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For better or for worse: Shaping the hospitality industry through robotics and artificial intelligence

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ABSTRACT: Contemporary technological applications are widely in use in the public sector; transportation, law enforcement, armed forces, and health care industries have long adopted robotics and artificial intelligence (AI). Our daily lives have been shaped through the digital transformation and, as such, this development has also impacted the hospitality industry. By exploring the practical implications, the authors outline motivations of organisations, and highlight shortcomings due to the current level of technology adoption. In line with this, a trade-off between convenience and limiting freedom of choice is contrasted with varying regional acceptance levels by users. Further, the adoption of advanced technology as far-reaching as social robots has implications on a strategic and human resources level; human-robot interaction (HRI) in a professional setting comes with changing job tasks, and a general-skill-focused human workforce and therefore requires adapted policies and strategies. Undoubtedly, the future is here, and rather than fearing the change the authors recommend using technological advancements and its possibilities through an informed choice.

KEYWORDS: acceptance, artificial intelligence (AI), hospitality industry, human–robot interaction (HRI), robotics, technological development, strategic human resource management (HRM)

The digital transformation

Automated processes and robotics are deeply integrated in today's society, and Collier (as cited in Murphy, Hofacker & Gretzel, 2017) declared, in 1983, the end of the Industrial Revolution through technological advancements. The Industrial Revolution, being widely associated with the economic prosperity of the Global North, was also the driver of societal changes based on changed living arrangements that were followed by new saving and spending patterns. Daily life was newly defined through scheduled working hours and emerging labour laws; commercial asset investments contributed to the development of accounting and finance practices. According to Wisskirchen, Biacabe, Bormann, Muntz, Niehaus, Soler, and von Brauchitsch (2017), digitalisation with the emergence of the internet and a new era of access to information beginning in the 1970s contributed to extended use of industrial machines. Industry 4.0, or the fourth Industrial Revolution, is defined through *cyber-physical systems* (CPS) – the extended integration of technology and the communication between everyday objects (the *internet of things*) – and shapes a new world order of permanently (inter)connected humans and machines. Hence, Dirican (2015) raised the question of how the emergence of robotics and artificial intelligence (AI) aggravated economic and labour market development not only on a societal and organisational level, but also on an individual basis.

Discussing the history of "robotics", Murphy et al. (2017) state that science fiction authors and later movie producers have had an interest in non-human beings since the early 1900s. Despite the commonly grim outlook of humanoids replacing life on Earth in most stories, *robotic applications* are an integral part of our daily lives, not only in our homes, but also in transportation, entertainment, law enforcement, armed forces, and health care.

Technological advancements in the hospitality industry

Even though for some the hospitality industry is still associated with long working hours, low salary levels and exploitation of minorities, the industry has come a long way since Orwell famously criticised and labelled hospitality-related workers as having *no social significance* in the 1930s (Baum, 2019). In the age of big data, the hospitality industry, a sector within the broader services industry, has adopted computerised processes and artificial intelligence in, for example, property management systems (PMS), revenue management systems (RMS), or customer relationship management (CRM), to synthesise key performance indicators (Mariani, Baggio, Fuchs, & Höepken, 2018). Smart home appliances and applications such as Alexa by Amazon, Siri by Apple, and the Google Assistant have found their way into hotel rooms to control the ambiance, provide information, order services or communicate complaints. Robotic appliances are not only utilised for programmable housekeeping purposes and assisting lobby attendants, concierges and bellboys, but have also been introduced as waiters in restaurants. The owner of a restaurant in China sees robots as not only an opportunity to save costs in the long run by easing the demanding workload of

his staff, but also as a form of high-tech entertainment (Allman, 2014). The Henn na Hotel in Tokyo, Japan, an experimental hotel project, utilises robotics and state-of-the-art technology to run what they called a low-cost hotel (LCH) with minimal human labour (Masuda & Nakamura, 2018).

Robotic butlers (e.g. Boltr in Aloft Hotels), robotic arms as bartenders (Bionic Bar on Royal Caribbean's *Quantum of the Seas*), or even virtual robotic agents in Singapore`s tourist information centre are further examples of how technological advancements have found their way into the day-to-day operations of hospitality businesses (Tung & Law, 2017).

In line with this, and probably an example of the most advanced application of AI, Singapore's Nanyang Technological University (NTU) introduced the human-like *social robot* "Nadine" as a receptionist in the Institute of Media Innovation faculty in 2018, and according to the scientists who created her, staffing needs were the main driver in her development. With the goal to fulfil administrative tasks in the care of the elderly, "Nadine" might even become a companion. She can interact with her environment, express emotions and, with the efficiency of a machine, work for extended periods of time (Nanyang Technological University Singapore, 2019). With the ambitious vision of social robots working alongside lawyers and journalists, "Nadine" could be the beginning of a line of front-line staff in the hospitality industry far beyond the capabilities of the robots used in the Henn Na Hotel in Japan.

As the above examples show, efforts to include machines, robotic applications or sophisticated social robots are plentiful. With manpower issues or economising efforts in mind, academic literature supports the notion that the technological development in service automation, artificial intelligence, and robotics create possibilities to enhance organisational performance, productivity, and quality consistency (Ivanov, Webster & Berezina, 2017). Ivanov (2019) further highlights the potential of waste and cost reduction to boost the financial bottom line.

How does it work in practice?

The question is: to what extent do these applications fulfil these ambitions from an organizational point of view? Especially, as the following examples outline, that in practice, the current state of robotic technology available to the hospitality industry has proven to be unsatisfying.

After only one year in operation, robotic waiters in three different restaurants in Guangzhou, China were, in spite of large-scale initial investment, "fired" because of incompetent service delivery and frequent technical difficulties (Price, 2016). In 2018, the CEO of travel company H.I.S., Hideo Sawada, the company behind the Henn na Hotel, announced plans to reduce the workforce of an amusement park by a third. Even though they will be re-assigned within the company, their old duties were to be taken over by machines (*Nikkei Asian Review*, 2018). However, in 2019, news emerged that management had to change their personnel strategy, as robots created more problems than achieving the goal of streamlined productivity and addressing labour market shortages (Hertzfeld, 2019).

Nevertheless, within academic circles, a consensus of more robotic appliances finding their way into the workplace can be seen. The extent of the predicted impact varies, however, as does the timeline. In addition, the notion of robots replacing or

even eradicating human life on earth is as old as the emergence of the term itself. Is this fear, undeniably painted by "Hollywood", justifiable or do the advantages outweigh the negatives?

Osawa, Ema, Hattori, Akiya, Kanzaki, Kubo, Koyama, and Ichise (2017) for example, argue for technology substituting job tasks, supplementing humans, but not replacing them. A study by the Future of Humanity Institute at Oxford University by Grace, Salvatier, Dafoe, Zhang, and Evans (2018, p. 729) reported on a panel of AI experts' significant variations in their prediction of "when will AI exceed human performance". The timeline stretches between a 50% chance within 45 years and a 9% chance for it to happen within the next nine years.

Interestingly, experts from Asia indicated a 30-year totalled estimate versus 74 years by North American respondents. Without details on the cause of the discrepancy, a report in *MIT Technology Review* picks up on this difference. In that report, Winick (2018) details that if statistics are adjusted for wage differences, Southeast Asian countries have up to a 200% higher adoption rate of robots than Europe or North America. Meinhardt, Laha, Arcesati, and Kopecky (2018) state that China's ambition for AI strategies is gaining momentum and overtaking North America's research investments, and leaving Europe behind. Supported by government policies and a strong incentive plan, China is planning to become the leader in AI innovations by 2030. With strong privacy concerns, enforced by the GDPR (General Data Protection Regulations 2016/679), Europeans tend to be more sceptical in accepting everyday technological advancements than their Chinese counterparts (European Political Strategy Centre, 2018).

Convenience over freedom of choice?

Fully adopting and incorporating AI and deep-learning applications is a choice, characterised by the convenience for the individual, the efficiency of the organisation and the economic prosperity of society.

Developments in artificial intelligence have been shown to go far beyond the comprehension of the human brain. In 1996, the world chess champion was beaten by Deep Blue (IBM), and in 2016 AlphaGo (Google) defeated a Go grandmaster, "a game long considered to be a challenge too complex and difficult for AI" (Villaronga, Kieseberg, & Li, 2018, p. 304). In line with this, Villaronga et al. (2018) pointed out the "right to be forgotten", a concept that emerged alongside the right for erasure, rooted in privacy laws and regulations, especially in the European Union. Even though AI may have been designed by humans, the self-learning and development capabilities may lay outside controllable parameters. Carrasco, Mills, Whybrew, and Jura (2019) further raised concerns of conscious and unconscious bias being carried forward in algorithms coded by their human developers.

Hence, in an ideal solution, governments, policymakers, and organisations would be either required to pursue collecting only non-sensitive data, or for data storage to be assessed differently for human brains and in artificial intelligence environments. This, however, contradicts the convenience that comes along with data collection and the ability of machines to "remember". Loyalty programmes are a large contributor to any hospitality company's ability to deliver personalised services based on collected data of spending or booking patterns. Personal guest profiles, as part of CRM systems, ensure that preferences are

remembered and support efforts to deliver hospitable service. Opposing this, Nitzberg, Groth, and Esposito (2017) concluded on the limiting effects of AI by "[narrowing] our field of vision and [reducing] our social and economic choices". They urge policymakers not to focus on privacy concerns, but rather to ensure everyone's *freedom of choice*.

Management implications

In the hospitality industry, unlike other industries, the service process and delivery is defined through the guest's participation. Adding customer-facing technology to the equation will add a new level of interaction and henceforth will influence the service dynamics. The nature of intangible and personalised service delivery presents itself with the issue that guests might not accept robotic appliances and substantiates the need to understand the effect of human-robot interaction (HRI). Murphy et al. (2017) concluded that the perfect humanoid robot showcases the pace and accuracy of a machine while simultaneously adhering to social norms and displaying empathy without being biased. However, they further raised the issue of politeness being one-directional as humans may or may not extend this in their interactions with robots.

Therefore, traditional models in the service industry need to be reconsidered. Employees and management need to recognise the effects on the operational processes and ultimately the customer experience (Susskind & Curry, 2015). It is, therefore, a strategic choice to determine the role of technology and how it can best serve the company in accomplishing its strategic objectives (Marler & Parry, 2016).

Further, the hospitality industry is still characterised by its labour intensiveness, irregular working hours and restricted wages, all contributing to a shortage of employees and a high level of employee turnover (Kuo, Huang, Tseng, & Boger, 2016). In the Netherlands alone, research has indicated that the industry needs to recruit more than 90 000 people a year (Groenemeijer, de Kort, Marchal, Grotenhuis, & Zwaneveld, 2017).

Addressing these issues, a case study of the experimental Henn na Hotel details that the management placed efforts on balancing the human and robot functions and their performance. The more complex tasks, for example high-quality cleaning, were performed by human labour, while robots were assigned to generalised and supportive activities such as handling large and non-fragile pieces of luggage to enhance the efficiency of human performance (Osawa et al., 2017). Other reasons for robotic and self-service technology investments are in line with the aim of enhancing efficiency and lowering labour costs (*BBC News*, 2015), but also to decrease service error costs and ultimately improve the profitability of the company (Ivanov, 2019).

Again, based on the Henn Na Hotel, Osawa et al. (2017) described that by hiring a robotic workforce a wider range of general skills were required for the human personnel to anticipate non-routine activities, to support and educate guests in operating the robots, and to monitor the operations. To carry out these multidimensional tasks, employees were trained accordingly in the hope of enabling the company to operate with a minimal human workforce.

From a non-fiction perspective opposing the picture painted by Hollywood, the impact of technology is already evident in most departments with administrative tasks. With automated and standardised processes the focus lies on relevant and continuous improvement of information. Decision-making is decentralised, and Marler and Parry (2016) conclude that this offers employees the opportunity to pay more attention to more complex issues and responsibilities. Especially in human resources, AI and the use of data bots is an integral part of today's hiring process. However, bots are programmed to pick up on keywords and other predetermined data and will, therefore, exclude a potentially qualified candidate based on the algorithm it is designed to operate with.

In line with predicted developments similar to previous stages of the Industrial Revolution, Marler and Parry (2016) also determined the trend towards the creation of more up-skilled jobs, if technological applications take over job tasks on a more widespread level.

Hence, with an adapted strategic vision, HR strategies and policies need to be modified with an emphasis on empowerment activities, such as the advancement of existing employees, adjusting job responsibilities, the development of new jobs and career opportunities, and the degree of employee control (Siegel, Waldman, & Youngdahl, 1997). Human-robot interaction (HRI) should become an integral focus of human resource strategies going beyond personnel management. With non-human "employees", Murphy et al. (2017) state that HRI might lead to feelings of isolation among the staff, as machines are designed to take charge and work at a level of precision far higher than the human employee.

What does the future hold?

To conclude, technological advancements have come a long way since the first Industrial Revolution and have accelerated the development of our society. Undoubtedly, driven by fiction, a fascination for human-like robots comes along with the unknown. Nevertheless, technology is not only a vital, but also an integral part of our daily lives, and this does not exclude the hospitality industry.

Socially accepted levels of applications can be found in various settings, and experimental projects try to expand the usage in operational parts of the broader hotel and tourism industry.

Success, however, differs, partly due to the performance of available technology and partly due to the acceptance levels. Here, Europe especially – with a strong emphasis on privacy and data protection – seems to lag behind.

Addressing issues within the hospitality industry, the further integration of AI and robotics indicates that by supplementing human skill sets with technology, employees will have more time and opportunities to deliver genuine hospitable service. By decreasing the individual's work and emotional load, academics see a link to improved organisational performance, and ultimately guest satisfaction (Kuo et al., 2016; Osawa et al., 2017).

To successfully integrate non-human employees into a team, it is essential for companies to ensure that all parties involved in the new technologies understand the changes in the operation and the influences on guest experiences (Susskind & Curry, 2015). Developing guidelines, ethical principles, and a code of conduct will be critical to address adverse impacts on the social part of the HRI, for example, naming or addressing robots, social norms, and values towards the robots, but also the extent of encouraging the integration of the new team member.

However, even though there is no agreement upon how or when more sophisticated applications will find their way into our businesses and personal lives, our community may very well soon extend to social robots.

The future is here. Instead of fearing the change, fearing the unknown, technological advancements should be embraced. Not without caution though, but through an informed manner where one has a choice – the "rise of the machines" should be seen as an exciting opportunity not only for the hospitality industry, but for all businesses and humankind.

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