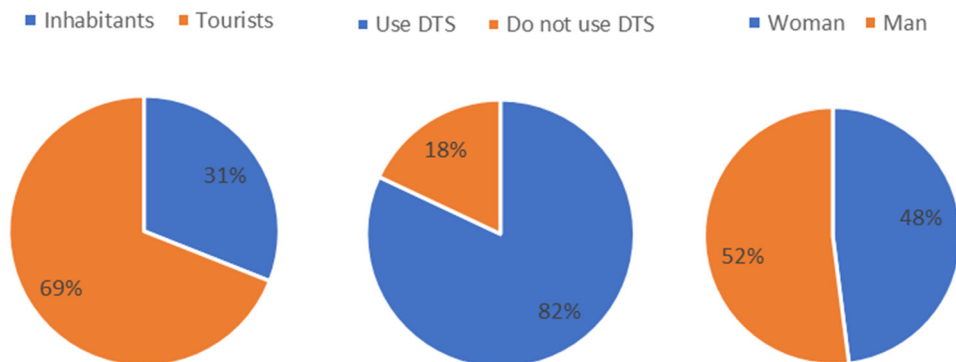


Fig. 5: Statistical Information of Respondents

the universe of interest is users of DTS, one of the questions was to separate respondents who use any DTSs (e.g. websites, applications, etc.) in their travels and those who do not use DTS but know it (Fig. 5).

This study used Harman’s single-factor test proposed by Podsakoff *et al.* (2003) to assess common method bias. The first factor explains 26 /93% of the covariance amongst all constructs. This is less than 50%, which means that common method bias does not affect our data (Podsakoff *et al.*, 2003; Podsakoff and MacKenzie, 2012). Nevertheless, this study entails all the common shortcomings of using an open-access sampling methodology (e.g., self-selection bias, lack of information about non-respondents, and unknown response rate) (Kuss *et al.*, 2014).

Data Collection and Analysis Tools

In this research, two types of data were collected. The first category consists of data gathered from the theoretical foundation study, which involved extracting key variables and factors by examining documents and existing studies in the field of DTSs. For this data, the exploratory approach had been used to identify the variables. The other category consisted of data gathered through questionnaires in the case study. As we have quantitative data,

we use the correlation analysis method to identify the relationship, patterns, significant connections, and relationships between variables. All in all, the quantitative and statistical analyses, supported by the theoretical studies, aided in achieving the research objectives.

RESULTS AND DISCUSSION

In bright of this study could answer our research questions about the knowledge of tourists in Mashhad about DTS, Priorities of travel tools and the most popular DTSs functions used by tourists in Mashhad. The result demonstrates clearly that 82% of tourists in Mashhad use digital services. Moreover, the range of usage of DTS is precisely the same between men and women (Fig. 5).

This study also demonstrates that travelers prefer to use websites as their priority and applications as their second priority. However, the Tourism maps are in third priority by average ranking, but it is close to applications (Table 1). According to the results, the tourism agency is located as the sixth priority. The results show that the websites have the first priority and applications have the second. However, the paper plans are in third priority by average ranking (Table 1). In addition, paper plans were indicated as a first priority more than Applications, but totally,

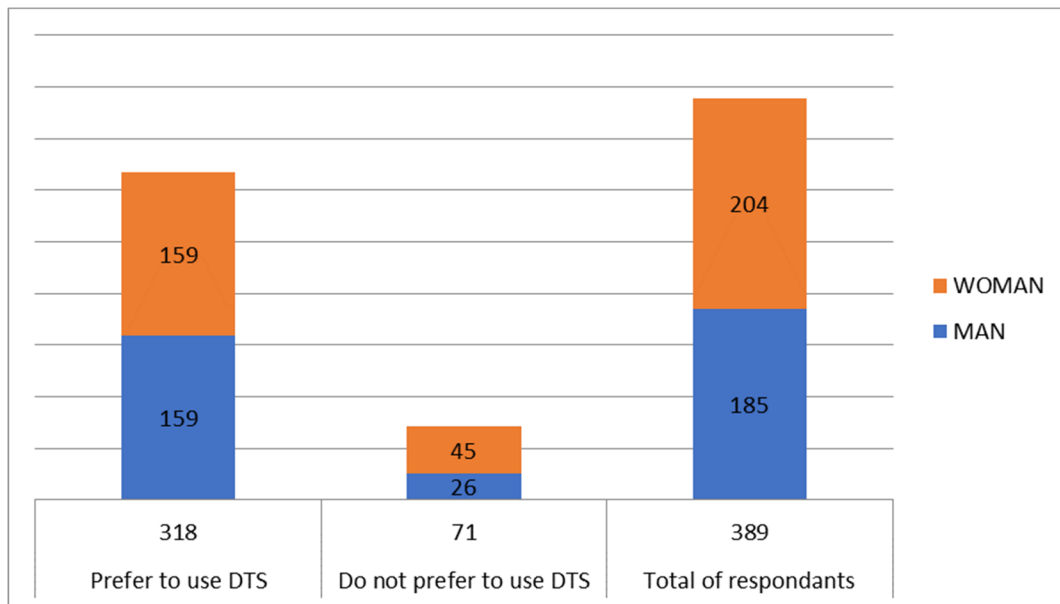


Fig. 5: The number of DTS’s users among respondents in Mashhad

Table 1: The priorities of travel tools for respondents in Mashhad

Travel tools	1st	2nd	3rd	4th	5th	6th	7th	Total answer
Websites	128	87	134	15	8	5	1	389
Applications	78	69	38	133	30	18	11	389
Tourism map	112	19	33	64	60	41	49	389
Asking friends	1	117	31	57	85	64	22	389
Booklets	48	62	83	30	18	14	123	389
Tourism Agency	13	19	47	44	34	145	75	389
Telephone guides	0	4	11	34	142	90	96	389

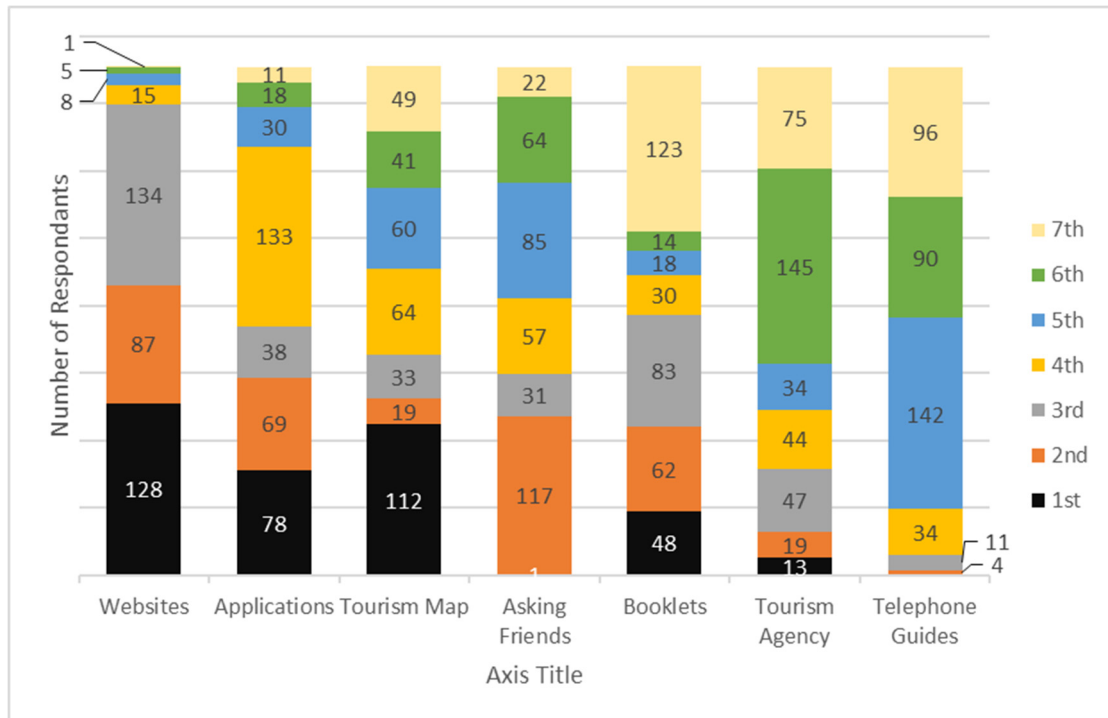


Fig. 6: The priority of travel tools for tourists and habitants in Mashhad

it was placed as a third priority. According to the results, the tourism agency is located as the sixth priority. The other priorities have shown in Table 1. Moreover, figure 6 revealed that “website” as the most important tool for travelers has a strong priority for tourists in Mashhad. It means that “websites” have gained more quantity as the second and third priority of travel tools among tourists in this city. However, application and paper plans are close to each other. Additionally, while the average rank of “asking friends” is slightly higher than “booklets”, we can say that they almost have the same priority.

Thus, it can be said that digital services, as pseudo-

modern tools are more acceptable for tourists and habitants in Mashhad.

Furthermore, this study has highlighted three main functions of DTSs in Mashhad: 1- moving through destinations and finding the best way (41%), 2-booking flights, hotels, restaurants, etc. (31), and finally 3- searching for information to make the best decision (28%) (Fig. 7).

Another important thing which followed in this research was the efficiency of DTSs information for tourists in Mashhad, their confidence in DTSs and the range of tendency to share personal information with DTSs. In bright of this study, today we know that

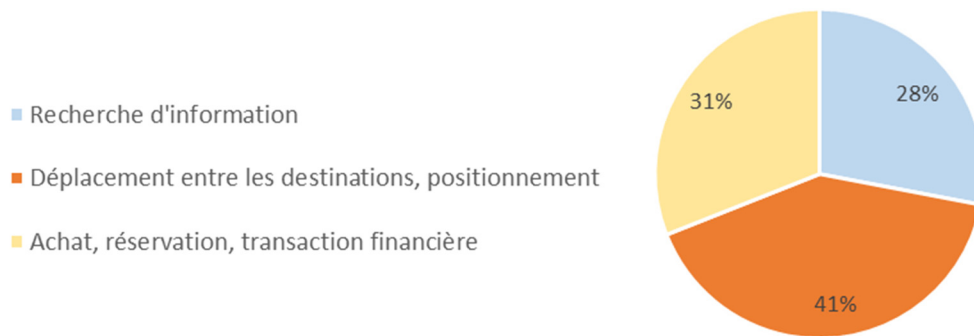


Fig. 7: Main functions of DTS which prefer to be used by travelers

Table 2: The Range of the efficiency, Reliability and personalization in DTSs used by tourists in Mashhad

Range	The efficiency of DTS's information		Confidence in receiving information		Confidence in giving personal information	
Very little	3.59 %		2.48 %		12.39 %	
Low	1.80 %		5.50 %		7.25 %	
Medium	27.25 %		33.33 %		35.95 %	
Much	29.64 %	67.37 %	37.92 %	58.72 %	29.91 %	44.41 %
Very much	37.72 %		20.80 %		14.50 %	
Total	100 %		100 %		100 %	

for 67.37% of respondents, the efficiency of DTS's information they have used is "much" and "very much". Moreover, more than 58 % of them have "much" and "very much" confidence in the received information (Table 2). However, digital services for their functions need personal user data. But the study showed that tourists' confidence in sharing personal data with DTS in Mashhad is not great. Just 44.41 % of travelers do not have a problem sharing their personal information with DTS, and it will be the biggest challenge for recommender systems to personalize the proposals efficiently.

This research has tried to investigate the position of DTS among Mashhad tourists and habitants to improve the efficiency of DTS in solving the problems of Mashhad tourism. This study showed that more than 67% of re- respondents believe that DTSs are efficient and more than 80% use DTS to manage their travels. This tendency to use DTSs is the fact that DTSs permit them to maintain their personalities and individualities in making and taking decisions. Travelers can find the best information everywhere and every time individually. DTSs work 24 hours and

every day. Moreover, three main functions of DTS (Fig. 7) correspond to the problems of tourists in Mashhad (Fig. 3). Thus, DTS will be useful in overcoming tourists' problems in Mashhad. To achieve this aim, we must find factors affecting DTS's efficiency. The correlation analyzing table of variables revealed key factors of DTS's efficiency. Efficiency of DTS's information has a significant correlation with "personalization rate" (.401**), "sharing personal information" (.269**), "confidence in DTS's received information" (.496**) and "receiving social information" (.106*) (Table 3). According to the correlation table of variables, we found that "received economic proposals" do not have a significant correlation with "efficiency of DTS's information" while receiving "social contents Proposals" (such as historical information, culture, rules, customs of societies) have a significant and direct correlation with "efficiency of DTS's information". It can also confirm tourism's primary goal: learning more about cultures and histories and generally doing new experiences.

Another key finding is that willingness to share personal information has a strange correlation with

Table 3: Correlation of personalized Information with other variables

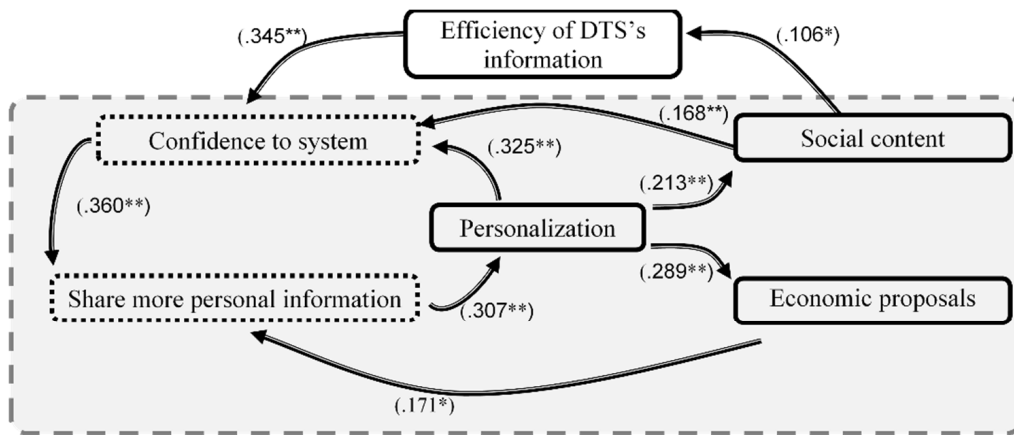
Kendall's Correlation		Social proposal	Confidence for give Personal Data	Confidence to System Information	Economical Proposal	Efficiency of DTS' s information	Personalized Information
Social proposal	Correlation Coefficient	1.000					
	Sig. (2-tailed)	.					
	N	327					
Confidence for give Personal Data	Correlation Coefficient	.122**	1.000				
	Sig. (2-tailed)	.008	.				
	N	322	331				
Confidence to System Information	Correlation Coefficient	.168**	.443**	1.000			
	Sig. (2-tailed)	.000	.000	.			
	N	319	326	327			
Economical Proposal	Correlation Coefficient	.340**	.171**	.055	1.000		
	Sig. (2-tailed)	.000	.000	.237	.		
	N	321	327	325	328		
Efficiency of DTS's information	Correlation Coefficient	.106*	.269**	.496**	.037	1.000	
	Sig. (2-tailed)	.024	.000	.000	.431	.	
	N	325	329	325	326	334	
Personalized Information	Correlation Coefficient	.213**	.352**	.345**	.178**	.401**	1.000
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.
	N	321	328	325	326	328	330

** . Correlation is significant at the 0.01 level (2-tailed).
 * . Correlation is significant at the 0.05 level (2-tailed).

receiving social content. Based on Table 2, just 44.41% of tourists in Mashhad have had “much” and “so much” confidence in DTS for sharing personal information. It is a big challenge for DTS to ameliorate its efficiency. The low willingness to share personal information with DTS can explain the low personalization rate of DTS in Mashhad. Just 39 % of tourists believed that the range of personalization of DTS in Mashhad is “much” or “so much” (Table 2). Correlation analysis showed that sharing social content with tourists can increase trust in DTS. As mentioned in other studies, “The ability to build and sustain trust-based relations with customers and to gain reputation and credibility is critical in the new power relationships. Intermediaries embark on a virtuous spiral, where interaction with consumers results in the accumulation of knowledge, which materializes in better content integration (as opposed to information processing), further enhancing trust and reputation (Fig. 8). Consequently, gaining

trust will increase the tendency to share personal information (Table 3). All in all, despite the complexity of the correlation between the variables in Table 3, a process can be formed to achieve the main goal of this research (Fig. 8), which is “improve the efficiency of DTS information”. In this process, DTS uses a smart recommender system to improve its efficiency, so the “personalization” of recommendations is an important key. Based on the variables’ correlations, by giving more “Social content” to tourists, DTS would gain tourists’ trust and consequently encourage them to share more personal information. This process can increase the personalization rate of DTSs; thus, the efficiency of DTS’s information will increase

Current findings support this claim that there is strong correlation between the implication of AI, customer satisfaction, and engagement (Kong et al., 2021; Mariani and Borghi, 2021; Prentice et al., 2020). To the best of our knowledge, this is the first empirical research that investigates the relationship



*.Correlation is significant at the 0.05 level (2-tailed).
 **. Correlation is significant at the 0.01 level (2-tailed).

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Fig. 9: The variable relationships in personalization's process to increase the efficiency of DTS's information in Mashhad

combining received social content, the confidence in DTS to share personal information, and increasing the efficiency of DTS's information, especially in Mashhad (Iran).

CONCLUSION

In this era, ICT innovations have had unbelievable effects on all fields, especially tourism. Accessibility to the internet all over the world and a huge amount of information, besides smart tools like smartphones, create a new phenomenon called Digital tourism systems, which help tourists manage their travel personally and individually. This study revealed that using the DTS is the first priority in managing travels in Mashhad. Most of the respondents (82%) in Mashhad use DTS and the most important functions of DTS from the respondents' perspective include these aspects: «moving between destinations», “buying or reserving services”, and “receiving information”. Looking at challenges faced by tourists in Mashhad (Fig. 4), it can be seen that the main functions of DTS effectively address these challenges. This highlights the need for further attention to the expansion of DTSs and enhancing their efficiency. The findings of this research indicate that DTSs, in order to enhance their efficiency, seek to increase the accuracy of personalizing data and recommendations provided to

users. In this regard, they utilize smart recommender systems to make an efficient connection between demands and huge amounts of information. Thus, two-way communication and receiving feedback and user opinions can assist DTSS in gaining a better understanding of users and providing more accurately personalized recommendations. However, based on the results obtained from theoretical studies and asking tourists, it is evident that the most significant challenge facing DTSS is gaining users' trust. When users have low trust in the system, they provide less feedback, which hinders the DTSS from improving their performance. This finding indicates that alongside technical and programming aspects, the interaction between the system and the user can play a crucial role in improving system efficiency. The questionnaire responses indicate that while the DTS's performance has been beneficial for users, more than half of the respondents (55.59%) are unwilling to share their personal information with the DTS. This reluctance is directly related to the level of trust in the DTS. As a result, it can be identified two major challenges facing the DTS in Mashhad: low user confidence and reluctance to share personal data with the system. The examination of relationships between research variables demonstrates that receiving “social content” has a direct and significant

correlation with increased trust in the system. This implies that digital tourist systems that convey more social content to their audience garnered greater trust among their recipients. Considering the direct and meaningful correlation between the personal data sharing rate and trust in the DTS, this result indicates that providing social content can be the key to solving the efficiency challenge facing DTSs in Mashhad. This finding can serve as a crucial guide for the tourism industry sectors that produce and manage a significant portion of digital tourism systems. It enables them to enhance their business growth while simultaneously improving the quality of tourism activities. Furthermore, the significance of DTSs among tourists and its prominent position among all travel tools in Mashhad demonstrates that by enhancing the efficiency of DTS, these systems can play a significant role in promoting tourism in Mashhad and alleviating challenges faced by tourists in Mashhad. Moreover, it underscores the responsibility of the city's tourism management to increase participation in supporting user rights in DTSs. Therefore, it is imperative for the tourism management of Mashhad to ensure user's security in DTSs through legislation, supervision, content production, and providing suitable infrastructure. However, with the rapid progress of DTSs, a privacy concern has appeared which requires more research. Furthermore, it is essential to consider topics such as the role of legislation, control, supervision, and content production in digital tourism systems in future researches in order to enhance user security and increase the efficiency of these systems.

Research limitation

This study encounters several noteworthy limitations. Firstly, the reliance on open-access sampling introduces potential sources of bias, including self-selection bias, a lack of data on non-respondents, and an unknown response rate. Secondly, despite the extensive literature on recommender systems and new technology in tourism, empirical research addressing the correlation between tourist confidence in DTS and the efficiency of these systems is notably scarce. Previous studies have primarily focused on technical methods to enhance the efficacy of intelligent recommender systems. Thirdly, the research model omits age as

a moderator variable, potentially overlooking a significant aspect. Future studies may benefit from conducting a multi-group analysis to explore variations between different demographic groups. Moreover, the research was conducted during the COVID-19 pandemic, which posed challenges in accessing and surveying tourists. The use of an online survey and quantitative methodology was employed to mitigate these challenges, limiting the respondent pool to those who were able to participate via digital means. Lastly, the study's scope is confined to Mashhad and its unique characteristics. Consequently, the findings may not be directly applicable to other cities. The distinct religious character of Mashhad could potentially influence respondent attitudes and behaviors. To broaden the applicability of the results, future studies could encompass a wider array of cities, countries, and demographics.

AUTHOR CONTRIBUTIONS

H. Mobini, performed the literature review, experimental design, analyzed and interpreted the data, prepared the manuscript text, and manuscript edition. Professor D. Crozat has been the supervisor and academic advisor throughout the stages of this research, playing a significant role in the analysis, research methodology, and achievement of research objectives. B. Shabani, helped in the literature review and manuscript preparation. M. Haghi, helped in the literature review and manuscript preparation.

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CONFLICT OF INTEREST

The authors declare no potential conflict of interest regarding the publication of this work. In addition, the ethical issues including plagiarism, informed consent, misconduct, data fabrication and, or falsification, double publication and, or submission, and redundancy have been completely witnessed by the authors

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ABBREVIATIONS

ACECR	Academic Center for Education, Culture and Research
AI	Artificial Intelligent
DTS	Digital tourism system
ICT	Information and Communication Technology
IoT	Internet of Things
SRS	Smart recommender system

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