HUOM! Tämä on alkuperäisen artikkelin rinnakkaistallenne. Rinnakkaistallenne saattaa erota alkuperäisestä sivutukseltaan ja painoasultaan.

Käytä viittauksessa alkuperäistä lähdettä:

Tussyadiah, I., Tuomi, A., Chao Ling, E., Miller, G. & Geunhee, L. (2021) Drivers of organizational adoption of automation. Annals of Tourism Research, 103308. DOI:10.1016/j.annals.2021.103308

PLEASE NOTE! This in an electronic self-archived version of the original article. This reprint may differ from the original in pagination and typographic detail.

Please cite the original version:

Tussyadiah, I., Tuomi, A., Chao Ling, E., Miller, G. & Geunhee, L. (2021) Drivers of organizational adoption of automation. Annals of Tourism Research, 103308. DOI:10.1016/j.annals.2021.103308

The final published version is available online at https://doi.org/10.1016/j.annals.2021.103308.

DRIVERS OF ORGANIZATIONAL ADOPTION OF AUTOMATION

Iis P. Tussyadiah[1]
School of Hospitality and Tourism Management
University of Surrey, United Kingdom
Guildford GU2 7XH United Kingdom
Email: i.tussyadiah@surrey.ac.uk
Phone: +44-1483684292

Aarni Tuomi
Hospitality Business Competence Area
Haaga-Helia University of Applied Sciences, Finland
Pajuniityntie 11, 00320 Helsinki Finland
Email: aarni.tuomi@haaga-helia.fi

Erin Chao Ling
Department of Logistics, Marketing, Hospitality and Analytics
University of Huddersfield, United Kingdom
Queensgate Huddersfield HD1 3DH United Kingdom
Email: C.Ling@hud.ac.uk

Graham Miller
Faculty of Arts and Social Sciences
University of Surrey, United Kingdom
Guildford GU2 7XH United Kingdom
Email: g.miller@surrey.ac.uk

Geunhee Lee
College of International Management
Ritsumeikan Asia Pacific University, Japan
Beppu, Oita, Japan
Email: glee1092@apu.ac.jp

---

[1] Corresponding author

1

Drivers of Organizational Adoption of Automation

Highlights

- Organizational adoption of automation is made possible by technological progress

- Labor shortage, due to demographic change, livability, and labor mobility, calls for automation

- Customer characteristics and culture determine how automation is designed and implemented

- Transformational leadership is key to successful realization of business model innovation

- These factors can be employed to improve adoption of best practices of automation in tourism

Drivers of Organizational Adoption of Automation

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).
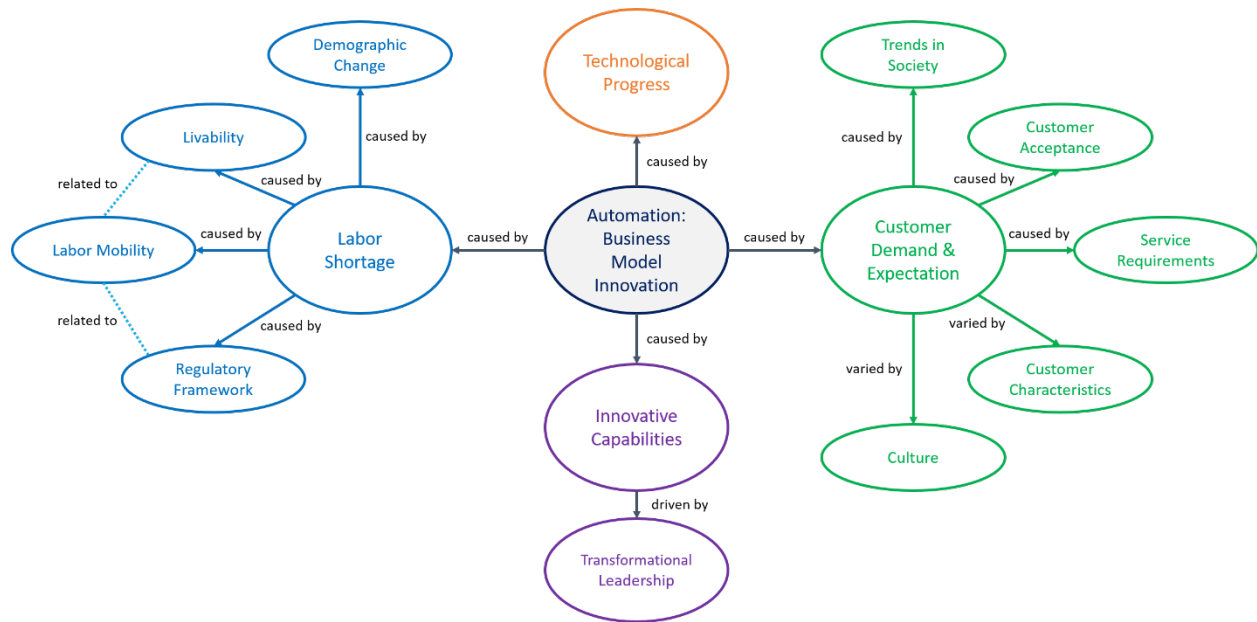

Fig. 1. Drivers of organizational adoption of automation

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

3

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

4

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, Hurley, & Knight, 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, Jiménez-Barrionuevo, & Gutiérrez-Gutiérrez, 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.

5

The drivers of automation adoption identified herein are consistent with the previously suggested frameworks in innovation adoption and diffusion (Rogers, 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).
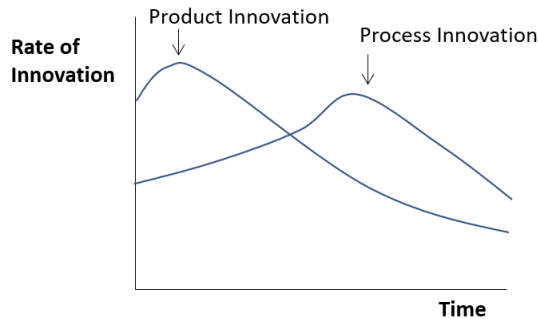
Utterback Abernathy Model:
Product innovation occurs first with dominant design. Process innovation follows to reduce cost. Most applicable to goods.
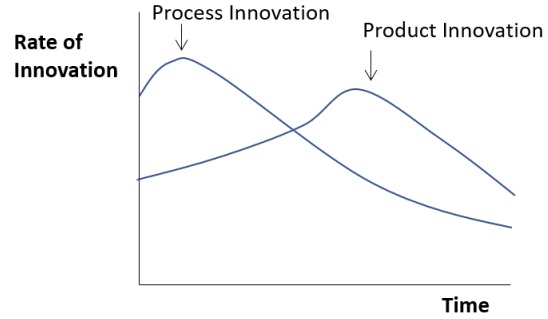
Barras Model:
Process innovation occurs first with enabling technology. Product innovation follows with better understanding of technology. Most applicable to services.
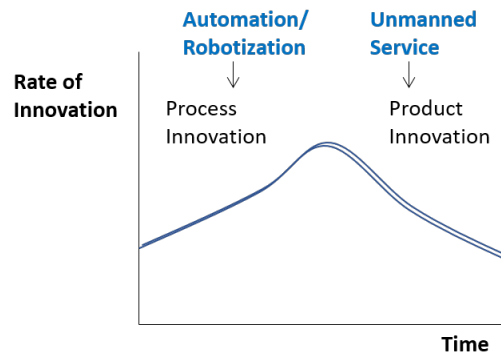
Linton Walsh Model:
Coupling of product and process innovation with enabling technology.

Fig. 2. Automation Coupling Process and Product Innovation

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 area, future studies should explicate the manifestation of these factors in the innovation process and address research questions summarized in Fig.3.
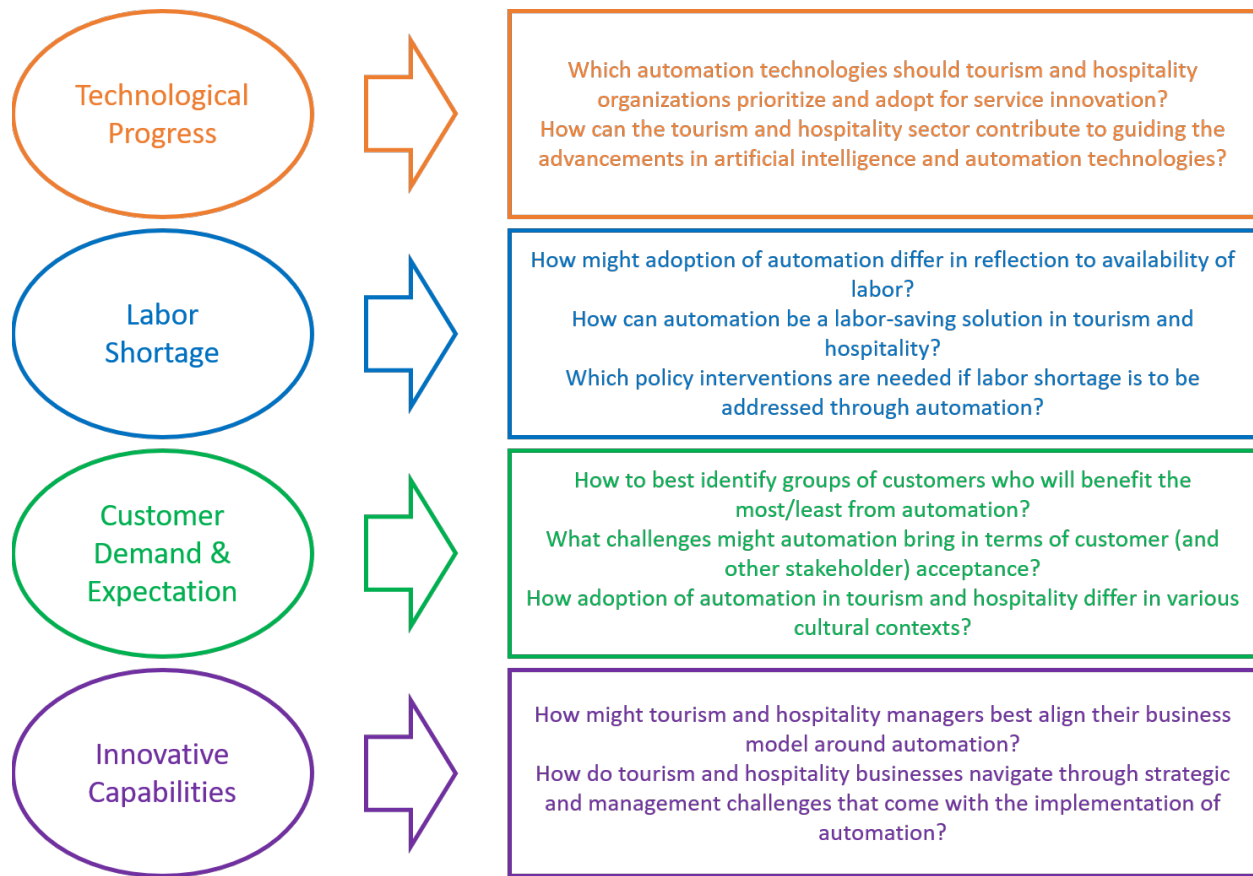
6

Fig. 3. Questions for future research

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. 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), Article 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, 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, 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.

Authors' Bio

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.

Drivers of Organizational Adoption of Automation in Tourism

Codes

Level 1 Code	Level 2 Code	Code Name	Definition	Sample Quote[*]
A		Technological progress	Technological changes/advancement of automation in services and various fields	"*If we are to talk about the current situation, everyone is feeling that automation development is going on in many fields, don't you agree? The most obvious would be self-driving cars, or vending machines are also a kind of automation which has been around long before. Many kinds of automation are advancing.*" – Hotel Manager, Japan
B		Labor shortage	The absence of human labor	
	B1	Demographic change	[Cause of B] A change in population's structure due to, for example, declining birthrate and increasing aging population	"*The place we are now at is called* [City] *of the* [Prefecture] *prefecture, and it has had some influence on us. Japan right now is experiencing some serious issues such as declining birthrates, aging population, and shortage of labor.*" – Hotel Manager, Japan
	B2	Livability	[Cause of B] Salary rate relative to cost of living	"*Because salaries are… real estate prices are increasing like crazy, it's crazy, really, um… salaries don't increase that much. Then there is a big gap and to overcome that gap salaries should be increasing, but it's not on that trend at the moment.*" – Hotel Manager, Hungary
				"*Is it just going to be unsustainable for us to be able to provide proper living wage for people and to have a huge labor force and to be able to do that at a cost that people are willing to pay? That is just not going to be able to happen, so we need to get ahead of that curve, that's where I believe it is* [a driver for automation]." – Hotel Manager, UK
	B3	Labor migration	[Cause of B] Laborers move around within a country/region and between different countries	"*The problem is that 250 km to the west we have* [Country] *they get almost double the money… It's EU, Schengen, it's easy, so there are a lot of people they are going around and leaving...*" – Hotel Manager, Hungary
				"*After graduating high school, the young people who has been living here go to big cities like* [City1], [City2], *or* [City3]. *As a result, in* [City4] *there aren't many young people at all. Without employees, our hotel and theme park cannot provide any service, so for the recruitment activities, the people in charge of our human resources division have to go all the way to the cities, you know. They are trying their best in the*

Level 1 Code	Level 2 Code	Code Name	Definition	Sample Quote*
				recruitment, conducting interviews and finding talented people, then convincing them to go work at [Resort] *in* [City], [Prefecture]. *However, the young people of Japan nowadays have an adoration for the city centers, for the urban area, so much that it doesn't matter how much we ask, they wouldn't come to work in the countryside.*" – Hotel Manager, Japan
	B4	Political and regulatory issues	[Cause of B] Political and regulatory framework with direct impact on labor, particularly influencing livability and labor mobility	"*The problem is that 250 km to the west we have* [Country] *they get almost double the money... It's EU, Schengen, it's easy, so there are a lot of people they are going around and leaving...*" – Hotel Manager, Hungary
				"*I think especially as there are shortages of staff because of Brexit, then areas of automation will become relevant. I mean, we're more automated in* [City]. *We have a restaurant in* [City] *with more automated cooking processes than we have here, because employing people is more costly in* [Country] *because of the social charges. So there, we're using cooking techniques that're we're not really using here to reduce labor.*" – Restaurant Manager, UK
				"*[it's] about productivity. ...the same political microeconomic issues everyone else faces that we just simply can't get enough labor, so how do we use automation and what form of robotics to help offset some those challenges.*" – Food Tech CEO, UK
	B5	Extreme environments	[Cause of B] Areas deprived of resources, which are traditionally inaccessible for tourism	"*Also, people are saying in the near future space travel will become common, but if we are to provide accommodation on the moon, there will certainly be a shortage of labor. It is also the context as to why* [Brand] *Hotel was born after all. So, in order to deal with this problem, all the simple things should be done by robots. It's the moon, you know.*" – Hotel Manager, Japan
C		Customer demand and expectation	Particular customer needs or requirements with regards to automation	"*...this is probably much more a younger demographic who were engaging in health tracking apps [...] There are people who want to work with those tracking apps to integrate them with their menus, so that people can have an entirely customized meal propositions. [...] The next is people who are subscribing to gym program, fitness program, whatever [...] they go 'I want you to vary my diet throughout the week' [...] but each meal that's being delivered is entirely unique [...] the ingredients, contents are not standard menu items. [...] you can no*

11

Level 1 Code	Level 2 Code	Code Name	Definition	Sample Quote*
				longer take the commissary or dispensary model where you take a scoop of this and a scoop of that… They can't do that. They can't physically manage the variations of all these coming through. They can't reliably get into portion control. […] so, the ways where we're finding a gain for our robotics [are] *demand for change, suddenly we have to build something that we didn't have to build before."* – Restaurant Robotics CEO, UK
	C1	Trends in society	[Cause of C] Global trends explaining society's (and the economy's) increasing reliance on automation	*"Furthermore, the social trend which encourages businesses to leave all the simple desk work such as reception to robots has also had good influence on us. The biggest influence of it all will probably be self-driving cars, followed by autonomous factories and robots producing goods, all of which the world is taking for granted. I wonder if the society, the economy will be able to follow the automation trend, leaving all the simple parts to robots. Our* [Brand] *Hotel is proud to be able to contribute something to that cause."* – Hotel Manager, Japan
	C2	Customer acceptance and use of automation	[Cause of C] Customers have adopted/are open to adopt and used/use automated systems (in daily life)	*"As AI home speakers are also becoming commonplace, the amount of home speakers or robotics or AI in society, they are also becoming conventional, I think."* – Hotel Manager, Japan *"…we were talking about the adaptation of people using things* [robotics]. *That is the real key for us, that once people start using things, then it becomes normal, and when it becomes normal it* [adoption] *happens very, very quickly."* – Hotel Manager, UK
	C3	Service process requirements	[Cause of C] Customer requirements to access services, such as language	*"…let's suppose that I'm at that front desk, and a guest comes to check in. If the guest is a Japanese, then since I am also a Japanese we can communicate easily.* […] *Not only that, I would also make use of all my knowledge and information and try hard to make the guest happy, to help him or her enjoy his or her time here, and leave the hotel in a good mood. On the other hand, if the guest is a Russian who cannot speak Japanese, the service quality immediately drops, don't you think? […] we understood that while robots might only be able to provide service 50% or 60% at most where humans can do 120-130%, robots can provide it equally to everyone regardless of age or nationality. It's something only possible for robots, impossible for humans."* – Hotel Manager, Japan

12

Level 1 Code	Level 2 Code	Code Name	Definition	Sample Quote[*]
	C4	Customer characteristics	[Variation in C] Demographic and psychographic characteristics of customers for which the variation in levels of acceptance/use of automation can be attributed to	"*I suppose it depends on the target demographic. Guests with family are not quite used to using this kind of services. On the other hand,* [Location] *is used by single businessmen. As such, there are businessmen who are quick to follow the trend, so it transitions smoothly. However, for the guests with family, like housewives, they don't really check in smoothly. There are quite a number of them who gets panicked or makes an error. That's how it was in the beginning, but fortunately thanks to increasing reputation, I feel that* [Brand] *Hotel is becoming more accessible.*" – Hotel Manager, Japan
	C5	Culture	[Variation in C] Sociocultural fabric of a country/region for which the variation in levels of acceptance/use of automation can be attributed to	"[…] *when I looked back, I think Japanese people actually have been under the influence of robots since childhood already.*" – Hotel Manager, Japan "*Right now, we already have places like self-service convenience stores. However, because there is always a difference in culture, a guest from overseas like America may not probably understand things the same as a Japanese guest may. Americans think this way, while Japanese people think that way. That is just how it is, and I have many concerns about this too, but if I was asked if it is impossible, I would say the real challenge is how to keep innovating current methods. To improve an idea, you really have to ask for opinions from various people and make use of technology.*" – Hotel Manager, Japan
D		Dynamic Capabilities	Companies' ability to integrate, build, and reconfigure internal competences to address or bring about changes in the business environment	"*What this means is that when the reception is busy there are people to deal with it, but when it's not busy people are not doing anything besides being there, and that's a waste of labor. That's why we thought we should make robots do the work. […] The hotel industry until now has always thought that a normal hotel, an ordinary hotel is one that has to provide human service, or being served by humans… Not relying on humans then, in a sense, will be a brand-new concept.*" – Hotel Manager, Japan "*The iPhone has this image of the pioneer that led the change from feature phones or flip phones to smartphones. We're hoping that* [Brand] *Hotel can also be in the same position. Sooner or later we will have copycats, that's for sure. […] in that sense we really want to hold the leading position. We want to build more hotels and stay on top.*" – Hotel Manager, Japan

Level 1 Code	Level 2 Code	Code Name	Definition	Sample Quote[*]
				"Our hotel too feels a sense of responsibility, which doesn't allow us to be idle. We have stated clearly that we promise to show the guests a different thing next time they come again. That being said, if next week a guest came again and told us that there was no change at all, then we would have nothing to do but to apologize. Sorry we don't work that fast. But if one or two years has already passed, then I agree there has to be some new changes." – Hotel Manager, Japan
				"The economics of robots, they are very persuasive. […] The restaurant industry has got a lot of scope for automation because it's labor intensive, and quite a lot of that labor is repetitive and not high skilled. That's why restaurants, along with some other areas of business, are preparing for automation." – Restaurant CEO, UK
	D1	Transformational Leadership	[Driver of D] Where a leader creates a vision to guide change through influence and inspiration and executes change in tandem with committed members of their team.	*"…seeing that the problem or labor shortage simply cannot be solved, [the Chairman] decided to change the way of thinking, and that from now on we would start a theme park or hotel business which wouldn't rely on human labor. Some people wondered how we could provide service that would make the guests happy without employing people. In response, the Chairman proposed to solve the labor problem by simply using robots instead of human workers."* – Hotel Manager, Japan

[*]The same quote may represent multiple codes.