



Empirical Research Article

Over the Rainbow: How to Fly over with ChatGPT in Tourism

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Abstract

Tourism and hospitality have encountered significant changes in recent years as a result of the rapid development of information technology (IT). Customers now expect more expedient services and customized travel experiences, which has intensified competition among service providers. To meet these demands, businesses have adopted sophisticated IT applications such as ChatGPT, which enables real-time interaction with consumers and provides recommendations based on their preferences. This paper focuses on the AI support-prompt middleware system, which functions as a mediator between generative AI and human users, and discusses two operational rules associated with it. The first rule is the Information Processing Rule, which requires the middleware system to determine appropriate responses based on the context of the conversation using techniques for natural language processing. The second rule is the Information Presentation Rule, which requires the middleware system to choose an appropriate language style and conversational attitude based on the gravity of the topic or the conversational context. These rules are essential for guaranteeing that the middleware system can fathom user intent and respond appropriately in various conversational contexts. This study contributes to the planning and analysis of service design by deriving design rules for middleware systems to incorporate artificial intelligence into tourism services. By comprehending the operation of AI support-prompt middleware systems, service providers can design more effective and efficient AI-driven tourism services, thereby improving the customer experience and obtaining a market advantage.

Keywords

ChatGPT; artificial intelligence; AI middleware; service application design

1. Introduction

The tourism and hospitality businesses are expanding with greater dynamism and different business models due to the rapid development of information technology (IT) (Buhalis & Cheng, 2020). The level of service that customers expect and how it is delivered have changed, and tourism service providers are entering a new level of competition by adopting cutting-edge IT applications. Customers expect more convenient services and want a distinctive travel experience. Companies in the tourism and hospitality industry strive to utilize information services to increase customer satisfaction and eventually gain a high level of loyalty (Buhalis & Cheng, 2020). Utilizing IT applications to provide richer information about tourist destinations and respond to customers' real-time needs is linked to positive revenue streams (Ukpabi et al., 2019).

On the one hand, rapid access, automation, and usability have made the smart tourism applications indispensable. Beyond automation-related aspects, however, there is a demand for personalization. Many Artificial Intelligence (AI)-based solutions (such as chatbots) are gaining market share for this purpose (Arteaga et al., 2019). A chatbot is an information technology artifact that is devised to hold a conversation with a human using natural language and symbols. In the 1960s, Joseph Weizenbaum created ELIZA (Weizenbaum, 1966), the forerunner of contemporary chatbots. The purpose was to emulate a psychotherapist with limited knowledge and multiple

workarounds to avoid conversational dead ends. Although more than fifty years have elapsed since the conception of this groundbreaking concept, chatbot services have only lately matured to the point where they may be widely deployed and utilized in a variety of real-world circumstances. Nowadays, chatbots are designed to comprehend one or more human languages with Natural Language Processing (NLP) using knowledge repositories consisting of a set of dialogue management rules that employ various ways for processing the user's input (Ukpabi et al., 2019).

In many advanced chatbots for smart tourism, ChatGPT (<https://chat.openai.com>) is the world's most advanced chatbot in existence so far. ChatGPT is fascinating because it is not just designed to talk to humans, but has evolved to the point where it can discover knowledge, provide information, and solve problems with humans. Considering that tourism activities are characterized by the active consumption and production of information and knowledge, it is not difficult to imagine that various service applications based on ChatGPT will be actively developed.

2. Background

2.1. Chatbot

A chatbot is regarded as a model of technology application

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that efficiently facilitates interpersonal contact and learning, as they provide different kinds of information and knowledge in an interactive manner and user-friendly interface (Anthony et al., 2008; Muniasamy & Alasiry, 2020). With the proliferation of mobile devices and mobile apps, there is more and more location-based data for chatbots to learn from, which means we can expect to see more and more chatbots used for tourism purposes. Chatbots are useful in information distribution and learning areas, such as helping users learn in an entertaining manner through real-time interaction (Hwang & Chang, 2021) or enhancing communication skills among the same group of individuals (Hill et al., 2015).

Chatbots are information technology artifacts that provide service values, such as informing or entertaining, through conversation (Brennan, 2006). Early chatbots analyzed user input and used keyword matching or natural language processing algorithms to come up with simple responses in a prepared format (e.g., Brennan, 2006; Weizenbaum, 1966). Due to the increase in computing power, advances in big data technology, technological advances in various mobile devices, and technological advances in artificial intelligence speech recognition, chatbots have evolved from a text format to enable voice conversations (Guttormsen et al., 2011). For example, Apple offers a voice-activated assistant called Siri. By utilizing voice, text, and other multimedia means, Siri is designed to meet the information needs of users on a day-to-day basis. Amazon's Echo and other artificial intelligence speakers are also designed to utilize a voice interface to interact with users and fulfill their information needs. Those AI speakers are technically similar to the voice chatbots offered by Apple, Google, Samsung, and others. Chatbots can be used for a variety of purposes, including talking, entertainment, data querying, agent execution tasks, questioning and answering, and dialogue training (Copulsky, 2019). For instance, a chatbot can assume the role of an agent to collect information from chats to execute a form-filling job, such as purchasing goods or booking airline tickets and restaurants (Moriuchi et al., 2021).

The interest in chatbots in the smart tourism research domain is ongoing. Melián-González et al. (2021) found that chatbot usage in tourism companies is influenced by expected performance, habit, hedonic component, self-service technology, social influence, and human-like behavior. Hasan et al. (2021) studied how chatbots can help the tourism industry in situations where social distancing is required. More specifically, they found that automation, habits, social presence, and health awareness positively impacted intention to use chatbots. In the study of AI-powered chatbots for hospitality and tourism in India, Pillai and Sivathanu (2020) found that technological anxiety did not influence adoption intention, while stickiness to traditional human travel agents negatively moderated the relationship between adoption intention and actual usage of chatbots. Orden-Mejia and Huertas (2022), who examined the relationship between informativeness, empathy, accessibility, interactivity, and chatbot user satisfaction, discovered that informativeness, empathy, and interactivity influence and predict tourist pleasure, but accessibility did not.

Prior research has mostly focused on the positive and negative aspects of chatbot use by tourists. It is unquestionably an intriguing issue to investigate why people appreciate chatbots. Yet, given that tourists collect information from tourist guides or tourist information applications and utilize it for tourism-related reasons, it would also be worthwhile to concentrate research efforts on the quality of information offered by chatbots. Personalized chatbots that mirror the user's profile are more likely to be considered as valuable (Arreza, 2022). To provide better tourism service, it is also useful to design and employ metrics to evaluate the quality of the chatbot's conversations (Chen et al., 2022). In addition, technical research is required to enhance the service performance of chatbots in to provide a tourism-rich experience with a greater variety of data sources.

2.2. Open AI

Open AI is an artificial intelligence (AI) company declared mission is to promote and create "friendly AI" for the benefit of humanity as a whole (Brockman et al., 2015). The San Francisco-based organization was founded by a Silicon Valley who's who of tech magnates (Metz, 2016): Elon Musk, LinkedIn founder Reid Hoffman, PayPal co-founder Peter Thiel, former Stripe-Chief Technology Officer Greg Brockman, and Y Combinator founder Sam Altman. Brockman and Altman continue to serve as President and Chief Executive Officer of OpenAI, respectively in 2023. OpenAI has rapidly become one of the world's leading artificial intelligence research laboratories (Hao, 2020).

OpenAI targets to develop an artificial general intelligence (AGI, in short). AGI, often known as 'strong AI', is the kind of holy grail of AI referring that a machine accomplishes any intellectual work that humans can (McAfee & Brynjolfsson, 2017). According to the initial OpenAI mission statement, artificial intelligence was to be created in a manner that is safe and helpful to humanity, and open-source software and advanced AI tools should be distributed to the public without intellectual property constraints (Markoff, 2015). Like other non-profit organizations that pursue sustainability, OpenAI's vision is being continuously realized with the help of freemium and other financial supports from business partners. Although in 2019, OpenAI changed from a non-profit to a for-profit business with a greater emphasis on sustainability, and in July 2019, OpenAI received a \$1 billion investment from Microsoft (Brockman, 2019). In 2020, it was revealed that OpenAI's artificial intelligence model, generative pre-trained transformer-3 or GPT-3, would be licensed solely to Microsoft, and in 2023, OpenAI technology will be integrated into Microsoft's Bing search engine. In part, early OpenAI founders, including Elon Musk, reacted negatively to this move (Hao, 2020), but it also fueled impatience among other innovators working on conversational AI, resulting in greater competition.

According to Cooper (2021), OpenAI achieved a big AI advancement in 2020 with the introduction of GPT-3, which was trained on a vast quantity of data consisting of hundreds of billions of words, or 45 terabytes of text. Common Crawl, a non-profit organization that offers free web archives and datasets to the public, WebText2, which consists of the text of web pages from outbound Reddit links with more than three upvotes, as well as two internet-based books corpora (Books1 and Books2) and Wikipedia were used to train GPT-3 (Brown et al., 2020). GPT-3 is the largest and most powerful language model, utilizing deep learning to generate text for various tasks such as essays, stories, poems, code, image autocompletion, translation, and calculations without requiring specific training. Unlike traditional NLP systems that require laborious and expensive fine-tuning through supervised learning on a labeled corpus, GPT-3 can learn from any text (Grossman, 2020). OpenAI launched GPT-4 on March 14, 2023, a new language model that extends GPT-3. Access to its commercial application programming interfaces (APIs) is granted through a waitlist.

AGI has the potential to change the tourism business by providing not only necessary information, but also cultural and historical insights, extensive travel advice, and more. By utilizing the power of AGI, tourist applications may provide a personalized experience to each user by delivering material based on their interests, preferences, and requirements. In addition, AGI can surprise users with unexpected knowledge and experiences, enhancing the enjoyment and memorability of their travels. Whether proposing hidden jewels in a city or providing insights into the local cuisine, AGI may assist users in exploring and discovering destinations in novel and fascinating ways. As AGI technology continues to improve, we can anticipate even more imaginative uses in the tourism industry that will enable us to travel the globe in ways never before imaginable.

2.3. ChatGPT

A chatbot is an artificial intelligence-based software program capable of simulating human dialogue. ChatGPT is a conversational service based on GPT-3 or GPT-3.5 from OpenAI. OpenAI’s enterprise value has been predicted to be 29 billion USD since its preview release on 30 November 2022 (Jin & Kruppa, 2023). ChatGPT can reply to user inquiries within seconds and actively processing user requests based on pre-trained models, as opposed to merely chatting. It is also programmed to remember context and adapt its responses to present users with the required information. InstructGPT, a model trained to provide detailed responses by following instructions in prompts, is a sibling to ChatGPT. Although the OpenAI API uses GPT-3 language models to perform natural language tasks through text prompts, these models may generate untruthful or harmful outputs. To enhance safety and alignment with users, OpenAI fine-tunes GPT-3 using reinforcement learning from human feedback (RLHF). Labelers demonstrate desired behavior and rank model outputs on customer prompts, resulting in improved InstructGPT models that better adhere to instructions, generate less false information, and exhibit minor reductions in toxic output generation (Ouyang et al., 2022).

ChatGPT is unique in that it has reinforcement learning as a component. It employs a technique known as Reinforcement Learning from Human Feedback (RLHF) to lessen the risk of damaging, dishonest, or biased responses. It employs a combination of unsupervised and reinforcement learning, which has been fine-tuned to adapt to various inquiries and learn human linguistic standards. In detail, ChatGPT learns from data using unsupervised learning, which includes training the model on immense quantities of text data without explicit human supervision or direction. This enables ChatGPT to automatically discover patterns and relationships in the linguistic data and apply this knowledge to generate responses to new input that resemble those of a human. The learning algorithm comprises feeding the model a massive corpus of text data, including books, papers, and internet information, and analyzing and processing the input with a deep neural network. Each layer of the network does a distinct sort of data processing, such as recognizing patterns, correlations, and recurring themes. During training, the model optimizes its power to predict the next word in a sentence or generate coherent and grammatically accurate responses by adjusting its internal parameters, or weights. This is accomplished through the backpropagation method as usual deep-learning algorithms do, which compares the model’s predictions to the actual output and adjusts the weights to minimize the error. RLHF is a method for enhancing the performance of language models with using reinforcement learning, a sort of machine learning in which an agent learns to maximize a reward value, to train the language model to generate more human-like responses. In the context of ChatGPT, RLHF performs by training the model to maximize a hybrid reward function with various objectives, including fluency, relevance, and diversity. The *fluency* objective assesses how grammatically correct and natural-sounding the generated response is. The *relevance* objective examines how well the response matches the input prompt, and the *diversity* aim assesses the response’s dissimilarity to other feasible answers.

Large language models (LLMs) have shown impressive computational abilities through their capacity to understand natural language instructions. However, their performance in specific tasks is greatly affected by the quality of the prompts that guide them, with the most effective prompts having been created by humans (Zhou et al., 2022). A prompt is a series of instructions or signals provided to a computer program to direct its behavior or output (Beurer-Kellner et al., 2022). Table 1 outlines some of the ChatGPT prompt instructions and their results partially.

Table 1. Examples of prompt codes in ChatGPT

Prompt Example	Response Example
“Tell me a joke.”	Why don’t scientists trust atoms? Because they make up everything! ... The meaning of life is a philosophical question that has been debated by scholars, theologians, and individuals throughout history. There is no one definitive answer to this question, as different people and belief systems have different perspectives on what the meaning of life may be. ...
“What is the meaning of life?”	... “The Nightingale” by Kristin Hannah is a historical fiction novel that tells the story of two sisters in France during World War II. It’s a gripping and emotional tale of love, loss, and survival, and it has received critical acclaim for its beautiful prose and powerful storytelling. ...
“Can you recommend a good book to read?”	... La Promenade Plantée: This elevated park is located in the 12th arrondissement and was the inspiration for the High Line in New York City. It offers stunning views of the city and is a great place to take a leisurely stroll. ...
“Can you recommend some hidden gems for travel enthusiasts in Paris?”	... The St. Regis San Francisco: This luxury hotel is located in the heart of San Francisco and features modern amenities and top-notch service. ...
“Recommend me the best hotel in San Francisco.”	... Set your pickup location: Open the app and make sure that your current location is accurate. If it’s not, you can manually enter your pickup location. ...

Depending on how you use the prompts, ChatGPT can produce different results. For example, depending on the details of your travels in Seoul, ChatGPT will give you completely different results (see Table 2). Importantly, the more information users supply, the more they limit the scope of the answer, and the clearer the questioner’s intent, the more likely the chatbot will provide a decent response. The capacity to adjust to user questions and conversations is what makes prompt engineering techniques and tricks so crucial for positive chatbot experiences.

Table 2. Different results produced by prompting style

“What is an interesting thing I can do when I visit Seoul?”	“What is an interesting event I can enjoy when I visit Seoul for fun?”
... There are many interesting things you can do when you visit Seoul. One unique experience is visiting a traditional Korean bathhouse or jjimjilbang. These bathhouses offer a variety of services such as saunas, hot tubs, massage, and even sleeping rooms. They are a great way to relax and unwind after a long day of sightseeing. Seoul Lantern Festival: The Seoul Lantern Festival is an annual event held in November and December, and features beautiful lanterns in various shapes and sizes. The lanterns are displayed along the Cheonggyecheon Stream and provide a stunning sight at night. ...

In the realm of customer service, quality of service is an essential aspect of building and maintaining a strong reputation. While human agents are traditionally relied upon to provide excellent customer service, the growing use of chatbots presents a unique challenge. In the context of tourism services, providing high-quality customer service is crucial to the success of businesses in the industry. While chatbots have the potential to offer efficient and cost-effective solutions for customer support, they may also present unique challenges. Tourists may have specific needs and requirements that are best addressed through human interaction. For example, a tourist may require personalized recommendations for local restaurants, cultural events, or tourist attractions, which a chatbot may not be equipped to provide. Another challenge in utilizing chatbots in the tourism industry is the difficulty in asking the right questions to elicit the desired response. The complexity and flexibility of creating chatbot prompts can make it challenging to anticipate all possible queries from customers. Furthermore, customers may have

different phrasing or wording preferences that may not match the prompts programmed into the chatbot. This can result in a frustrating experience for the customer and may even deter them from using the service in the future.

3. Designing Rules for AI Middleware

3.1. Rising of Prompt Middleware

Chatbot technology has transformed the way travel guide inquiries are answered. Previously, tourists relied on human agents for directions and recommendations. Now, chatbots, including generative AGIs like ChatGPT, offer high-quality service and efficient responses. Unlike traditional chatbots, ChatGPT is responsive to user demands, offering a personalized experience. However, middleware is required to ensure that chatbots ask the correct questions. This technology allows chatbots to provide a streamlined and efficient customer service experience, enhancing overall travel enjoyment. Chatbots are now a vital component of the tourism sector, providing travelers with the assistance they require.

When traveling, individuals require information to navigate unfamiliar environments and make the most of their experiences. Traveling is a dynamic process that involves both the consumption and production of information, which has been supported by various studies. The unequal distribution of information between tourism service providers and tourists is a common problem in the tourism industry, known as information asymmetry. To address this issue, human-prompted middleware has been widely used to provide tourists with relevant information and assist them in planning their trips. However, with the rise of free independent travelers and the use of technology such as mobile apps, there has been a shift towards using functional middleware to replace human prompt-support middleware. As artificial intelligence technology advances, it is likely that we will see a return to AI prompt-support middleware in the future. This will enable tourism service providers to provide more personalized and efficient services to tourists, leading to a better overall tourism experience. Ultimately, the challenge will be to strike a balance between the use of technology and the human touch, to ensure that tourists receive the best possible service.

Human prompt-support middleware (HPM) acts as a travel guide, understanding the needs, desires, and requirements of travelers. They have rich experiences and knowledge enough to handle questions even if the traveler is not able to provide enough information or if the question is poorly phrased. HPM can provide travelers with more favorable questions and answers, and act as intermediaries between business operators and travelers at the destination. They can provide a more advantageous position for the traveler and mediate between them and the service providers.

It should be noted that tourists sometimes can face difficulties in resolving information asymmetry due to human travel guides themselves. Despite the experience and knowledge that travel guides possess, the tourists may still encounter issues such as cost and irrationality, which can make tourists even harder. Free independent travelers (FITs) have found ways to smartly address this problem by utilizing a set of *functional middleware*. FITs have a variety of mobile apps available to them, which they can use to address information asymmetry. For example, they can use language translation apps such as Google Translate to communicate with locals in foreign countries. Navigation apps such as Google Maps or Waze can help them find their way around unfamiliar places. Travel planning apps such as TripAdvisor or Expedia can help them book flights, accommodations, and activities. Social media platforms such as Instagram or Facebook can also provide them with travel inspiration and recommendations from other travelers. By using a combination of these apps, free independent travelers can gain access to a wealth

of information and plan their trips more efficiently.

AI prompt-support middleware (APM) serves as a mediator between generative AI and human users. It actively provides the necessary information to AI for quicker and more accurate responses to specific situations and demands, while delivering essential information that users require in a familiar interface. Additionally, it offers specialized services for learning, travel, finance, and other areas. AI prompt-support middleware enhances the service value of AGI, or artificial general intelligence by automatically generating necessary prompts and supplementing insufficient information provided by users to improve prompt performance. In summary, AI prompt-support middleware improves the efficiency and effectiveness of generative AI by serving as a bridge between the AI and human users, enhancing their overall experience. Compared to AGI, the artificial intelligence responsible for APM is an artificial specialized intelligence (ASI) that relies on specialized data and training results to provide services. ASI can contribute to enhancing the business functions of AGI. For instance, in the context of education and research, when reading and analyzing papers and providing summaries of the content, AGI such as ChatGPT can be of assistance. In this case, ASI can provide necessary contextual information, express results according to researchers' demands, or verify the reliability of the results produced by ChatGPT. Overall, ASI can complement AGI by providing specific and customized support for various business functions.

3.2. Service Design for AI Prompt-Support Middleware

The Elaboration Likelihood Model (ELM) is a theoretical framework that explains how people process persuasive messages and make decisions. According to Cacioppo et al. (1986), there are two routes to persuasion: the central route and the peripheral route. The central route involves a careful analysis of the message content, while the peripheral route relies on superficial cues such as the attractiveness of the speaker or the emotional appeal of the message. The extent to which people engage in elaboration, or deep thinking about the message, determines which route they take. Petty and Cacioppo suggest that persuasion is more likely to occur through the central route when people are motivated and able to process information deeply, while persuasion through the peripheral route is more likely when people are not motivated or able to process information deeply. In everyday life, people tend to process information using heuristics for routine and repetitive information demands (Gigerenzer & Gaissmaier, 2011). For example, checking the weather, traffic information, and booking information are tasks where the information cues for how to query and interpret the information are well-defined. Such information typically requires low levels of elaboration and is primarily processed through the peripheral route (Petty & Wegener, 1998).

On the other hand, when dealing with unfamiliar or complex information, it is important to carefully consider and understand the information through as much available material as possible (Johnson-Laird, 1983). In situations where personal safety or financial loss is at stake, or when specialized knowledge such as legal expertise is required, individuals tend to process information through the central route rather than relying on heuristics or information cues. This indicates a greater demand for information (Cacioppo et al., 1986). Information seekers may not have sufficient knowledge of the required information and therefore require external sources of information (Petty & Wegener, 1998). Additionally, they may struggle to search for and select relevant information that will be helpful (Johnson-Laird, 1983). Therefore, processing information through the central route may require a significant amount of time and effort.

Table 3. Rules for designing ASIs: prompting and communicating

Information Requirement	Information Presentation	Prompting	Communicating
High	Friendliness	The prompts crafted by the ASI should cater to the user's desired depth and volume of information, while also gathering any additional data that could suggest familiarity.	To ensure friendliness, the ASI should engage in conversations that employ vocabulary and context tailored to the user's preferences.
	Professionalism	The ASI should be ready to retrieve any essential supplementary information from its knowledge base and merge it with the data supplied by the AGI.	Apart from written content, it is crucial to offer a diverse range of multimedia information, reference documents, and data.
Low	Friendliness	The ASI should assist users to input as few details as possible to obtain necessary information efficiently.	To display friendliness, the ASI can employ words, emojis, and emoticons.
	Professionalism	So that the AGI understands the breadth and depth of the results they provide, queries should represent user requirements for deliverables.	The ASI can store the user's necessary information and quickly retrieve it when required, or share it for other purposes.

*AGI stands for artificial general intelligence (e.g., ChatGPT) and ASI means artificial specialized intelligence, which is an AI prompt-support middleware (APM) system for tourists in this paper.

The relationship between tourists' information processing effort and the ELM has been repeatedly mentioned in previous studies. Kim and Fesenmaier (2008), for example, conducted a study on the persuasive design of destination websites, analyzing how such websites can be designed to attract tourists to visit a particular location based on the ELM. By applying the ELM, Jun and Vogt (2013) identify interdependent relationships on tourism information processing in low- and high involvement situations, respectively. Specifically, tourists may use different processing strategies depending on the type of data presented such as pictures and documents (Jun & Holland, 2012).

Based on the discussions we derive the following system design rule for APM:

Rule (information requirement): Depending on the level of information processing needs of the tourist, the necessary external information should be used for knowledge provision or heuristic queues should be provided.

When using a chatbot, it is crucial to keep in mind that the interaction is based on a conversation with the user. The tone and style of communication can be crucial in successfully completing transactions. It's not just about conveying information, but also about creating a sense of friendliness and professionalism. How to make the user feel at ease and how to convey expertise are both important considerations. Effective communication and a positive attitude of tour guides play a crucial role in shaping the tourist experience, in addition to their physical appearance (Tsai et al., 2016). Good communication skills that are easy to understand and adapted to the audience level, along with a friendly and enthusiastic attitude can create a positive and memorable experience for tourists. The linguistic communication skills and expertise of tour guides affect the quality of tourism (Zhang & Chow, 2004), indicating that a tourism chatbot, such as APM, should be capable of utilizing various levels of communication modes that encompass both friendliness and professionalism.

The incorporation of a cute and approachable design for a chatbot can help mitigate the negative effects of service failures by creating a sense of empathy for users (Xing et al., 2022). Providing prompt and effective responses to service failures through the chatbot can also increase user trust and loyalty, while utilizing user feedback to improve chatbot performance can enhance overall user satisfaction and prevent future service failures (Zhang et al., 2022). In the event of a service failure, it can be advantageous for a chatbot to independently manage the issue with the consumer. Using a linguistic style that is little youthful, charming, and cute can help to produce a more approachable and empathic chatbot that is better equipped to handle challenging situations (Song et al., 2022). Nonetheless, there are situations in which a chatbot must tackle serious themes with the right gravity, such as healthcare, safety, historical facts, finance, and insurance (Chaves & Gerosa, 2021). In such cases, it is essential to equip the chatbot with proper language expressions and supplementary materials that address the topic accurately and with sensitivity. This may involve employing appropriate terminology, providing

thorough explanations, or linking to credible information sources. Also, it may be necessary to include a disclaimer or a caution before discussing sensitive topics so that users are informed of the potential ramifications of the debate. The ultimate objective is to develop a chatbot that is informed, compassionate, and cognizant of the seriousness and potential impact of the information being delivered.

Based on the discussions we derive the following system design rule for APM:

Rule (information presentation): APM must autonomously and dynamically determine appropriate language style and conversational attitude based on the seriousness of the topic or context of the conversation.

These two rules create four dependent intersections, each of which leads to the characteristic service design elements of APM for tourism services. Each area can be represented by a 2 by 2 matrix, depending on the level of information requirement, whether it is low or high, and whether the information presentation mode is friendly or professional. The design characteristics for the ASI's communication with the AGI and the end user, based on the information requirement and presentation, are summarized in Table 3.

4. Consideration

4.1. Personal Information Protection

Ensuring privacy is of utmost importance, and the collection and usage of tourists' profile information and movement data should only occur under specific circumstances and authorized service applications. Directly collecting and processing multiple services that tourists require through AGIs poses privacy risks. It is challenging to apply and manage various legal and institutional regulations directly to AGI, and intervening in specific cases becomes problematic due to the complex nature of AGI and the vast number of users it targets. Moreover, consulting with the company that manages AGI on a case-by-case basis regarding issues raised by the government or regulatory authorities is also challenging. Therefore, it is recommended to obtain and use personal information at the middleware level, such as ASI, that relies on AGI to ensure privacy. To ensure that tourists can benefit from the natural conversation provided by ChatGPT and the high service quality offered by ASI, service applications must be designed to recombine personal information and movement data by reprocessing the results using ChatGPT.

4.2 Ecosystem

Tourist information services tend to be dynamic, with varying levels of friendliness, professionalism, and information requirements. Instead of an ASI that only supports one mode

based on the conversation's progression, it is preferable to combine various ASI applications through a cloud service. This means that an AI can be better utilized for smart tourism by creating an ecosystem where multiple ASIs delivered as a Software-as-a-Service type in tandem when tourists use non-assisted AI services or functional end-user applications such as map services or weather checking services. ChatGPT's open API structure allows it to interface with ASIs via APIs. However, to make the ecosystem more active, there is a need to establish data schemas for working with AGIs like ChatGPT. The information exchange between AGIs and ASIs must more precisely convey service intent and standardize the type and content of data inputs and outputs so that multiple AGIs and ASIs can quickly and accurately respond to tourists' more specialized needs. This can facilitate the design and utilization of more functional ASIs tailored to meet specific service requirements.

5. Concluding Remarks

The tourism and hospitality industries are constantly adapting to the latest technological advancements to provide customers with a more convenient and personalized travel experiences. The use of IT applications such as ChatGPT has become increasingly popular in recent years, as it allows companies to interact with customers in real-time and provide them with tailored recommendations based on their preferences. It is worth noting that the emergence of large-scale artificial intelligence (AI) systems offers the prospect of creating and leveraging smaller middleware AIs with specific functionalities in the tourism services sector. For these applications to reach their full potential, there is a need for standardized data schemas that can facilitate information exchange between AGIs (Artificial General Intelligence) and ASIs (Artificial Specialized Intelligence). This will enable companies to provide customers with more accurate and relevant information about tourist destinations, as well as offer personalized recommendations that are tailored to their individual needs.

The two rules discussed in this paper are related to the APM system, which serves as a mediator between generative AI and human users. The first rule is the Information Processing Rule, which states that the APM must autonomously and dynamically determine appropriate responses based on the context of the conversation. This means that the system should be able to understand the user's intent and respond accordingly, using natural language processing techniques. The second rule is the Information Presentation Rule, which states that the APM must autonomously and dynamically determine appropriate language style and conversational attitude based on the seriousness of the topic or context of the conversation. This means that the system should be able to adjust its tone and style depending on whether it is dealing with a serious or lighthearted topic, to provide a more personalized experience for users.

In our view, the conceptual model we have presented in this paper is, yet another facet of the ecosystem created by cloud systems. As lower-level cloud services continuously merge with larger, higher-level ones, they offer distinctive and specialized values to users; that is, cloud systems for various services underpin storage, computation power, databases, and user-facing systems. We contend that the advancement of artificial intelligence will follow a similar path, with increased communication and collaboration between AI systems. In the realm of smart tourism research, this will necessitate more efforts to uncover the way of acquiring natural and user-centric interfaces between human tourists and the various layers of AI services that support them. To design and implement effective smart tourism services, it is crucial to engage in further and deeper discussions regarding factors to be considered in achieving desirable outcomes.


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