Smart tourism technologies for the psychological well-being of tourists: a Bangladesh perspective

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Smart Tourism Technologies for the Psychological Well-being of Tourists: A Bangladesh perspective

Abstract

Purpose –The importance of smart tourism technologies (STTs) has been rising recently. But how STTs are related to tourists' psychological well-being has got little attention. The study intends to show how STTs increase tourists' psychological well-being by capitalizing on the theory of Tourism 4.0. The study investigates the associations between the factors of STTs with the perceived benefit and, subsequently, perceived benefit with the psychological well-being of tourists. Moreover, it also examines the moderating impact of a growth mindset (GM) between perceived benefits (PB) and tourists' psychological well-being (TPW) in the tourism industry.

Design/methodology/approach –Using a structured questionnaire, 243 responses were collected through the convenience sampling method. Structural equation modeling (PLS-SEM) was used for the analysis.

Findings –Findings show that automation, security/privacy concerns, information accuracy, and personalization are significantly related to the perceived benefits of tourists. The results also confirm that a growth mindset moderates the relationship between perceived benefits and tourists' psychological well-being.

Practical implications – The results show the social and managerial importance of the perspective of tourism in developing countries. Based on the tourism 4.0 concept, this study presents a theoretical contribution by expanding practical information regarding the link between smart tourism technologies (STTs) and psychological well-being. Moreover, the study shows some directions to the tour operator about improving perceived benefits and psychological well-being. The notion of tourism 4.0 is a new paradigm that seeks to unlock the psychological well-being of visitors through the hyper-interconnectedness of humans and technologies.

Originality/value – This study contributes to prior research on technology-based tourism by exploring the uncharted STT variables, perceived benefits, growth mindset, and psychological well-being. Moreover, the study makes an empirical effort to conceptualize the tourism 4.0 concept on the proposed relationships. Tourist firms should focus on implementing this theory to develop their business.

Keywords: Tourism 4.0, smart tourism technology, tourist's psychological well-being, growth mindset, perceived benefit**,** automation, personalization, information

Paper type: Research paper

1. Introduction

The expansion of information and communication technology (ICT) has considerably propelled the traditional tourist business into the era of smart technology, now known as tourism 4.0 (Sujood and Siddiqui, 2022; Stankov and Gretzel, 2020). Prior research has demonstrated that tourism 4.0 can be immune to tourism as it helps to revive the damages of tourism after COVID-19 (Gretzel and Koo, 2021) by providing travel and life experiences with assistive technologies (Lee *et al.,* 2018; Preko *et al.,* 2022). However, recently scholars of tourism and ICT have mentioned the importance of tourism 4.0 for the psychological well-being of the tourist in different literature (Lee *et al.,* 2018; Wan and Onuike, 2021). Smart tourism technologies (STTs) can contribute to tourists' experience through personalization, tracking their routes, monitoring health conditions, creating awareness, instructing drills, and real-time monitoring, *etc*. (Wan and Onuike, 2021; Ye *et al.,* 2020). The interaction of all these features during traveling enhances the perceived benefit of a tourist, which ultimately leads to psychological well-being (Anderson and Rainie, 2018). Peng *et al.* (2023) have drawn attention to the fact that the study of smart technology in tourism and psychological well-being is still infancy.

STTs are defined as the storehouse of large information infrastructure gathered from the vast volumes of data provided by tourists (Jawad and Naz, 2022). Previous researchers have defined STTs with different attributes like- informativeness (Goo *et al.,* 2022; Huang *et al.,* 2017; Jeong and Shin, 2020; Pai *et al.,* 2020), interactivity (Goo *et al.,* 2022; Huang *et al.,* 2017; Jeong and Shin, 2020; Pai *et al.,* 2020), accessibility (Goo *et al.,* 2022; Huang *et al.,* 2017; Jeong and Shin, 2020; Pai *et al.,* 2020), and personalization (Huang *et al.,* 2017; Pai *et al.,* 2020), security concern (Pai *et al.,* 2020). Based on the tourism 4.0 concept, the study has emphasized the abovementioned four pillars of STTs mentioned by Peceny *et al.* (2019). However, the study would like to propose two unexplored variables, namely information accuracy and automation, in the STTs literature. Information accuracy and automation are fundamental in defining STTs (Ho, 2022). The smart technologies (mobile apps, IoT services, contactless payment, tracking devices, etc.) that provide accurate information leads an individual to be more interested, encouraged, and motivated to improve their travel experience (Jeong and Shin, 2020; Sia *et al.,* 2022). On the other hand, Yang and Zhang (2022) have emphasized the importance of automation in smart tourism. Surprisingly, previous studies didn't use these two variables. Past research has investigated the relationship between different STT factors and travel experience (Goo *et al.,* 2022; Yang and Zhang, 2022), the exploration and exploitation scope of tourism (Huang *et al.,* 2017), and perceived tourism experience (Pai *et al.,* 2020). Interestingly, no study was found between the factors of STTs and perceived benefit. Thus, the study intends to argue that these unexplored relationships could step forward the STTs literature.

Adopting ICT is one means of personal development in this technological age. Recently, scholars have given much attention to the study of personal growth using the latest technologies (Hoffman *et al.,* 2022). Tourists may feel their basic technological abilities can be more developed using STTs (Yodchai *et al.,* 2022). A study demonstrated that tourism-based ICTs have a direct effect on a tourist's overall growth mentality (Stankov *et al.,* 2022a). However, study on STTs has got little attention in tourism (Stankov *et al.,* 2022b). Scholars in psychology mentioned that the growth mindset could strengthen the association between benefits and individuals' well-being (Brandisauskiene *et al.,* 2021). Thus, the study would like to explore the opportunity to use the growth mindset to mediate between perceived benefit and psychological well-being.

Tourists' psychological well-being has got much attention in tourism literature from different perspectives, including- experiencing hot spring tourism (Lin, 20014), adventure shows (Farkić *et al.,* 2020), activities in travelling (Wei and Milman, 2002), cultural tourism (Willis, 2015), *etc*. However, tourists' psychological well-being from the periphery of STTs has not been studied yet (Hassan *et al.,* 2022). So, understanding psychological well-being based on the literature gap is a timely needed demand in the literature (Mensah *et al.,* 2022).

After exploring the prior literature, the study positioned the perspective of STT factors and perceived benefits (Jeong and Shin, 2020) that ultimately leads to psychological well-being (Danby and Grajfoner, 2022). To our knowledge, however, no research has been conducted on the moderating influence of a growth mindset between visitors' perceived advantage and psychological well-being. To address these critical literature gaps, this study examines a number of research issues:

RQ₁: What influence do STT variables have on tourists' perceived benefits?
RQ₂: What is the association between perceived benefit and the psychological well-being of tourists?
RQ₃: How does growth mindset moderates between perceived benefits and tourists' psychological well-being?

By answering these questions, the research would like to delve into some contributions. Academically and theoretically, the study uses Tourism 4.0 concept as the foundation for understanding STTs (Stankov and Gretzel, 2020). Moreover, with the inclusion of information accuracy and automation, the study will contribute to the factors for developing the STT. Moreover, the concept will help us to understand how tourism technologies and human interactions can bring mental well-being. In addition, the study will help us understand how a growth mindset might influence the correlation between perceived benefits and psychological health. From a managerial perspective, the industry will gain insights into developing STT factors and their importance in providing benefits. Moreover, the study will contribute to Bangladesh's context as a developing country. In the Asia-pacific region, Bangladesh has become one of the major tourist spots. In 2021 earnings from tourism stand over 200 million (USD), and it was 110 million (USD) in 2020, which contributes around 5% of the total GDP (The Business Standard, 2022). Bangladesh is an example of immense development in ICT, which brought out many new smart technologies in the tourism sector. Unfortunately, there is no study has been observed from Bangladesh's perspective. Thus, from the contextual scope, the study will put forward some contributions from a developing country perspective.

The paper is structured as follows: The following section provides a literature overview. In section three, the study's research model is proposed. The fourth section describes the data-gathering methods and questionnaire design. The fifth section of the report discusses the data analysis and findings. In section six, the discussion and conclusions are offered. In the final part, limitations and future research ideas are presented.

2. Literature background

2.1 Tourism 4.0

Tourism 4.0 is the transformation of technology-based tourism into hyper-interconnectedness of digital and physical platforms (Stylos *et al.,* 2022; Stankov and Gretzel, 2020). Tourism 4.0 is the potential of tourism technology to facilitate interactivity, virtuality, activity dispersion, real-time data collection and operation, service orientation, and human engagement (Pencarelli, 2020).It helps to overcome the traditional user-experienced-based tourism into a dynamic and hybrid context by ensuring personalization (Van and Hieu, 2020), information accuracy (Pencarelli, 2020), security (Barbery-Montoya *et al.,* 2020), and automation of services (Stankov and Gretzel, 2020).

2.2 Smart Tourism Technologies (STTs)

STTs are widely applied in numerous studies related to tourism (Pai *et al.,* 2021). STTs have been studied in marketing to understand customer experience (Jeong and Shin, 2020). STTs are a form of tourism technology that helps in building interconnection, harmonization, synchronization, and combined effort to provide tourism services through different technologies like- Internet of Things (IoT) (Wang *et al.,* 2020), near field communication (NFC) (Basili *et al.,* 2014), real-time sensors (Novera *et al.,* 2022), smartphones (Xiang *et al.,* 2021), mobile apps (Dorcic *et al.,* 2019), inter-connected devices (Dorcic *et al.,* 2019), beacons (Gretzel and Koo, 2021), augmented reality (AR) and virtual reality (VR) (Hailey Shin *et al.,* 2021), integrated payment methods (Jeong and Shin, 2020), smart cards (Wang *et al.,* 2016), and social networks sites, etc. (Park *et al.,* 2016). Using STTs depend on several factors related to ICT (Leung, 2022). Therefore, ICTs and their integration into physical infrastructures are a central part of STTs (Kelly and Lawlor, 2019).

STTs are strongly reliant on extensive personalization. According to No and Kim (2015), personalization is the credential of the STTs that helps tourists search for customized information, trip planning, track sharing, etc. Along with personalization, tourists seek security from the STTs they intend to use. Security is the extent to which STTs demonstrate trustworthiness to visitors by protecting their confidential information (No and Kim*,* 2015). On the other hand, providing accurate information to tourists is an essential requirement of STTs (Tavitiyaman *et al.,* 2022). In the age of tourism 4.0, automation has become one of the major factors in tourism, where we can no longer expect hospitality staff to be human beings; instead, we must embrace a broader perspective of technology (Ivanov *et al.,* 2017). STTs perform an essential role in the economic, social, and cultural growth of a country with respect to marketing and industry (Hamid *et al.,* 2021).

2.3 Perceived Benefits (PB)

The word perceived benefit refers to the belief that a particular action will result in positive outcomes (Kang and Jung, 2021). Travelers may get some fundamental benefits and confidence while using STTs in traveling (Pai *et al.,* 2021), and this type of benefit or strength is deemed as the perceived benefit. STTs could give a positive experience to the tourist by providing information about the place, like accommodation, packages, transportation, availability of the services, delivery process, and all other relevant services to the tourists (Hinson and Boateng, 2007).

2.4 Tourists' Psychological Well-being (TPW)

Nowadays, the concept of psychological well-being has got much attention in technology-based tourism (Vada *et al.,* 2019). Tourists seek a friendly and healthy lifestyle while travelling to a different destination using assistive technology (Pyke *et al.,* 2016). Tourists usually look for a place to relax and enjoy their moments without mental pressure (Zhang and Zhang, 2022). Psychological well-being is the combination of pleasant affective emotions, such as (the hedonic perspective), and efficiency in personal and social life (Roy *et al.,* 2021). The psychological well-being of visitors is ultimately influenced by the impact of contentment, which is defined by smart services and travel experiences, on their overall happiness (Lee *et al.*, 2018).

2.5 Growth Mindset

People who have a growth mindset think that their talents can be developed via hard work, novel approaches, and helpful criticism from others (Gretzel, 2021). They are more likely to succeed than people with a more rigid mindset (those who believe their talents are intrinsic gifts) (Dweck, 2016). Solberg *et al.* (2020) stated that people with a digital mindset basically represent a part of a growth mindset based on two general assumptions. The first belief is self-centered, representing personal beliefs about how fixed or adaptable one's capacity to learn and apply new technology is. The second belief is situation-specific, representing views about how much of the context of technological progress is made up of finite resources that must be completed versus expandable resources that all parties can benefit from.

Drawing on the literature reviewed in section 2, this study examines the proposed relationship through the mentioned Figure 1 as follows.

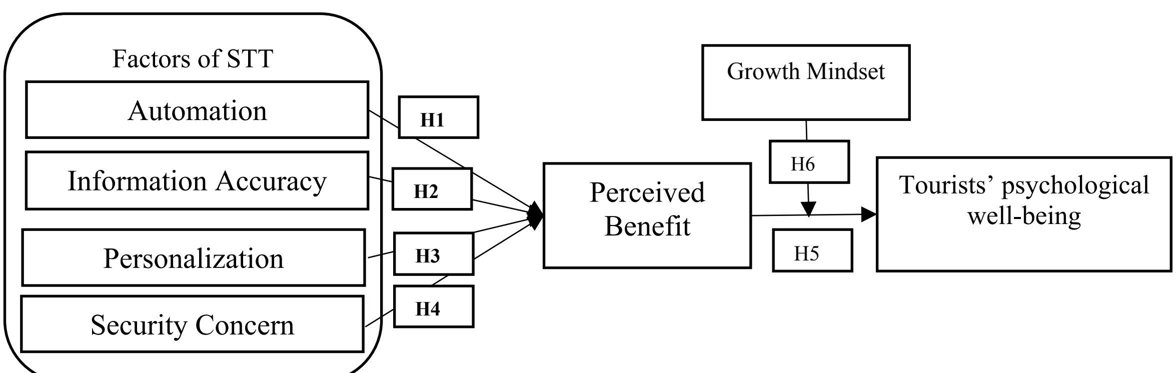

Figure 1: Conceptual Framework

3. Hypotheses Development

3.1 Automation and perceived benefit

Intelligent automation in travel and tourism has brought comfort, convenience, and savings to tourists. Tourists perceive these advancements as their personal attainment (Tussyadiah, 2020). Service automation technologies in tourism play a supporting role (Prentice and Nguyen, 2020). Automation plays the role of salespeople and robot guides which brings different advantages to tourists (Ivanov and Webster, 2017). Thus, this study proposed that:

H_1: *Automation in STTs has a positive impact on perceived benefits.*

3.2 Information accuracy and perceived benefit

According to Kim *et al.* (2004), there is a significant correlation between accurate information and tourists' perceived benefits. Tourists can utilize necessary information using STTs at tourist destinations. Finding such a wealth of knowledge encourages them to be interested, encouraged, and motivated to improve their tour experience (Jeong and shin, 2020). Moreover, information accuracy leads to travelers' perceived benefits (Shim and Jo, 2020). Therefore, a proposed hypothesis is:

H_2: *Information accuracy of STT has a positive impact on perceived benefits.*

3.3 Personalization and perceived benefit

Personalized services of STTs enhance travelers' experience and satisfaction (Madu and Madu, 2002). Personalized services reduce search time, and it is positively associated with travelers' personal attainment (Ball *et al.,* 2006). Personalization of travel technology affects the perceived benefits of travelers' (Ku *et el.,* 2018). For instance, customized tour-routing applications show visitors the best path to save on driving time and traffic stress and ultimately enhance their experience (Jeong and Shin, 2020). Thus, this study hypothesizes:

H_3: *Personalization of STT has a positive impact on perceived benefits.*

3.4 Security concern and perceived benefit

Park and Gretzel (2007) explained security concerns in three ways: information protection, online reservation, and privacy which are essential for the tourists' benefit. In a technology-mediated environment, tourist security is positively associated with personal safety (Pai *et al.,* 2021). Similarly, Chatterjee *et al.* (2021) mentioned that security concerns are positively associated with tourists perceived benefits. Therefore, the proposed hypothesis is:

H_4: *The security concern of tourists has a positive impact on perceived benefits.*

3.5 Perceived benefits and tourists' psychological well-being

Lee *et al.* (2018) mentioned that the impact of overall STTs benefits leads to tourists' psychological well-being. Depending on the different types of STTs, tourists like to select the most dependable one, which largely impacts their mental health and psychological well-being (Cooper and Buckley, 2022). Recently, after COVID-19, concern about derived benefits from STTs has gotten the tourist's attention, and their psychological well-being has become their major concern (Peterkin *et al.,* 2022). Lafortezza *et al.* (2009) mentioned that the regular use of STTs results in considerable gains in perceived advantages and that ultimately leads to psychological well-being among users. Thus, the study proposed:

H*$_5$*: Perceived benefits have a positive impact on tourists' psychological well-being.

3.6 Moderating effect of growth mindset (GM)

The Growth Mindset is well-defined as the concept that tourists' abilities are something that can be developed through hard work (Brandisauskiene *et al.,* 2021). As stated by Molden and Dweck (2006), an individual's fundamental beliefs on the malleability and changeability of important human characteristics (e.g., IQ and personality) in the context of cultivating a growth mindset. Further, prior studies have shown that a growth mindset does work as a moderator between students' perceived achievement and psychological development (Brandisauskiene *et al.,* 2021). Similarly, Cutumisu and Lou (2020) found a positive significant moderating effect of a growth mindset between perceived benefit-seeking behavior and performance. Zeng *et al.* (2016) used a growth mindset as a moderator between beneficial engagement and psychological well-being. Therefore, in line with prior research, a hypothesis is developed to propose tourists' growth mindset as a moderator between perceived benefits and tourists' psychological well-being.

H*$_6$*: The growth mindset of tourists moderates the relationship between perceived benefits and tourists' psychological well-being.

4. Methodology:

4.1 Sampling strategy

The primary data was gathered from 243 active tourists who use different STTs while traveling to different tourist destinations of Bangladesh (*e.g.,* Cox's Bazar, The Sundarbans, Srimangal, Lalbagh Fort, Rangamati, Bandarban, Saint Martin, Paharpur, Kuakata, Bagerhat, Sonargaon, Comilla, Bogra, etc,). As Bangladesh is one of the most popular tourist destinations in the Asia-Pacific area (Rahman *et al.,* 2021), the number of domestic and foreign tourists is regularly rising (Roy *et al.,* 2022). We distributed (handed over) 700 questionnaires for the survey and received 350 replies from two times surveys, and from 350 replies, 243 were usable questionnaires. Some of the responses were incomplete, so we had to discard them. Nonetheless, we double-checked all returned survey questionnaires to ensure that all the entries were appropriate.

4.2 Operationalization of constructs

The items used to assess each latent variable have been developed from previous research. We have adopted 5 items of security concern from Pai *et al.* (2021), 7 items of information accuracy from Mahlamäki *et al.* (2020), 4 items of personalization from Pai *et al.* (2021), 6 items of growth mindset from Porter *et al.* (2020), 2 items of automation from Prentice and Nguyen (2020), 3 items of perceived benefits from Park *et al.* (2019) and Kanwal *et al.* (2020), and 6 items of tourists' psychological well-being from Zheng et al. (2015). The list of the item descriptions is detailed (see appendix A). We sought advice from the 3 academic experts and 5 tour operators before developing the questionnaire. The items were scrutinized by academic experts, and the instruments were analyzed and modified considering the study's context. We contextualized several items to assure the face validity of the items and to prevent non-response bias, as suggested by Gani *et al.* (2022). All variables were estimated using a five-point Likert-type scale. Users' age, gender, education, occupation, marital status, tour organizer, the composition of a travel group, and length of stay were all used as control factors suggested by Gao *et al.* (2018).

4.3 Survey method

We distributed the questionnaire to 25 responders using the convenience sampling method. A pilot survey of 40 people was undertaken. With these 40 respondents, the data were examined, and the measuring scales' reliability, validity, and overall usefulness were confirmed. After designing the questionnaire, we performed face-to-face interviews with the respondents by maintaining COVID-19 protocols. Survey data was acquired using a convenience sampling method in major cities of Bangladesh. These interviews lasted around 20 min to complete, and the participants were engaged since they were given consent papers and relevant documentation that explained the study's goal. Following Armstrong and Overton's advice, we conducted a nonresponse bias test (1977). From our original questionnaire distribution to the most recent postal distribution, we compared the number of returned questionnaires. We received 121 responses before the conclusion of the first distribution (January 11, 2022), for a response rate of 49 percent. We received 122 responses after the second distribution (March 22, 2022), which counts a 51 percent response rate. A t-test then tested the outputs on independent samples. This independent-sample *t-test* revealed no significant disparities, indicating that our data did not suffer from non-response bias (Hikmet and Chen, 2003).

4.4 Common method bias

To examine the common method variance, MacKenzie and Podsakoff's (2012) was followed. To measure the variables, the researchers used a 5-point Likert scale response format (Gani *et al.,* 2022). The participants were notified that their information and replies would be kept secret to ensure their privacy. The participants were then told that there were no correct or incorrect responses and that they could answer as they pleased. Moreover, response to the questionnaire was completely voluntary, and no remuneration or gift was given for participating in the study. Furthermore, the survey did not include any concerns about social acceptability or disparity in the questionnaire. Moreover, the exploratory factor analysis included a statistical check using Harman's (1967) single-factor test. According to the findings, there was an explained variation of 23.9%, which was below the required level of 50.0%. No significant common method bias was seen in the results.

4.5 Data analysis method: SEM-PLS

Since PLS-SEM is frequently used in observational studies to estimate and evaluate measurement models, the study used it for data analysis (Hair *et al.,* 2019). We used a structural model that was evaluated using PLS-SEM, which provides a number of benefits over conventional regression-based statistical techniques (Urbach and Ahlemann, 2010). PLS can reveal multicollinearity, misspecification, and skew distributions for indicators (Chin, 1998). Moreover, PLS does not necessarily require normally distributed data (Vinzi *et al.,* 2010). Hair *et al.* (2011) mentioned that when several latent variables have several indicators as confirmatory analysis, a researcher should use PLS-SEM. To investigate the proposed correlations in our investigation, we employed PLS-SEM. We used the recommended two-stage methodology, assessing both the measurement model and the structural model (Quoquab *et al.,* 2017). Additionally, to assess the relevance of the path coefficient and factor loading, bootstrapping (resampling=5000) was performed (Weedige et al., 2019).

5. Data Analysis and Findings

5.1 Demographic Profile

Data from 243 active passengers were gathered. Table 1 shows that the majority of the respondents were female, 52.7% belonging to the age group of 18-39 (97.1%). Most of our respondents were in bachelor's colleges 89.6%. Of the respondent's travel organizers, 25.5% were self-dependent, 2.5% depends on travel agents, and the rest 72% depend on family friends and others. Based on the composition of the travel group, we have found that 1.1% like to travel alone, 46.1% prefer to travel with family, and 49.4% prefer to travel with friends. We have observed the length of stay that 76.5% would only travel for 5 days.

[Please Insert Table 1 here]

5.2 Measurement Model

The psychometric characteristics of the model for examining reliability, convergent validity, and discriminant validity are shown in Table 2. The PLS method verifies the reliability of the model structures. Standard loading of each item and Cronbach's alpha values demonstrates the reliability as these are greater than 0.70. The composite reliability (CR) of the variables also satisfies the criteria of the threshold level, which are above 0.80. The average variance extracted (AVE), which indicates the convergent validity, also satisfies the criteria of threshold level as each variable is more than 0.50 (Hair *et al.,* 2019). Furthermore, VIF (a measure of the quantity of multicollinearity among a set of numerous regression variables) values range from 1.02 to 2.88, matching the ≤ 5 criteria (Hair *et al.,* 2017).

[Please Insert Table 2 here]

Discriminant validity is also shown by the outcomes. The square root of the AVE presented in Table 3 was calculated in this investigation to establish the discriminant validity (Fornell and Larcker, 1981). The heterotrait-monotrait (HTMT) correlations were used to further test the discriminant validity (Henseler *et al.,* 2015). The HTMT ratio cannot be more than 1.00. (Henseler *et al.,* 2015). Every concept, therefore, passed the discriminant validity test. The HTMT findings are displayed in Table 4.

[Please Insert Table 3 here]

[Please Insert Table 4 here]

5.3 Assessing the structural model

After evaluating the measurement model with a satisfactory result, we need to evaluate the result of the structural model (Hair *et al.,* 2019). We evaluated the models' predictive quality through (R^2), effect size (f^2), and blindfolding-based predicted relevance via (Q^2) (Ringle *et al.,* 2020). Table 5 displays the coefficients of determination (R^2) of the latent variables acquired using the PLS approach. Perceived benefits had a moderate (<0.50) R^2 of 0.321. Similarly, the psychological well-being of travelers had an R^2 of 0.244. As a result, perceived benefits have modest explanatory power in defining variance, while tourists' psychological well-being has a deprived (<0.25) explanatory power (Hair *et al.,* 2019).

[Please Insert Table 5 here]

We performed predicted relevance (Q^2) using the blindfolding method. Procedures for blindfolding should only be used on structures with reflected measures (Weedige *et al.,* 2019). Table 5 demonstrates that the model is sufficiently predictive because all Q^2 values are larger than zero. PB = 0.183 (Q^2>.15, indicating a higher predictive relevance) and TPW = 0.117 (Q^2>.10, indicating a medium predictive relevance) were discovered in our case (Hair *et al.,* 2019).

[Please Insert Table 6 here]

The SEM-PLS result of the relationship is shown in Table 6. It shows the relationships between Personalization (P) and Perceived Benefits (PB) ($t = 3.859, \beta = 0.297, p < .05$); Information Accuracy (IA) and Perceived benefits (PB) ($t = 3.754, \beta = 0.292, p < 0.05$), Automation (Auto) and Perceived Benefits (PB) ($t = 3.711, \beta = 0.277, p < 0.05$), Security concern (S) and Perceived Benefits (PB) ($t = 3.447, \beta = 0.231, p < .05$). Thus, H1, H2, H3, H4, and H5 were supported. Furthermore, this study also assessed the moderating effect of the Growth Mindset (GM) between Perceived Benefits (PB) and Tourists' Psychological Well-beings (TPW). The value here was found ($t = 4.853, b = 0.334, p < 0.02$) positive and significant. The study has demonstrated the f^2, the effect size is somewhat redundant with respect to the magnitude of the path coefficient for each association (Hair *et al.,* 2019). In Table 6, f^2 indicates the change in R^2 when an exogenous variable is removed from the model. Here all the f^2 of the factors are greater than 0.35, meaning a large effect size.

[Please Insert Figure 2 here]

6. Discussion

The study provides an insight that among the STT factors, personalization shows the strongest predictive relationship, followed by information accuracy, automation, and security concern. This study's findings show that personalization positively correlates with perceived benefits (Ku *et al.* (2018). It implies that tourists seek personalized services while using STTs. Tourism 4.0 focuses on building a mutual understanding between technology and personal choices by emphasizing the personalization of services (Martínez-González and Álvarez-Albelo, 2021). Thus, designing STTs based on personal preferences is encouraged in tourism 4.0. Our study also demonstrated that information accuracy is positively and significantly associated with tourists' perceptions of benefits (Shim and Jo, 2020). Expanding on previous findings, those accessing accurate information via STTs are more likely to get more tourists (Eysenbach and Köhler, 2002; Jiang and Street, 2017). It implies that receiving accurate information will help tourists to optimize better services from STTs. The findings show that automation positively impacts tourists' perceived benefits (Tavitiyaman *et al.,* 2022). Tourists perceive that automation helps all the intended benefits mentioned by Ivanov *et al.* (2017). Later, the research revealed a strong and positive correlation between perceived advantages and security concerns (Chatterjee *et al.*, 2021). This study shows that perceived benefits strongly impact people's psychological well-being, as demonstrated in previous studies (Maziriri *et al.,* 2019). In tourism, optimistic experienced are expected to determine tourists' sense of adaption to the destination, and their mental health will be benefit (Zou and Meng, 2020).

On the other hand, in line with past findings, visitors' growth attitude moderates the relationship between perceived advantages and psychological well-being (*e.g.,* Brandisauskiene *et al.,* 2021). Brandisauskiene *et al.* (2021) mentioned that the growth mindset plays an important role between support and achievement. It means that those who have a higher growth mentality will be more assured in their ability to use the advantages for their psychological well-being. It shows that tourists' growth perspective assists them in adapting to smart technologies. And the benefit they derive from STT contributes to their psychological well-being (Jeong and Shin, 2020).

6.1 Theoretical Implication

The study has two major theoretical implications. First, the findings of this paper developed a research model for the relationship between the factors of STTs and perceived benefits by utilizing the tourism 4.0 theory (Sia *et al.,* 2022). The study has broadened the extent of the tourism 4.0 theory by establishing the unexplored relationships between STTs and perceived benefits. It elaborates on the argument that components of STTs will enhance tourists' psychological benefit, ultimately leading to well-being (Jeong and Shin, 2020). Second, the theory also helps in explaining the growth mindset. Travelers' growth mentality affected the association between reported benefits and psychological well-being. High satisfaction with the perceived benefits might lead to high satisfaction with the trip experience, increasing tourists' psychological well-being with a higher growth mindset. When the growth mindset is higher, the experience is better and psychological well-being will increase (Brandisauskien *et al.,* 2020).

6.2 Managerial Implication

The findings offer several key practical implications for managers. *First,* the present study recognizes the factors of STTs. It suggests that touring operators and technology-based organizations need to emphasize personalizing factors, information accuracy, automation, and security issues carefully. Our findings show that among all these four factors, information accuracy has got much weightage. It shows that STT providers should emphasize establishing strong information systems for tourists. It has been discovered that most tourists want to use STTs positively, particularly personalization (Pai *et al.,* 2021). Besides, marketers of smart tourism destinations should be careful about the privacy of their tourists by providing a safe and protected environment because their satisfaction with the service can deteriorate if their security and privacy are at stake while using STTs (Jeong and Shin, 2020). *Second,* tour operators and technology-based organizations need to focus on improving the benefits of using STTs for tourists. *Third*, because people with a higher development mindset are more likely to thrive on more benefits and their mental and health benefits, the importance of the growth mindset became more apparent during the COVID-19 epidemic. Thus, STTs should be concerned about how to comply with the mental growth of the tourist. Tour operators should pay attention to this insight and help the tourists while operating with tech-based activities. Therefore, tourism/destination-related parties should create a smart tourism system that provides a diverse range of information resources that can quickly answer travelers' individual needs that can ensure tourists' satisfaction and psychological well-being.

7. Limitations and future research scope

There are various shortcomings in the current research that might be fixed by further studies. First, the study collected data from a small sample size. Future studies may incorporate this limitation by collecting data from a larger sample of representative groups, which can offer more valid results. Second, due to the substantial disparities in the economic and technical conditions between Bangladesh and other countries, this research's generalizability to other countries was constrained using cross-sectional data. Future researchers could use an experimental study technique to tackle the problem of causation and bias, at least in part. Future researchers are also urged to conduct additional research on other nations to improve their understanding of the larger picture. Finally, a thorough examination of the potential predictors is required to understand how STT connects to tourists' perceived benefits and the impact of a growth mindset on their psychological well-being.

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Appendix A: List of Measures

Constructs	Statements	Sources
Security Concern	1. When I use STT, I don't worry about collecting too much personal information. 2. When I use STT, I believe my privacy is protected 3. When I use STT, I don't worry about the security of sensitive information. 4. My personal information could not be subject to misuse and unauthorized access when transacting through STT. 5. STT provides adequate security to protect my personal information.	Pai *et el.,* (2021)
Information Accuracy	1. STT provides sufficiently comprehensive information for configuring products. 2. STT provides sufficiently precise information for configuring products. 3. STT provides relevant information for configuring products. 4. STT provides accurate information. 5. STT provides reliable information. 6. STT provides information that is always correct 7. STT provides information that is up-to-date.	Mahlamäki *et el.,* (2020)
Personalization	1. When traveling in somewhere, STT allows me to receive tailored information. 2. When traveling in somewhere, STT provides me with easy-to-follow paths and links. 3. When traveling in somewhere, the tourism information provided by STT meets my needs. 4. When traveling in somewhere, I can interact with STT to get information tailored to my specific needs.	Pai *et el.,* (2021)
Automation	1. STT tools provide information in a timely fashion. 2. STT tools return answers to my requests quickly.	Prentice and Nguyen (2020)
Perceived benefits	1. I think that using STT can save my time while traveling 2. I think that STT can offer me a wider range of customized services 3. I think that using STT can generate more convenience	Park *et el.,* (2019); Kanwal et al. (2020)
Growth mindset	1. I choose STT that will lead to more learning. 2. STT persist after setbacks, show resilience that I feel motivated 3. Learning from STT is worthwhile	Porter *et el.,* (2020)

	4. Spending on STT is praiseworthy 5. I feel inspired by using STT 6. I can see the goal of learning by using STT	
Tourists' Psychological well-being	1. I feel I have grown as a person. 2. I handle daily affairs well. 3. I generally feel good about myself, and I'm confident. 4. People think I am willing to give and share my time with others. 5. I am good at making flexible timetables for my work. 6. I love having deep conversations with family and friends so that we can better understand each other.	Zheng *et el.,* (2015)

Tables and figure

Table 1: Participant description

Characteristics	Categories	Frequencies	Percentage
Gender	Male	115	47.3%
	Female	128	52.7%
Age	18 – 39 years old	99	40%
	40 – 49 years old	88	36.2%
	50 years or older	56	23.05%
Education Level	Some college or less	66	27.16%
	Bachelor’s college	58	23.87%
	Master’s degree	71	29.23%
	PhD or doctorate degree	48	19.75%
Marital Status	Single or living alone	132	54.32%
	Married or living with partner	111	45.68%
Travel organizer	Myself	44	18.12%
	Travel agent	54	22.22%
	Friends, family or others	145	59.67%
Composition of travel group	Alone	11	10.5%
	Family members	112	40.1%
	Friends or others	120	49.4%
Length of stay	5 days	156	64.19%
	6 -7 days	61	25.10%
	8 – 10 days	14	5.76%
	11 days or more	12	4.91%

Table 2 Convergent validity and internal reliability

Construct	Items	Standard Loadings	Cronbach's Alpha	Composite Reliability	Average Variance Extracted (AVE)	VIF
Automation (Auto)	Auto1	0.905	0.720	0.876	0.780	1.462
	Auto2	0.861				1.462
Growth Mindset (GM)	GM1	0.852	0.876	0.909	0.716	1.787
	GM2	0.896				2.734
	GM3	0.878				2.889
	GM4	0.750				2.002
Information Accuracy (IA)	IA1	0.757	0.870	0.906	0.681	1.765
	IA2	0.700				1.698
	IA3	0.761				2.051
	IA4	0.809				2.243
	IA5	0.849				2.431
	IA6	0.737				1.770
	IA7	0.711				1.826
Perceived Benefit (PB)	PB1	0.709	0.798	0.869	0.624	1.395
	PB2	0.797				1.700
	PB3	0.801				1.662
	PB4	0.846				1.958
Personalization (P)	P1	0.829	0.777	0.894	0.679	1.766
	P2	0.848				1.201
	P3	0.807				1.947
	P4	0.812				1.870
Security (SC)	SC1	0.772	0.726	0.879	0.595	1.134
	SC2	0.732				1.627
	SC3	0.703				1.237
	SC4	0.768				1.022
	SC5	0.870				1.643
Tourist Psychological Wellbeing (TPW)	TPW1	0.798	0.755	0.869	0.593	1.395
	TPW2	0.755				1.506
	TPW3	0.774				1.335
	TPW4	0.787				1.369
	TPW5	0.735				1.390

Table 3 Constructs correlation coefficients and the square root of AVE (in bold on diagonal)

	1	2	3	4	5	6	7
(1) Automation	0.883						
(2) Growth Mindset	0.505	0.846					
(3) Information Accuracy	0.537	0.540	0.825				
(4) Perceived Benefit	0.514	0.550	0.418	0.777			
(5) Personalization	0.563	0.419	0.436	0.529	0.824		
(6) Security	0.296	0.193	0.381	0.186	0.337	0.771	
(7) Tourist Psychological Wellbeing	0.384	0.279	0.353	0.497	0.412	0.100	0.710

Table 4 Heterotrait - Monotrait (HTMT) ratio of correlations

	1	2	3	4	5	6	7
(1) Automation							
(2) Growth Mindset	0.135						
(3) Information Accuracy	0.688	0.100					
(4) Perceived Benefit	0.681	0.087	0.493				
(5) Personalization	0.677	0.059	0.768	0.666			
(6) Security	0.451	0.317	0.485	0.226	0.446		
(7) Tourist Psychological Wellbeing	0.514	0.136	0.438	0.643	0.532	0.200	

Table 5 Result of Adjusted R^2 and Q^2

	R^2	Q^2
Perceived Benefit	0.321	0.183
Tourist Psychological Wellbeing	0.244	0.117

Table 6 Results of Hypotheses

	Relationships	Original Sample (O)	Sample Mean (M)	SD	T Statistics	P Values	Decision	f^2 effect size	95%BC-CI Lower	Upper
H1	Auto -> PB	0.277	0.271	0.075	3.711	0.000	Supported	0.061	0.128	0.417
H2	IA -> PB	0.293	0.288	0.080	3.754	0.000	Supported	0.060	0.058	0.262
H3	P -> PB	0.297	0.296	0.083	3.859	0.000	Supported	0.079	0.140	0.466
H4	SC -> PB	0.231	0.211	0.070	3.447	0.000	Supported	0.051	0.267	0.055
H5	PB -> TPW	0.474	0.479	0.066	7.236	0.000	Supported	0.326	0.332	0.590
H6	GM*PB -> TPW	0.334	0.317	0.057	4.853	0.001	Supported	0.204	0.330	0.241

*Note: *Automation (Auto), Growth Mindset (GM), Information Accuracy (IA), Perceived Benefit (PB), Personalization (P), Security (SC), Tourist Psychological Wellbeing (TPW)*

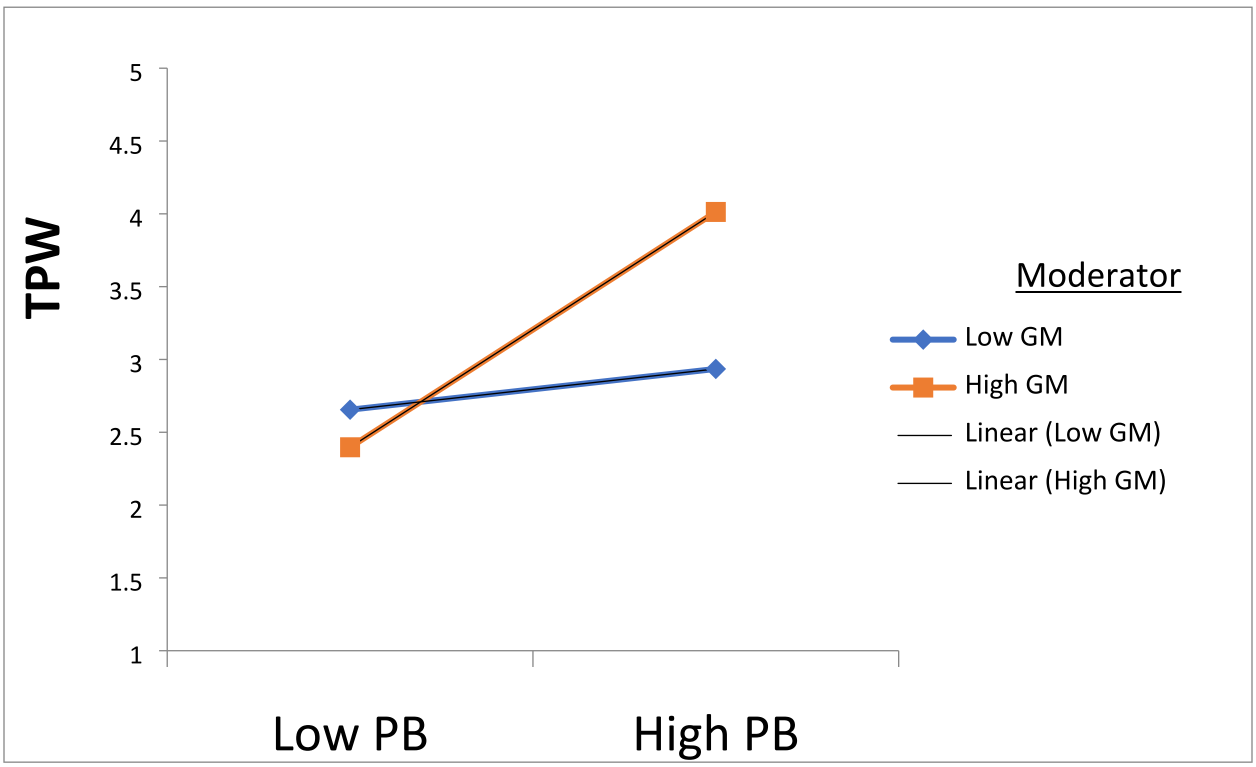

Figure 2: GM strengthens the positive relationship between PB and TPW