Research note

Drivers of organizational adoption of automation

Iis P. Tussyadiah [a,*], Aarni Tuomi [b], Erin Chao Ling [c], Graham Miller [d], Geunhee Lee [e]

[a] School of Hospitality and Tourism Management, University of Surrey, Guildford GU2 7XH, United Kingdom
[b] Hospitality Business Competence Area, Haaga-Helia University of Applied Sciences, Pajuniityntie 11, 00320 Helsinki, Finland
[c] Department of Logistics, Marketing, Hospitality and Analytics, University of Huddersfield, Queensgate Huddersfield, HD1 3DH, United Kingdom
[d] Faculty of Arts and Social Sciences, University of Surrey, Guildford GU2 7XH, United Kingdom
[e] College of International Management, Ritsumeikan Asia Pacific University, Beppu, Oita, Japan

ARTICLE INFO

The implementation of artificial intelligence, robotics, and automation in tourism and hospitality has received increasing attention from researchers and practitioners alike. It is expected that innovative technological solutions will bring a host of transformation to the sector (Ivanov & Webster, 2019). While examples of full automation in tourism remain scant, understanding the factors influencing organizational decision to adopt automation is important to assess the likelihood to increase adoption rate in the future. Of interest is identifying potentially modifiable factors that can be employed to improve adoption of best practices (Wisdom et al., 2014). Thus far, no empirical studies have been done to address this. This research aims to fill the gap by providing a set of factors identified by practitioners as driving the organizational adoption of automation. The results suggest avenues for further research and offer best practices to implement automation in tourism.

Semi-structured interviews were conducted with 12 founders/managers of the first fully automated/robotized hotels and restaurants, located in Japan, Hungary, United Kingdom, and United States, representing global pioneers of automation in the sector. Interviews lasted an hour on average, all of which were recorded and transcribed. Transcripts were coded, interpreted, and validated by multiple authors, following thematic analysis procedure suggested by Braun and Clarke (2012). Themes were identified as elaborated below (see Fig. 1 and Supplement).

* Corresponding author.
E-mail addresses: i.tussyadiah@surrey.ac.uk, (I.P. Tussyadiah), aarni.tuomi@haaga-helia.fi, (A. Tuomi), C.Ling@hud.ac.uk, (E.C. Ling), g.miller@surrey.ac.uk, (G. Miller), glee1092@apu.ac.jp. (G. Lee).
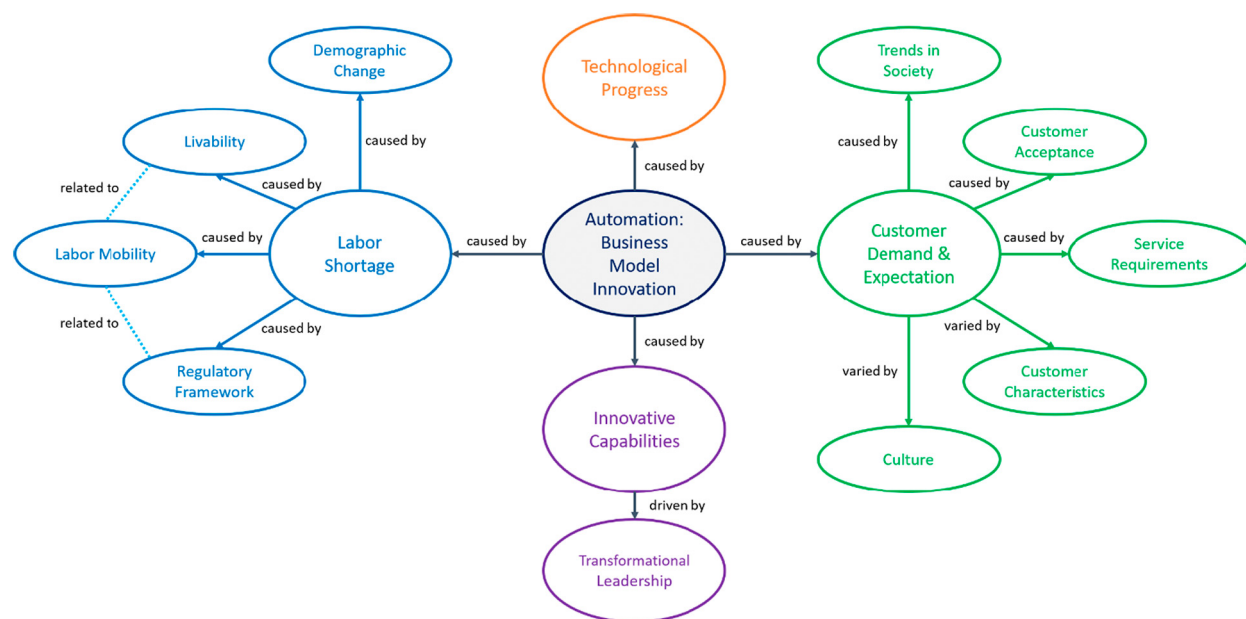
Fig. 1. Drivers of organizational adoption of automation.

Technological progress

Interviewees promptly recognized the important roles of technological progress and widespread applications of artificial intelligence and robotics, such as autonomous vehicles and voice assistants, in automating tourism and hospitality services. Literature has paid attention to how technological innovation and evolution drive new business models (Baden-Fuller & Haefliger, 2013) and/or strategic alignment (Croteau & Bergeron, 2001) as business organizations adopt technological innovation or adapt to technological changes to improve performance. The findings suggest that technological progress provides companies with technical feasibility and affordance for unmanned service operations, providing opportunities for new business models and/or new product/service concepts centered around process innovation.

Labor shortage

Severe or persistent labor shortage was the most intensely discussed determinant of automation adoption. When referring to automation, the term *unmanned* was meaningfully used to emphasize the absence of need for human labor in response to the difficulty of finding talent in the sector, exacerbated by COVID-19 (Stergiou & Farmaki, 2021). Indeed, previous studies have suggested that automation can tackle the problem of growing labor shortage in different industries: construction, manufacturing, agriculture, tourism (Meier, 1991; Tuomi et al., 2020). Several interrelated forces were identified as causing labor shortage: demographic change, livability, labor migration, and political and regulatory issues.

Demographic change

Interviewees blame aging society and declining birth rate for contributing to labor shortage. Declining birth rate has a direct effect on decreasing the supply of "young people", presenting a problem for tourism and hospitality industry that has historically relied upon the younger demographics for its entry-level, often hourly, positions (Meier, 1991).

Livability

The tourism and hospitality sectors are notorious for their low profit margins and high reliance on manual labor, which often reflect in comparatively low wages (Robinson et al., 2019). The combination of low salaries and increasing cost of living makes the sector an unpopular choice for career development. Some interviewees lamented about companies unable to give livable wages due to the high operations cost. Others empathized with employees, recognizing the difficulties of making a decent living when increases in prices are not matched with those in wages.

Labor mobility

Another force is the ease with which laborers can move around within a country/region (e.g., urban migration) and between countries (cross-border employment). Interviewees explained how they deployed resources to recruit graduates from major cities to work for their hotel (located in a secluded resort area) without success. Others expressed their disappointment that young talents leave their countries to work elsewhere in pursuit of more attractive salaries and sustaining benefits.

Regulatory framework

Some of the forces are further facilitated by the political and regulatory framework, with direct impact particularly on livability and labor mobility. For example, under the "open border" policies, and due to the proximity between country capitals, it is easy for residents to work in another country to take advantage of higher wages and lower living costs. While migrant workers have often been considered a solution to domestic labor shortage problem, political instability (e.g., 'Brexit') make it harder for companies to access them. Previous studies suggest that restrictions, tighter enforcement, and harsher penalties for noncompliance when it comes to employing migrant workers contribute more to the labor shortage problem in hospitality (Meier, 1991).

Customer demand and expectation

Adoption of automation is attributed to customer demand for more automated service delivery. Interviewees discussed several factors shaping customer demand for automation in tourism, including general societal trends, customer acceptance and use of automation, and service requirements. Furthermore, customer demand for automation is understood to be varied according to their characteristics and culture.

Trends

Managers recognized a trend in society where businesses are encouraged to leave simple, routine tasks to robots. Following in the footsteps of autonomous factories, there is an expectation that delegating simple tasks to robots will make service delivery more efficient and work more enjoyable, thus benefiting both customers and employees (Wirtz et al., 2018).

Customer acceptance

Interviewees stated that consumers are already utilizing voice assistants at home or opting for self-service machines in retail stores and thus benefiting from automated assistance. Consumers are therefore curious about how similar technologies can be applied in hotels (novelty) or expecting the same benefits from automation during a hotel stay as they would have at home (convenience).

Service requirements

Customer requirements to access quality services were considered an important driver. Specifically, interviewees credited staff limitations in language proficiency, rendering it impossible to deliver the same level of service quality to all customers without being proficient in their language. A manager reflected that it is not merely about effective communication (e.g., questions being answered), but also about reducing anxiety (e.g., fear of making mistakes) that would hinder staff ability to perform tasks appropriately, resulting in variable service quality. Automation is thus adopted to address the need for consistent service quality despite different customer requirements.

Customer characteristics

Differing customer characteristics were considered important in deciding *how* instead of *whether* automation should be adopted. This is because the levels of acceptance and use of technology vary by demographic (age, gender, family status) and psychographic (value, interest) characteristics (Tsourela & Roumeliotis, 2015). Interviewees explained that the characteristics of the targeted market segment influenced the selection of robot types (appearance, functions) to be implemented.

Culture

Acceptance and use of automation vary by culture. As technologies are developed in tandem with social production of meanings around them, the widespread use of automation can also be attributed to how agent technologies have been embedded in the sociocultural fabric of a country. Japan, where the first robotic hotels were introduced, is a special case where robots are perceived to have a positive role in society (as assistants or even heroes), as peoples' relationship with intelligent machines is rooted in the animistic conception of attaching souls to both living beings and non-living objects (Trovato et al., 2013). Previous studies have shown how cultural background affects customer perception towards and acceptance of service robots in different settings and, consequently, efforts have been done to program robots to adapt to the culture of their users (Trovato et al., 2013).

Innovative capabilities

While acknowledging the external forces driving automation adoption, interviewees highlighted their company's ability to recognize and take the opportunity to utilize automation as a radically new technological solution, leading to innovation in their business model. The companies introduced a new business concept (e.g., robotized hotel) as a differentiation strategy to compete in an ever-changing environment, thereby demonstrating their innovativeness and market orientation (Hult et al., 2004). Quite a few credited their leaders' innovativeness and ambition to be the pioneer who sets global standards for the implementation of automation in the sector. Indeed, the role of transformational leadership, having such characteristics as inspirational motivation, idealized influence, and intellectual stimulation towards employees, in company's innovative strategies and, consequently, performance has been suggested in the literature (Bass & Avolio, 1994; García-Morales et al., 2012). Transformational leaders can not only create visions for change, but also manage the innovation process well. Because of being the first mover in the marketplace, the companies benefit from raising popularity and good reputation.

The drivers of automation adoption identified herein are consistent with the previously suggested frameworks in innovation adoption and diffusion (Roger, 1983) with new insights on how these factors play a role in bringing automation into business model innovation in the labor-intensive tourism and hospitality sectors. Labor shortage sets the need for automation, shifting from labor- to technology-intensive service operations. Theoretically speaking, this illustrates a tight coupling of process and product innovation, where automation (i.e., process innovation through enabling technology) results in a significant change in service characteristics (i.e., unmanned tourism and hospitality services), adding to extant literature regarding the relationship between product and process innovation (Linton & Walsh, 2008) (Fig. 2).

The findings provide practical implications to achieve fruitful implementation of automation in tourism, including advancing automation technologies to provide unique solutions for the sectors, understanding customer expectation for unmanned services, and integrating transformational management for innovation in tourism and hospitality organizations. To advance research in this
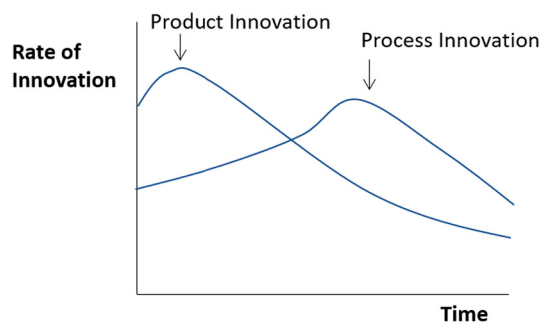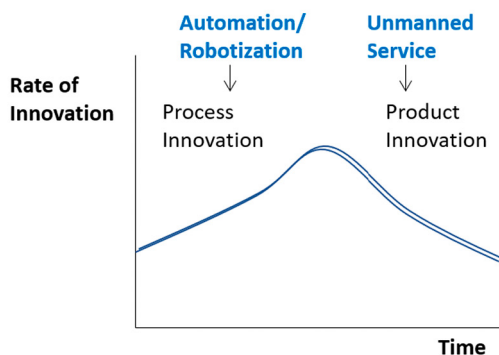

Utterback Abernathy Model:
Product innovation occurs first with dominant design. Process innovation follows to reduce cost. Most applicable to goods.
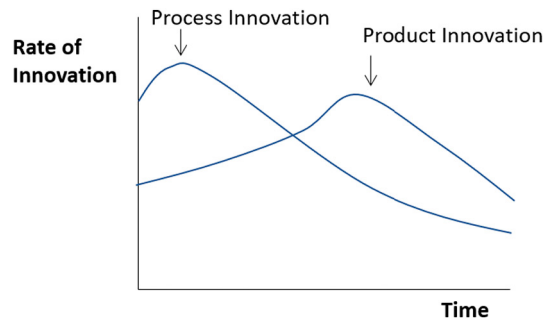
Barras Model:
Process innovation occurs first with enabling technology. Product innovation follows with better understanding of technology. Most applicable to services.

Linton Walsh Model:
Coupling of product and process innovation with enabling technology.

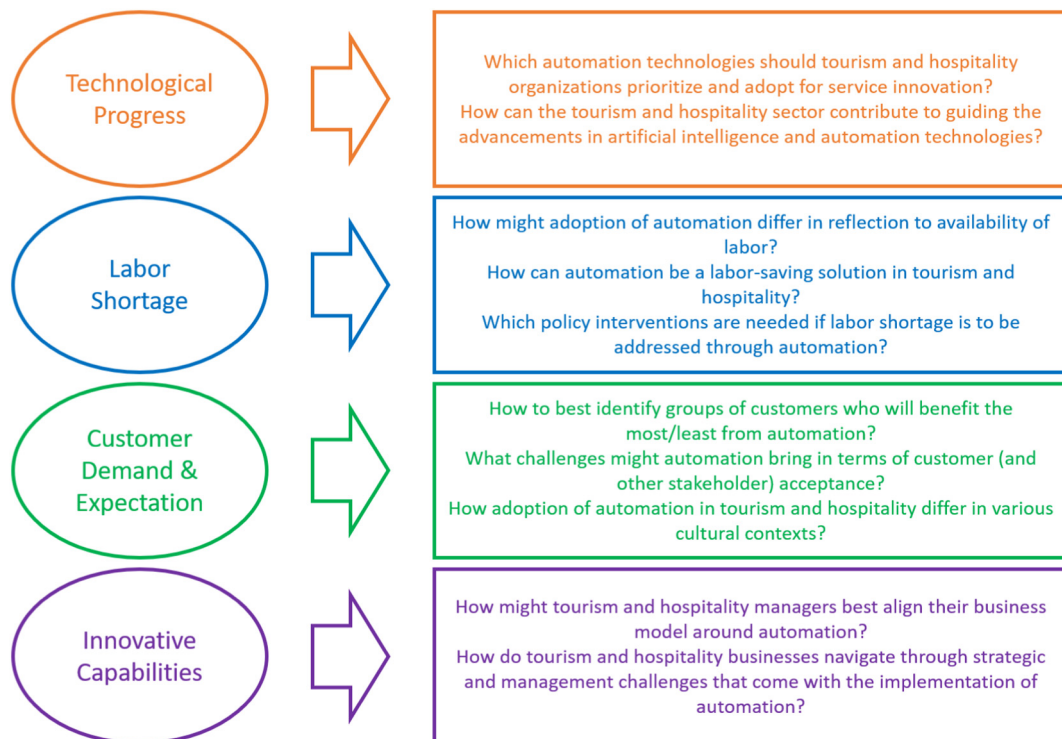Fig. 2. Automation coupling process and product innovation.

Fig. 3. Questions for future research.

area, future studies should explicate the manifestation of these factors in the innovation process and address research questions summarized in Fig. 3.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.annals.2021.103308.

References

Baden-Fuller, C., & Haefliger, S. (2013). Business models and technological innovation. *Long Range Planning, 46*(6), 419–426.
Bass, B. M., & Avolio, B. J. (1994). Transformational leadership and organizational culture. *International Journal of Public Administration, 17*(3–4), 541–554.
Braun, V., Clarke, V. (2012). Thematic analysis. In H. Cooper, P.M. Camic, D.L. Long, A.T. Panter, D. Rindskopf, K.J. Sher (Eds.), APA handbook of research methods in psychology, Vol. Vol. 2. Research designs: Quantitative, qualitative, neuropsychological, and biological (pp. 57–71). American Psychological Association.
Croteau, A. -M., & Bergeron, F. (2001). An information technology trilogy: Business strategy, technological deployment and organizational performance. *Journal of Strategic Information Systems, 10*, 77–99.
García-Morales, V. J., Jiménez-Barrionuevo, M. M., & Gutiérrez-Gutiérrez, L. (2012). Transformational leadership influence on organizational performance through organizational learning and innovation. *Journal of Business Research, 65*(7), 1040–1050.
Hult, G. T. M., Hurley, R. F., & Knight, G. A. (2004). Innovativeness: Its antecedents and impact on business performance. *Industrial Marketing Management, 33*, 429–438.
Ivanov, S., & Webster, C. (2019). *Robots in tourism: A research agenda for tourism economics.* Tourism Economics, 1–21.
Linton, J. D., & Walsh, S. T. (2008). A theory of innovation for process-based innovations such as nanotechnology. *Technological Forecasting and Social Change, 75*(5), 583–594.
Meier, J. D. (1991). Solutions to the hospitality industry's labor shortage. *Hospitality Review, 9*(2), 10.
Robinson, R, Martins, A., Solnet, D., & Baum, T. (2019). Sustaining precarity: Critically examining tourism and employment. *Journal of Sustainable Tourism, 27*(7), 1008–1025.
Roger, E. M. (1983). *Diffusion of innovation.* New York: The Free Press.
Stergiou, D., & Farmaki, A. (2021). Ability and willingness to work during COVID-19 pandemic: Perspectives of front-line hotel employees. *International Journal of Hospitality Management, 93*, Article 102770.
Trovato, G., Zecca, M., Sessa, S., Jamone, L., Ham, J., Hashimoto, K., & Takanishi, A. (2013). Cross-cultural study on human-robot greeting interaction: Acceptance and discomfort by Egyptians and Japanese. *Journal of Behavioural Robotics, 4*(2), 83–93.

Tsourela, M., & Roumeliotis, M. (2015). The moderating role of technology readiness, gender and sex in consumer acceptance and actual use of technology-based services. *The Journal of High Technology Management Research, 26*(2), 124–136.

Tuomi, A., Tussyadiah, I., Ling, E. C., Miller, G., & Lee, G. (2020). X=(tourism_work) y=(sdg8) while y=true: automate(x). *Annals of Tourism Research, 84*, Article 102978.

Wirtz, J., Patterson, P., Kunz, W., Gruber, T., Lu, V., Paluch, S., & Martins, A. (2018). Brave new world: Service robots in the frontline. *Journal of Service Management, 29* (5), 907–931.

Wisdom, J., Chor, K. H. B., Hoagwood, K. E., & Horwitz, S. M. (2014). Innovation adoption: A review of theories and constructs. *Administration and Policy in Mental Health and Mental Health Services Research, 41*(4), 480–502.

Iis Tussyadiah is Professor at University of Surrey. She conducts research on information technologies and human behavior.

Aarni Tuomi is Lecturer at Haaga-Helia University of Applied Sciences. His research explores service automation in hospitality and tourism.

Erin Chao Ling is Lecturer at University of Huddersfield. Her research focuses on AI systems in travel.

Graham Miller is Professor at University of Surrey. He conducts research into business ethics, sustainable tourism, and CSR.

Geunhee Lee is Associate Professor at Ritsumeikan Asia Pacific University. His research focuses on consumer behavior.