12-12-2021

Toward a Taxonomy of Service-Oriented Chatbots

Jonilda Bahja

Paul Lowry

Toward a Taxonomy of Service-Oriented Chatbots

Jonilda Bahja
Virginia Tech
jonildab@vt.edu

Paul B. Lowry
Virginia Tech
pblowry@vt.edu

ABSTRACT

As applications of chatbots evolve, they become an appealing technology for service-oriented businesses in hospitality and tourism (HT). Indeed, the research about chatbots in HT context is growing rapidly covering a range of perspectives from users to experts. Nevertheless, chatbots research in HT field remains new with a wide-ranging variability of challenges. Hence, the purpose of this study is to develop a taxonomy for chatbots in HT guided by a phenetic approach. The taxonomy focuses on two dimensions: the type of information and the level of interaction. Four categories of chatbots were identified, respectively informer, facilitator, planner, and performer. We utilize this taxonomy to advance the discussion of research gaps about chatbots in HT, as well as indicate the future research opportunities. The findings of the study help to understand the potential for chatbot applications in HT.

Keywords

Chatbots, taxonomy, social presence, service industry.

INTRODUCTION

The growth of chatbot applications has gained a momentum not only from tech developers, but also from academic community. In the last decade several studies have investigated chatbots from developers and users' perspective covering a wide range of issues. Chatbots ability to perform tasks ranging from simple ones to complex natural conversations such as customer services support (Brandtzae & Følstad, 2018; Feine, Gnewuch, Morana, & Maedche, 2019) has spiked the interest of service-oriented industries including HT. Despite its early stages, the literature of chatbots in HT field is advancing with conceptual and empirical research (Popesku, 2019). Recent publications turn the attention to the users' perspective. For instance, Melián-González, Gutiérrez-Taño, and Bulchand-Gidumal (2019) investigated chatbot user intentions.

The authors concluded that there are several factors that influence chatbot applications in HT such as chatbots' expected performance, the predisposition of users towards self-service technologies, the anthropomorphic characteristics of chatbots, the hedonic value of using chatbots, the social influences and the friendliness. Another study by Pillai and Sivathanu (2020) concluded that customers' behavioral intention and actual usage of chatbots for HT organizations is influenced by perceived ease of use, perceived usefulness, perceived trust, and perceived intelligence and anthropomorphism. Other researchers have investigated the chatbots success in the parameters of a particular sector within HT such as lodging, restaurants, museums, and travel agencies (Leung & Wen, 2020). Based on the systematic literature review, Calvaresi, Calbimonte, Schegg, Fragniere, and Schumacher (2021) conclude that the chatbot evolution in tourism is fostering remarkable change. Following on these optimistic notes, the research of chatbots in HT field is promising.

The branching of chatbot research has called for classifications of them to form a firmer understanding of their similarities, differences, and opportunities for the future. In the broader research about chatbots, they are classified under different taxonomies such as taxonomy of conversational agents (Feine et al., 2019), taxonomy of software bots (Lebeuf, Zagalsky, Foucault, & Storey, 2019), taxonomy of social bots (Lebeuf, 2018), and taxonomy of design elements of chatbots (Latah, 2019). In the context of HT, only a general discussion is provided for their classification based on the platform they are build, their recommendation abilities and incorporation of artificial intelligence (AI) solutions (Popesku, 2019). In conclusion, three types of chatbots were suggested: customer service travel bots, AI-empowered travel bots, and Facebook chatbots. Hence, the purpose of this study is to develop a taxonomy, and discuss relevant issues of chatbots research in HT. The taxonomy focuses on two dimensions: the type of information and the level of interaction. The findings of the study help to understand the possibilities for chatbot applications in HT, by showing the similarities and differences among the functionality of them.

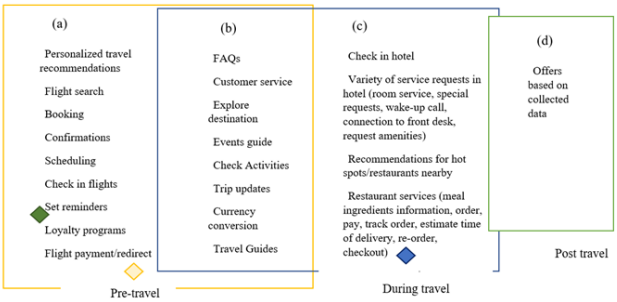
CHATBOT APPLICATIONS IN HT INDUSTRY

Chatbots applications are a suitable fit for the service-oriented nature of HT industry, serving with FAQs information, planning, booking, customer support and recommendations (Pillai & Sivathanu, 2020). The use of chatbots benefits HT organizations as it enables them to provide a 24/7 customer support (despite of their human resources or the size of company), to increase their capacity of serving to multiple guests at the same time, to increase engagement with guests, reduce the operational costs for the organization, and create more revenue opportunities (Bowen & Morosan, 2018; Pillai & Sivathanu, 2020).

Chatbot technology is embraced among different sectors of HT industry, such as online travel agencies, lodging, restaurants, airlines, and attractions. From online travel agencies (OTA), Skyscanner, Expedia, Booking.com, Kayak, and Travelocity have deployed chatbots in messaging platforms (Facebook Messenger, Kik, Viber, Skype, Slack). These chatbots allow consumers to get information, book a flight, modify/cancel a flight, find the best deals, and to connect with a customer care associate if necessary (Granger, 2017). In the lodging sector, well-known brands such as Marriott International, Cosmopolitan Hotel, and Wynn Las Vegas are utilizing chatbots to help guests find information about the hotels and offer different services to customers. For instance, Chatbotler from Marriott International allows guests to find information about Marriott Hotels, assists in changing the reservations, and provides access to the loyalty program account (Hospitality Upgrade, 2017). The Cosmopolitan Hotel in Las Vegas developed a chatbot called Rose, a playful chatbot with an appealing personality, to exhibits the resort, guide art tours, arrange for amenity delivery to guest rooms, and suggests the perfect restaurant when needed (Granger, 2017). Wynn Las Vegas Hotel communicates with customers through chatbot and customizes the experience in hotel rooms by utilizing Amazon Alexa for Hospitality, a voice-enabled chatbot (Miller, 2016). In Edwardian hotels', Edward chatbot helps travelers with tips on sightseeing places, bars, restaurants and more (Granger, 2017).

Many businesses in the food and beverage sector are utilizing chatbots as well, such as Domino's, Starbucks, Cheesecake Factory, and Dunkin' Donuts. On the other hand, Google has deployed an overarching chatbot named Google Duplex, which calls a restaurant and makes a reservation successfully (Wakabayashi, 2018). In travel, Emirates Airlines has deployed a chatbot called Emma, which searches personalized vacation packages for customers and suggests destinations (Viewpoints, 2018). As for touristic attractions, the Heinz Nixdorf Museums Forum in Germany is a compelling case of applied chatbots technology in touristic attractions. The chatbot called Max engages visitors of the museum in conversations and provides information about the museum and related topics (Kopp, Gesellensetter, Krämer, & Wachsmuth, 2005). Museum visitors insert the input by using a keyboard, while the chatbot, which is projected in a large flat screen, responds to visitors with voice, gestures, facial expression, and gaze, and entertain the visitors by talking naturally and funnily.

Even within the same sectors, chatbots do not offer the same performance, which leads to some of them being more advanced and sophisticated than others. Nevertheless, it could be argued that the spread of chatbots application is still in the early stages for hospitality and tourism organizations. However, it is logical to expect a further expansion considering the benefits from this technology. For instance, only in 2017 about fourteen percent of the airlines globally were using chatbots (Aviation Pros, 2017), while for 2020 chatbots the rates were estimated to go up to sixty-eight percent. The service-oriented nature of activities for HT organizations significantly benefits from chatbot operations. According to Aspect software research, 44% of consumers prefer AI-based chatbots over humans for customer care services (Sweezey, 2018). This is helpful in a way that in different stages of travel, chatbots support with different functions and services. For example, before traveling to a destination, travelers can use a chatbot to search for flights, schedule tours, book a flight, access the loyalty program. During the travel stage, other functions such as check-in at a hotel, events guide access, or trip updates are more important. In the post travel stage, chatbots can help with receiving feedback on the experience of the travelers and share future deals. A summary of the main services is provided in figure 1.



A TAXONOMY OF CHATBOTS IN HT

The development of taxonomy for this study is guided by a phenetic approach. In other words, the categories are formed based on the similar characteristics of the objects of the study, such as functional chatbots in HT (Nickerson, Muntermann, Varshney, & Isaac, 2009).The study is approached by the customer-centric value chain perspective where the value created by the functions of chatbots, and also the level of interaction with user are key factors. The list of chatbots included in the research is retrieved from case studies of Chatbotguide.org, compiled in 2018. In addition to the chatbots in traveling segment, the restaurant segment was merged to gain a more comprehensive list of functions from chatbots that are applicable to HT field. In total, the functions of more than seventy chatbots were analyzed using phenetic approach. The categorization of chatbots functions into groups was based on similarities. The list of groups created was expended in circumstances where the chatbot did not fit any of the previously established groups. While some chatbots would be clearly placed into a particular group, for some of them it was challenging to state the exclusivity to a certain group considering their complexity. From the analysis, the chatbots in HT field

were grouped in four categories such as informer, facilitator, planner, and performer as showed in figure 2.

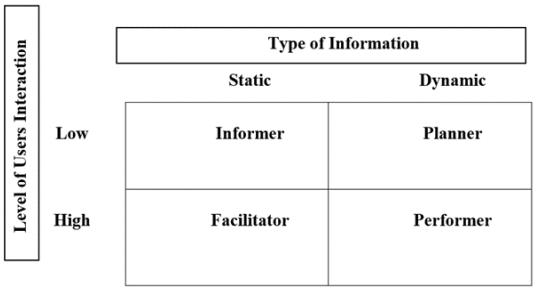


Figure 2. Taxonomy of Chatbots Based on Interactions with Users (tourists, guests, customer)

CONCLUSION

This article develops a comprehensive taxonomy of chatbots in hospitality and tourism based on two major dimensions, their functionality, and the interaction with users. The taxonomy provides valuable insights on the categories of chatbots, and the value generated from each of them. The results from taxonomy show that chatbots are diverse, but mainly in tourism they oversee tasks with low complexity. With the advancement of chatbot technology and the integration of AI in performing more complex functioning, it is reasonable to believe that chatbots will become a tool of experience enhancement. Furthermore, the research about applications of chatbots in HT remain only few years old and the challenges that contribute to the current version of the taxonomy remain to be further explored. Understanding those barriers, the practitioners and academic community can benefit on pushing further specific categories of chatbots that would benefit the service-oriented nature of it. In addition, the diverse nature of HT organizations and their goals for chatbots applications remain essential factor to be analyzed for shaping the current state of art of chatbots and their classifications.

REFERENCES

1. Aviation Pros. (2017). Airline and airport CIOs embrace artificial intelligence. Retrieved from https://www.aviationpros.com/airports/airport-technology/press-release/12365728/sita-airline-and-airport-cios-embrace-artificial-intelligence
2. Bailey, K. D. (1994). Typologies and taxonomies: An introduction to classification techniques (Vol. 102). Sage.
3. Bansal, H., & Khan, R. (2018). A review paper on human computer interaction. *International Journals of Advanced Research in Computer Science and Software Engineering*, 8, 53-56.
4. Bowen, J., & Morose, C. (2018). Beware hospitality industry: the robots are coming. *Worldwide Hospitality and Tourism Themes.*
5. Brandtzaeg, P. B., & Følstad, A. (2018). Chatbots: changing user needs and motivations. *Interactions,* 25(5), 38-43.
6. Calvaresi, D., Ibrahim, A., Calbimonte, J. P., Schegg, R., Fragniere, E., & Schumacher, M. (2021). The Evolution of Chatbots in Tourism: A Systematic Literature Review. *Information and Communication Technologies in Tourism* 2021, 3-16.
7. Chung, M., Ko, E., Joung, H., & Kim, S. J. (2020). Chatbot e-service and customer satisfaction regarding luxury brands. *Journal of Business Research*, 117, 587-595.
8. Dale, R. (2016). The return of the chatbots. *Natural Language Engineering*, 22(5), 811-817.
9. Derrick, D. C., & Ligon, G. S. (2014). The affective outcomes of using influence tactics in embodied conversational agents. *Computers in Human Behavior*, 33(2014), 39-48.
10. Edwards, C., Beattie, A. J., Edwards, A., & Spence, P. R. (2016). Differences in perceptions of communication quality between a Twitterbot and human agent for information seeking and learning. *Computers in Human Behavior*, 65, 666-671.
11. Feine, J., Gnewuch, U., Morana, S., & Maedche, A. (2019). A Taxonomy of social cues for conversational agents. *International Journal of Human-Computer Studies,* 132(2019), 138-161.
12. Gao, J., Galley, M., & Li, L. (2019). Neural approaches to conversational AI. *Foundations and Trends in Information Retrieval*, 13(2-3), 127-298.
13. Gentner, T., Neitzel, T., Schulze, J., & Buettner, R. (2020). A Systematic Literature Review of Medical Chatbot Research from a Behavior Change Perspective. *Paper presented at the 2020 IEEE 44th Annual Computers, Software, and Applications Conference* (COMPSAC).
14. Granger, B. (2017, September 11). How hotel chatbots will change guest experience. Retrieved from https://www.hospitalityupgrade.com/techTalk/June-2017/How-Hotel-Chatbots-Will-Change-Guest-Experience/
15. Hospitality Upgrade. (2017). Marriott International's AI-powered Chatbots on Facebook Messenger and Slack, and Aloft's ChatBotlr, Simplify Travel for Guests Throughout Their Journey. Retrieved from https://www.hospitalityupgrade.com/_news/NewsArticles/Marriott-Internationals-AI-powered-Chatbots-on-Facebook-Messenger-and-Slack.asp/
16. Jain, M., Kumar, P., Kota, R., & Patel, S. N. (2018). Evaluating and informing the design of chatbots.

Paper presented at the *Proceedings of the 2018 Designing Interactive Systems Conference*.

17. Kennedy-Eden, H., & Gretzel, U. (2012). A taxonomy of mobile applications in tourism.
18. Kim, N.-Y., Cha, Y., & Kim, H.-S. (2019). Future English learning: Chatbots and artificial intelligence. *Multimedia-Assisted Language Learning*, 22(3), 32-53.
19. Kopp, S., Gesellensetter, L., Krämer, N. C., & Wachsmuth, I. (2005). A conversational agent as museum guide–design and evaluation of a real-world application. Paper presented at *the International Workshop on Intelligent Virtual Agents.*
20. Latah, M. (2019). The Art of Social Bots: A Review and a *Refined Taxonomy.* arXiv preprint arXiv:1905.03240.
21. Lebeuf, C., Zagalsky, A., Foucault, M., & Storey, M.-A. (2019). Defining and classifying software bots: a faceted taxonomy. Paper presented at the 2019 *IEEE/ACM 1st International Workshop on Bots in Software Engineering* (BotSE).
22. Leonard, A. (1998). Bots: The origin of new species: Penguin Books Limited.
23. Leung, X. Y., & Wen, H. (2020). Chatbot usage in restaurant takeout orders: A comparison study of three ordering methods. *Journal of Hospitality and Tourism Management*, 45, 377-386.
24. Ling, & Tussyadiah. (2019). Designing travel bots [PDF File]. Hack Hospitality. Retrieved from http://epubs.surrey.ac.uk/851705/1/HH_Designing%20Travel%20Bots%202019.pdf
25. Madotto, A., Wu, C.-S., & Fung, P. (2018). Mem2seq: Effectively incorporating knowledge bases into end-to-end task-oriented dialog systems. arXiv preprint arXiv:1804.08217.
26. Melián-González, S., Gutiérrez-Taño, D., & Bulchand-Gidumal, J. (2019). Predicting the intentions to use chatbots for travel and tourism. *Current Issues in Tourism*, 1-19.
27. Miller, M. (2016). Wynn Las Vegas installing an Amazon Echo in every hotel room. Retrieved from https://www.zdnet.com/article/wynn-las-vegas-installing-an-amazon-echo-in-every-hotel-room/
28. Moore, S. (2018). Gartner Says 25 Percent of Customer Service Operations Will Use Virtual Customer Assistants by 2020.
29. Nickerson, R., Muntermann, J., Varshney, U., & Isaac, H. (2009). Taxonomy development in information systems: Developing a taxonomy of mobile applications. *In European conference in information systems*.
30. Nickerson, Varshney, U., & Muntermann, J. (2013). A method for taxonomy development and its application in information systems. *European Journal of Information Systems*, 22(3), 336-359.
31. Pillai, R., & Sivathanu, B. (2020). Adoption of AI-based chatbots for hospitality and tourism. *International Journal of Contemporary Hospitality Management.*
32. Popesku, J. (2019). Current Applications of Artificial Intelligence in Tourism and Hospitality. Paper presented at the Sinteza 2019-*International Scientific Conference on Information Technology and Data Related Research.*
33. Shah, H., Warwick, K., Vallverdú, J., & Wu, D. (2016). Can machines talk? Comparison of Eliza with modern dialogue systems. *Computers in Human Behavior*, 58(2016), 278-295.
34. Shawar, B. A., & Atwell, E. (2007). Chatbots: Can they serve as natural language interfaces to QA corpus? Paper presented at the *Proceedings of the Sixth IASTED International Conference*.
35. Shum, H.-Y., He, X.-d., & Li, D. (2018). From Eliza to XiaoIce: challenges and opportunities with social chatbots. *Frontiers of Information Technology & Electronic Engineering*, 19(1), 10-26.