Tourism Employee Competence in
The Artificial Intelligence Era

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Abstract

The study aims to address the peculiarities of the professional development of hospitality workers in Bali in the context of the development of machine learning technologies. An empirical study was conducted, including a survey of industry employees. The study revealed the positive dynamics of Indonesia's gross domestic product, the share of the tourism segment in it, and the impact of the coronavirus pandemic. The key economic indicators of the Bali labour market, such as the unemployment rate, which has decreased from 6% to 2.7% since 2020, and the minimum wage, which has increased by IDR 400 thousand per month over 5 years, were discussed separately. Trends in the technological transition of the tourism industry to a new way of "Industry 4.0", the introduction of "smart tourism" principles, and sustainable development goals were also studied. A 4-question survey was conducted among 120 employees of 12 hotels in 5 regions, which showed that most staff members are aware of the importance of using modern technologies and the need to improve self-efficacy. The practical significance of the study is determined by the evaluation of the effectiveness of a format in which humans and artificial intelligence do not compete but create a symbiotic pair.

Keywords: *Digitalisation; Hospitality Industry 4.0; Sustainable Development; Machine Learning; Staff Qualification.*

1. Introduction

Digital technologies are not only expanding their application areas every day but are also significantly improving their capabilities. Artificial intelligence (AI) has become the next stage in the development of innovative technologies and has revolutionised the modern world. A trend has emerged in which more and more tasks are being transferred from traditional performers to machine algorithms, and the distribution of roles between humans and computers is in search of a new balance. Consequently, it is necessary to revise the concept, which implies not competition between human and machine intelligence, but a symbiosis that increases the efficiency of processes.

Indonesian scientists are closely monitoring the implementation of this phenomenon, especially in the tourism industry. Astuti et al. (2024), emphasising Indonesia's long tradition of hospitality, as well as the country's cultural and natural wealth, noted a significant increase in the number of domestic and international tourists in 2023-2024. At the same time, there were several difficulties in serving guests caused by language and mental barriers. By examining how AI solves these problems with the help of chatbots, virtual concierges, and recommendation systems, the authors confirmed the effectiveness of innovations. Saragih et al. (2024), in turn, addressed AI trends in the tourism sector regarding service robots and text mining. As a result, several promising areas of development were identified, including intelligent systems, machine learning algorithms, and the integration of mixed and virtual reality. With an emphasis on the part played by cynicism towards change, Lestari et al. (2021) examined the connection between organisational performance, trust in leadership, and dynamic managerial capability. The authors addressed the impact of employees' scepticism regarding organisational transformation while highlighting how managerial capabilities and faith in leadership influence performance outcomes. Halim (2022) found a hidden potential for the introduction of AI technologies in Indonesian tourism, as he observed that a significant part of the staff has not yet been trained in the features of modern innovations. The focus group discussions conducted by the author showed the readiness of hoteliers and travel agency managers to improve the skills of employees and develop the hospitality industry.

The tourism industry in Indonesia, in the context of readiness for the fourth industrial revolution, was considered by Dhakal & Tjokro (2021), and the innovative potential of local hotel complexes was studied in the example of two popular resort destinations – Bali and Labuan Bajo. As a result, the study proved that the level of access to digital infrastructure between the two regions is so different that the intervention of central authorities is needed to reduce this technological gap. A group of Malaysian researchers led by Qian et al. (2023) studied the resorts of Bali in terms of smart tourism technologies, as well as the impact of digital services on holiday satisfaction and guests' intention to visit a particular hotel again. The results showed that personalisation is a key factor that positively influences a tourist's desire

to return. At the same time, according to the authors, such parameters of intelligent tourism technologies as informativeness, accessibility, and interactivity did not have a sufficient impact on the behaviour of guests.

The importance of automation and the inclusion of AI in technological processes in the hospitality and tourism sector was also discussed by Jabeen et al. (2022). A specially developed model that includes 5 criteria of employee behaviour was used to conduct surveys among the staff of 35 five-star hotels. The findings showed that of all the criteria, three – personal knowledge, willingness to provide a service, and skills in working with mobile applications – were the most important factors influencing employees' readiness to adopt AI. When studying the prospects for the development of the tourism industry in Indonesia, it is important not to forget that this country is the leader in terms of the number of Muslims living there. Consequently, the observance of Shariah rules when travelling and control over halal food can also be entrusted to AI. This aspect of technology development was studied by Battour et al. (2023), who, based on customer experience, proposed a theoretical model of technology use for Muslim travellers. Similar efforts were carried out by Sulong et al. (2023), using machine learning protocols to predict the demand for halal tourism.

AI can also be used to develop digital marketing strategies (Leonow et al. 2019; Lyndyuk et al. 2024). As noted by Lacárcel (2022), this approach will determine the decision-making processes of tourists about the place to go on holiday, and the choice of a travel agent, and can also plan leisure activities for holidaymakers at the resort itself, depending on individual preferences. The author believed that the analysis of tourists' social data and information about their previous travel experience would help to create a personalised offer and the most suitable leisure programme for everyone. Ensuring sustainable development of tourism using advanced AI technologies, blockchain, Internet of Things (IoT), augmented and virtual reality was proposed by Rane et al. (2023). Since tourist flows often lead to the deformation and destruction of cultural and natural heritage sites, the authors proposed to use modern digital achievements not only to improve the comfort of tourists but also to comprehensively address the problem of anthropogenic impact.

Thus, the issue of applying AI in the tourism sector has been raised quite often. However, insufficient attention has been paid to the place of the skilled worker in the new system of innovative development of the industry. The study seeks to fill this gap, exploring ways to improve the competence of tourism business personnel in the development of AI. The study also aims to formulate an objective balance of human-computer interaction and confirm the hypothesis that their symbiosis is possible and that the correct distribution of roles in such a tandem will increase the efficiency of the industry.

2. Materials and methods

In the process of conducting this study, various aspects and trends in the development of digital technologies were considered both in the global economy as a whole and in the tourism sector in Indonesia. To determine the dynamics of this process on the example of the resorts of Bali, as well as structural changes in the industry, a comparative analysis of such a key indicator as the number of foreign tourists who visited the island in the period from 2008 to 2023 was carried out. The crisis phase from 2020 to 2022 was considered separately, when, due to the COVID-19 coronavirus pandemic and the accompanying quarantine restrictions, the tourism, hotel, and aviation sectors were almost brought to a state of collapse.

In addition, as part of the study of human resource development in the era of AI, trend comparisons were made of indicators directly related to the formation of the labour market in Indonesia and the increase in the value of human capital. These statistics include the dynamics of the minimum wage in the Bali tourism industry, as well as the unemployment rate in the period from 2019 to 2023. Separately, to get a more complete picture of the industry at the national level, the contribution of the travel and tourism sector to Indonesia's gross domestic product (GDP) was analysed, both in absolute terms in Indonesian rupiah and as a share of total national GDP. To make an objective and comprehensive assessment of the development of innovative technologies in the hospitality sector in Indonesia, the role of government support programs was acknowledged, as well as the establishment of the Indonesian Tourism Foundation (ITF) and the promotion of the national tourism brand through cultural, sporting, and business events. However, these topics were not deeply analysed, as the focus remained on the main technological trends in the industry.

Based on various disparate data, professional travel publications, expert opinions of hoteliers and agents, as well as other open sources, we synthesised the key prerequisites for the upcoming transformation of the industry into the so-called "Travel Industry 4.0", which will integrate various business processes and be based on the use of AI and IoT technologies. At the same time, a generalised and holistic picture of the prospects for digital transformation in Bali was formed, including machine processing of incoming orders, and the formation of a digital portrait of the guest and preferences based on social media data.

Among the materials used in this study, in addition to those already mentioned, were data from the Ministry of Communications and Informatics, the Ministry of Education, Culture, Research, and Technology, the regular report of the Organisation for Economic Co-operation and Development (OECD) "Tourism Trends and Policies" (2022), the Ministry of Tourism and Creative Economy, and the National Statistics Agency Statistics Indonesia. The study also identified challenges facing Indonesia's tourism industry in the context of the country's participation in the Group of 20 (G20) (Tourism and the…, 2023) and the Association of Southeast Asian Nations (ASEAN). To determine the prospects for the development of a symbiosis between human resources and AI, a survey was conducted on the following four issues: "How do you assess the technological development of the industry in 2022-2024?"; "To what extent do you feel threatened by AI?"; "Do you currently observe the development of human resources in the tourism industry in Bali?"; and "Do you agree with the statement that the development of AI increases the competence of staff?" In addition, using extrapolation based on the data received and processed, existing trends, and expert opinions, the conditions for further development of the Indonesian tourism industry in the context of achieving sustainable development goals were predicted.

A survey was conducted based on anonymity and in agreement with the management of the hotel complexes among employees of 12 hotels on the island, representing 5 conventional regions – Nusa Dua, Uluwatu, Denpasar, Sanur, and Ubud. The selection process was purposive, aiming to ensure that the sample was representative of different regions and roles within the tourism industry. To ensure that the sample adequately reflected the heterogeneous nature of the hospitality workforce in Bali, steps were taken to include personnel from hotels of all sizes and operational focuses to collect a wide range of opinions on the technological changes in the sector. As a result, a total of 120 people of various specialities working with guests – managers, receptionists, animators, and guides – were successfully interviewed. Each of the respondents was asked 4 questions, three of which required a response format of 1 (lowest) to 10 (highest) points, and one question was in the format of a binary yes/no answer.

3. Results

Even though the phenomenon of AI has been widely discussed for several decades, it was only in the late 2010s that it found practical domestic application. Over the next few years, AI's service capabilities, as well as the images, voice messages, and videos it generates, have become ubiquitous. Moreover, it has become apparent that there has been steady progress in the operation of computer-intelligent systems and a significant increase in the quality of the results obtained. The integration of AI into human life has become so widespread that great attention has been paid to the ethical component of this phenomenon.

As of 2024, AI is actively used in the creation of text and graphic materials, complex calculations, and the service sector. The travel industry is also increasingly using the power of computer intelligence to improve the personalisation of customer experience, generate recommendations, or develop customised holiday programmes. Many routine processes in the hospitality sector, such as booking tickets or rooms according to specified parameters, and managing reservations, are now under the control of AI. For instance, the Four Seasons Resort Bali at Sayan offers 24/7 customer service by using AI-powered chatbots to help guests with booking requests and questions. Grand Mirage Resort & Thalasso Bali has implemented AI-based systems to personalize guest services, such as adjusting room conditions and recommending activities based on individual preferences. The Apurva Kempinski Bali also uses AI for predictive maintenance, utilising sensors and data analysis to proactively solve possible problems in its facilities and guarantee guests have a smooth stay. For Indonesia, the tourism industry and everything related to it is of great image importance. At the same time, despite international stereotypes, the industry's impact on GDP is not critical from an economic perspective. The dynamics of the country's gross domestic product are shown in Fig. 1.
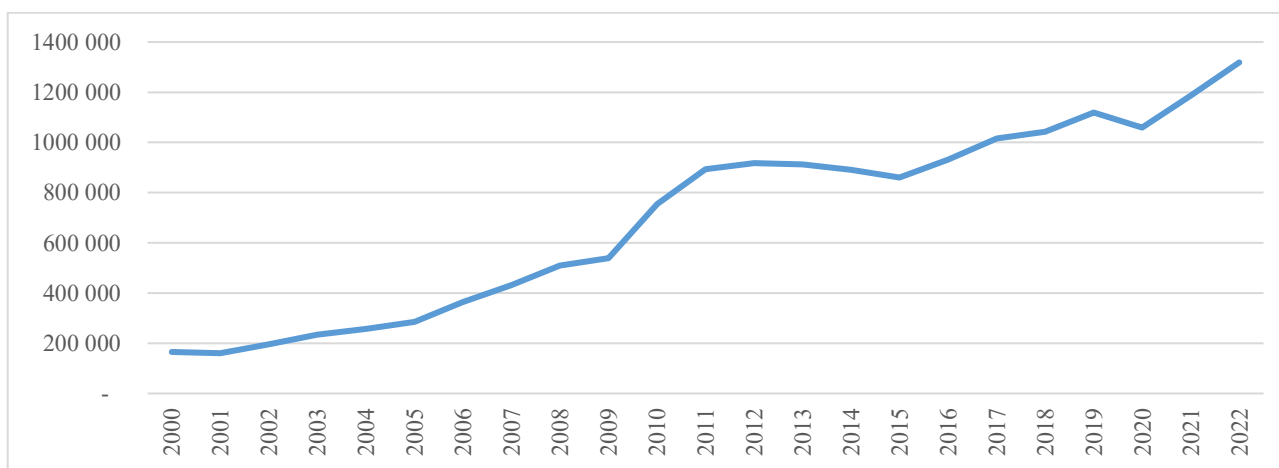

Fig. 1: Indonesia's GDP by years, million USD

Source: compiled by the authors based on GDP (current US$) – Indonesia (2022).

The contribution of the Indonesian travel and tourism sector to the national economy in the period from 2019 to 2021 is shown in Fig. 2.
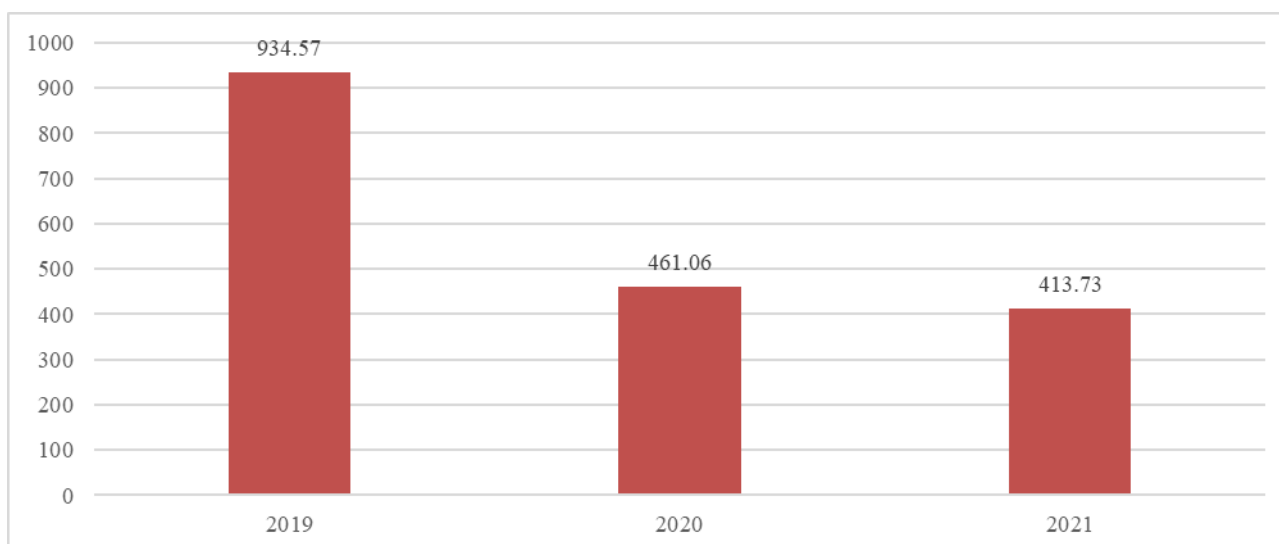

Fig. 2: Indonesian tourism segment, trillion IDR

Source: compiled by the authors based on Contribution of travel and tourism sector to GDP in Indonesia from 2019 to 2021 (2021).

As can be seen, the Indonesian economy has been on a positive, almost linear, trend for more than twenty years, with few exceptions. Such exceptions include the year 2020, when the COVID-19 coronavirus pandemic and the resulting quarantine restrictions brought the global economy to the brink of collapse. Indonesia, on the other hand, was not significantly affected even by this critical year, with a GDP decline of only 5.4%. The two graphs above also show that the importance of the tourism industry to the Indonesian economy is not critical. Even in 2019, the last "dockyard" year, the share of the tourism segment was 5.09%, and in the following years it was even lower – 2.64% and 2.11%, respectively.

Nevertheless, the tourism and resort industry is a kind of business card for Indonesia, a positive stereotype, and the government pays a lot of attention to the harmonious development of this industry. An indicator of success in this area is the dynamics of the number of foreign tourists visiting the country (Fig. 3).
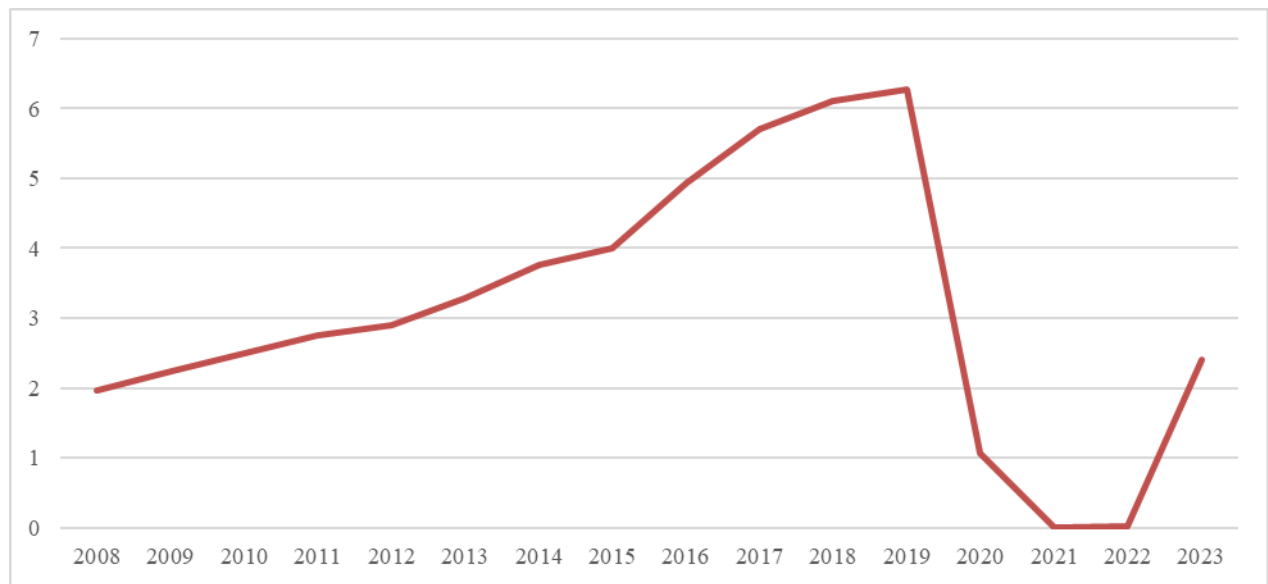

Fig. 3: Number of foreign tourists by year, million people

Source: compiled by the authors based on the Number of foreign tourist arrivals to Bali, Indonesia, from 2008 to 2024 (2024).

For more than a decade, from 2008 to 2019, the number of foreign tourists wishing to use the services of the Indonesian hospitality industry has been steadily growing. This indicates, on the one hand, the high quality of these services, and, on the other hand, the correct state communication at the international level aimed at polarising Indonesian resorts. The pandemic has virtually zeroed in on the indicators, but, as shown above, it has not had a significant negative impact on the country's economy.

Furthermore, Indonesia, as one of the world's leading countries, is a member of the G20 of the world's leading powers, and its tourism industry is developing inextricably from the rest of the civilized world. The World Tourism Organisation (Tourism and the… 2023), which exists as a specialised intergovernmental agency of the United Nations (UN) system, pays special attention to the tourism industries of the G20 countries and declares that in 2022 these twenty countries received 74% of all foreign tourists in the world. Accordingly, communication and coordination of actions in the digitalisation of the tourism sector, as well as coordination of forces between countries in the implementation of AI algorithms, are of utmost importance.

The application of standardised worldwide digitalisation frameworks in the hospitality industry is significantly impacted by Indonesia's language and cultural diversity (Larina 2019). Since the nation is home to more than 700 different languages, digital transformation needs to be customised to account for these regional and local differences. For instance, to guarantee inclusivity and accessibility, AI-driven customer support systems must be modified to recognise and react in a variety of languages and dialects. Furthermore, cultural differences have an impact on how technology is used in the hospitality industry. While some areas may be more receptive to digital advancements, others may be resistant because of traditional values or a lack of exposure to technology. Therefore, Indonesia's potential to successfully implement global digitalisation frameworks depends on its capacity to localise material, adhere to cultural norms, and offer sufficient training to close the technology gap.

One of the issues discussed at the annual meeting of the G20 Working Group on Tourism and the meeting of relevant ministers in 2023 was the discussion of common rules for the introduction of digital technologies. During the conference in Goa, India, a general communiqué was adopted, declaring that digitalisation is a key factor for the tourism sector to remain competitive and maintain the momentum of attracting new consumers (Goa roadmap for… 2023). As a result, measurable outcomes such as a 10-15% increase in digital transactions in the tourism sector are expected, driven by the adoption of AI technologies for tasks such as intelligent travel facilitation and destination selection. In addition, the world's leading countries have noted an increase in demand for the use of AI in tourism across the entire value chain, including intelligent travel facilitation and intelligent travel destination selection. Separately, the G20 tourism ministers outlined a shift to a discursive model, including smart visas, secure infrastructure, and border crossing controls provided by algorithms controlled by AI. A significant uptick in the use of AI-powered smart visas and automated border control systems is anticipated, with improvements in border processing times by up to 30%, contributing to faster and more efficient travel. Much attention is also devoted to the role of human resources – the international strategy for the application of AI in tourism also involves the use of technology to maintain and improve the qualifications of human capital through additional education and training in new skills.

ASEAN, another major international organisation of which Indonesia is a member, at its 41st summit held in Jakarta in 2023, noted in the final agreement the importance of a digitally inclusive society in the modern world (Leaders' statement on the development... 2023). The organisation's partners announced the launch of the development of relevant international procedures aimed at the digital transformation of economic sectors, including tourism, to improve human resource development and quality of life. Professionals in the tourist sector must obtain specialised training and certifications that are in line with new digital and technological tools to meet the G20 and ASEAN digitalisation goals. Training programs that emphasise blockchain, AI, and machine learning are crucial because these technologies are at the basis of the tourism industry's digital transformation (Lakshmi et al. 2025; Onipko & Yaprynets 2024). Certifications in fields like data security, AI-powered customer support systems, and smart tourism infrastructure are probably going to become standard requirements. Professionals working with AI algorithms and data privacy procedures in the tourist industry will also need international cybersecurity certifications, such as those provided by CompTIA or EC-Council (Pidpalyi 2024; Kovalchuk 2024). For workers hoping to fulfil the changing standards outlined in the G20 and ASEAN frameworks, industry-wide qualifications in digital marketing, IT management, and customer experience optimisation using digital technologies will also be crucial. Training programs should emphasise both technical skills

and soft skills, such as cultural competency and tool flexibility, while deploying digital solutions in varied situations, to guarantee that the workforce is suitably equipped to carry out these goals (Yurtseven et al. 2025; Srybna et al. 2024).

Narrowing the focus from the digitalisation of tourism in a global format to the study of the labour market and human resource development in the tourism sector of Bali, it is necessary, first, to identify the existing dynamics in terms of key local indicators – the minimum wage (Fig. 4) and the unemployment rate (Fig. 5).
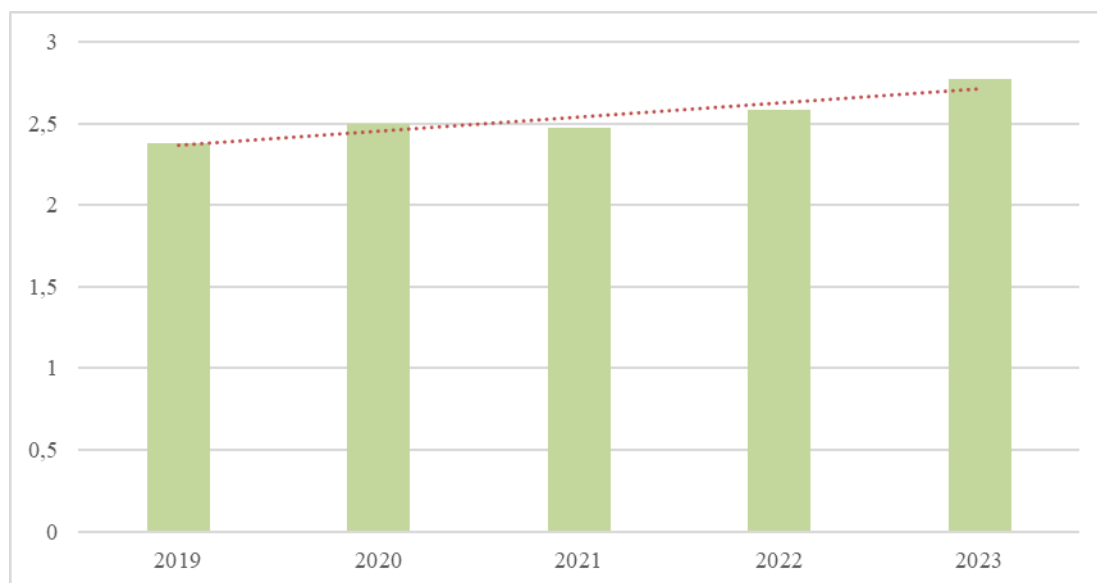

Fig. 4: The minimum wage in Bali is a million IDR/per month

Source: compiled by the author based on the Monthly minimum wage in Bali, Indonesia, from 2019 to 2023 (2023).

Despite the shocks caused in 2020-2022, the minimum wage in Bali remained approximately the same and even showed a slight increase. The fact that in 2023, the minimum wage resumed its noticeable growth, indicating the development of the industry in general and human resources in particular.
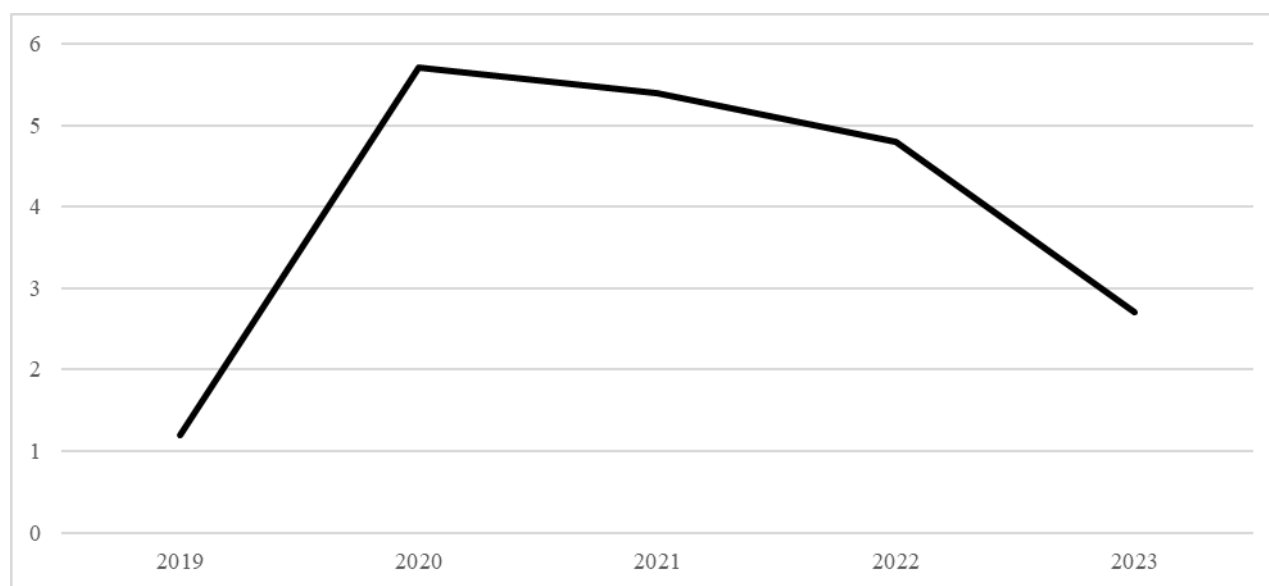

Fig. 5: Unemployment rate in Bali by year, %

Source: compiled by the author based on the Unemployment rate in Bali, Indonesia, from 2019 to 2023 (2023).

The unemployment rate rose significantly in 2020 due to the collapse of the international tourism industry. The steady improvement of this indicator and the decline in unemployment indicate a gradual recovery in the tourism industry's demand for human resources.

In the era of AI, the requirements for the competence of travel industry employees are significantly increasing – on the one hand, AI is significantly faster than humans in terms of information processing, and on the other hand, machine intelligence alone is not able to formulate the necessary tasks and needs qualified personnel (Mukanov et al. 2018; Kliuchnyk et al. 2023). For instance, a hotel's technical service employee can prepare a guest personalisation algorithm that AI will follow. To collect information about the nature, preferences, and travel experience of a tourist, AI can investigate using open sources, study social networks, and analyze activity and geolocation. As a result, in a short time, a lot of personal data will be known about a person, including marital status, hobbies, profession, circle of friends, and medical history. Such a dossier will help AI develop a personalised offer for each potential guest, but this approach also carries significant risks. AI algorithms jeopardise the very notion of privacy; the confidentiality of any person can be violated, and the issue moves from the technical to the ethical plane (Pavlova et al. 2024; Rexhepi et al. 2023). Therefore, the role of a person, an employee of the tourism industry, in shaping the personalised story of a tourist remains crucial. Only a person with inherent ethical and moral standards can

determine to what extent it is acceptable to collect customer information and when the desire to please a guest can turn into online espionage (Rexhepi et al. 2024; Yarin et al. 2023). Thus, in the modern world, one of the most important criteria for the competence of a tourism business employee is an ethical attitude.

To the question "How do you assess the technological development of the industry in 2022-2024?" the total number of points was 984. Thus, the arithmetic mean score of this question by the industry's employees was 984/182 = 8.2 points out of 10 possible. This high rating is a practical confirmation of the hypothesis that the tourism industry is experiencing a revival in the post-pandemic period, thanks to innovative technologies, among other things.

In the next question, when asked to rate "To what extent do you feel your job is threatened by AI?" the total score was 612 points. The average score for this question, 5.1 points, shows that half of hotel managers, superintendents, and tour guides feel that there is significant competition from AI algorithms. They fear that in the foreseeable future, virtual assistants will be able to replace them and take away their jobs. This is an alarming but informative signal – at a higher level of management, it is necessary to ensure that staff are educated to introduce the concept of their symbiosis instead of the false idea of competition between humans and AI.

In response to the third question – "Do you currently observe the development of human resources in the tourism industry in Bali?" – respondents gave a total score of 804 points. The average score in this case is 6.7, which indicates not only the positive dynamics of human capital growth but also, importantly, the awareness of this fact by employees of hotels and resort complexes.

The final question, "Do you agree with the statement that AI development improves staff competence?", which was a binary response, received 108 positive responses and only 12 negatives. This is an important indicator that demonstrates that most employees in Bali's tourism industry are aware of the need to improve themselves and enhance their technical skills in working with AI. About 10% of staff who do not consider the development of modern technologies to be a sufficient basis for self-development need to be replaced.

International digitalisation frameworks have a big impact on the competency needs found in the employee survey, since most workers in Bali's tourism sector understand the value of improving their technical abilities to work with artificial intelligence (Zamyatina et al. 2021; Pohuda 2023). These frameworks, which stress the use of AI and cutting-edge digital technology in the hospitality industry, draw attention to the rising need for personnel to be technically proficient. Employees' recognition of the necessity for training in AI-driven systems and digital tools to match the industry's changing expectations is reflected in the poll results. The need for workers to acquire both new digital capabilities and conventional hospitality skills is becoming increasingly more important as global frameworks influence the direction of tourism. The significance of ongoing upskilling to guarantee that employees can successfully adjust to the digital transformation in the hotel industry is further highlighted by this alignment between employee attitudes and worldwide technical developments.

Promoting the symbiosis of AI and humans is one of the cornerstones of the latest concept of the "Tourism Industry 4.0". First, this concept is associated with the fourth industrial revolution and relates to the widespread introduction of a system of personalised and highly individualised services for travellers and holidaymakers. New forms of human-machine interaction, such as process modelling, value chains, and big data databases, are designed to accelerate the creation of a new travel ideology (Pohuda 2023). The philosophy of Industry 4.0 is to use the benefits of personification for a person on holiday, a person who is a priori set up for a positive perception and a temporary absence of everyday and work commitments. Thus, the average tourist, being in a state of psychological comfort, is very enthusiastic about technological innovations offered by AI, and subsequently, after the end of the holiday, transfers this positive new experience to their daily life and everyday life.

The skills of implementing technological innovations, among other things, also contribute to the achievement of sustainable development goals in the tourism industry (Matskiv et al. 2025). The concept of sustainable tourism involves ensuring a positive impact on the environment, society, and culture, guaranteeing the preservation of traditions, identity, and authenticity for local communities, and protecting them from the excessive impact of tourist flows (Zhansagimova et al. 2022; Ivashko et al. 2020). According to the criteria formulated by the Global Sustainable Tourism Council (Global sustainable tourism… 2013), the key areas of development of the industry are destination management, economic benefits for local communities, preservation of the cultural heritage of tourist sites, and environmental protection. Furthermore, the development of human resources and the increase of labour capital play a crucial role. Increasing education levels and the resulting competitive advantage of the workforce is a driving force for sustainable tourism – especially in the context of increasingly sophisticated technological innovations in Indonesia's tourism industry.

It is also worth addressing the growing role of the creative economy in the hospitality industry – despite all the advantages of AI, humans play a key role in creating comfort for tourists. For instance, in the context of the concept of sustainable tourism, theme parks are becoming increasingly popular in Indonesia. These can be natural and protected areas where animals are in their natural habitat and the impact on them from visitors is minimised. Several tourist villages in the format of theme parks convey the flavour of traditional Indonesian life – Pemuteran and Penglipuran Village in Bali, Nglanggeran Tourist Village in Yogyakarta Tamansari Village at the foot of Mount Ijen. All these open-air museums are united by the concepts of sustainable tourism, eco-activism, and the idea of preserving folk traditions. Even though these places appear as retro oases free of technology, the development and implementation of tourist villages, their logistics, and security cannot be done without the use of sophisticated computer systems. It is in these thematic and ethnographic locations that the competence of tourism business employees is particularly important, and the achievement of sustainable development goals is made possible by the coordinated work of qualified personnel and machine algorithms (Pavlenchyk & Tsizdyn, 2025).

In general, self-efficacy is important when it comes to improving staff competencies, an employee's belief in their ability to effectively control their function and predict the actions of their immediate environment. The sources of such effectiveness include practical experience in problem-solving, observation, verbal persuasion skills, and a positive emotional state. Self-efficacious people can achieve results and complete tasks on their own initiative (Efremov 2025a; 2025b). Moreover, such employees are ready to make every effort to achieve the goal, including removing obstacles and communicating with other stakeholders. The development of AI, paradoxically, does not reduce the number of self-effective workers in the tourism industry, but, on the contrary, helps them stand out from the crowd, acquire the necessary skills and guidance, and improve their qualifications with the help of machine algorithms (Myskiv & Nycz-Wojtan 2022; Tanana & Soga 2023).

As society and the global economy rapidly prepare for the next technological order, it is extremely important to pay sufficient attention to the tourism industry as one of the important components of human psychological transformation. Even though machine learning and AI are being assigned more and more technical tasks over time, it is the employees of hotels, resorts, entertainment complexes and theme parks who are the face of the hospitality industry and the future of the entire tourism industry depends on their qualifications, education, tact, ability to deal with guests and anticipate conflict situations.

4. Discussion

The results obtained during the study make it possible to assess the trends in the development of human resources and AI in the Indonesian tourism industry and compare them with the data of other researchers. Thus, Okafor et al. (2022), studying the relationship between the impact of the COVID-19 pandemic on the tourism industry and the digitalisation of the industry, which was also discussed in this study, found that the high level of access to digital technologies in some developing countries helped to offset the negative impact of the pandemic. The authorities of these countries have managed to compensate for the ban on foreign travellers crossing the borders with domestic tourism. This can explain the contradiction found in this study, when, with zero foreign tourist arrivals in 2020-2021, the industry still managed to demonstrate some economic activity. Kişla et al. (2023), in continuation of the topic, investigated the impact of COVID-19 and related restrictions on the GDP of tourism-dependent countries. According to their observations, some countries have lost up to half of their export revenues, which has led to significant economic turmoil. At the same time, as the current study has shown, Indonesia's economy is sufficiently diversified not to be critically dependent on any one industry.

The assessment of tourism policy and planning illustrated in this paper, on the example of Bali, was conducted by a group of scholars led by Koerner et al. (2023). They emphasised the effectiveness of the Indonesian hospitality industry in setting priorities for tourism development, maintaining a reasonable pricing policy, and sufficient international openness. At the same time, the authors noted that for the full sustainable development of the country's tourism industry, mobilisation and efficient use of significant human and financial resources will be required.

Ethnic tourism in the format of theme parks and tourist villages, studied in this paper, in the context of the use of modern technologies and the need for highly qualified personnel, was also the subject of study by Rosalina et al. (2023). In their view, Bali's rural tourism resource management strategy plays an important role in promoting sustainable development and ensuring efficient use of labour. The importance of residents' participation in the work of tourist villages in terms of maintaining control over the resources that go into the local budget was also proved.

Pickel-Chevalier and Yanthy (2023), studying the mutual influence of education and employment in Bali, proved that people who received higher tourism education on the island have more rights and opportunities. The topic of professional development of hotel and tourism industry personnel and the positive impact of competence on employment were also investigated and proved in this paper. Eider et al. (2021) also addressed the analysis of governance problems in Indonesia. The authors conducted a socio-ecological study of human-environmental interaction in Indonesia's Gili Matra Marine Park, interviewed local tourism industry employees, and noted the growing role of digitalisation in the travel industry, which echoes the results of the survey conducted in this study.

AI, the importance of which in the tourism industry has been repeatedly noted in this study and proven during empirical research, has been the subject of study for several scholars around the world. For instance, Limna (2023) believes that the use of AI is a strategic and decisive factor in the economic development of the travel industry, as machine algorithms can improve and speed up customer service, expand the operational capabilities of hotel staff, and reduce costs. At the same time, the author noted, new challenges and risks related to security and privacy issues are emerging. Lei et al. (2023) addressed the communication between AI and the customer in more detail using the example of booking hotel services and proved the existence of a positive customer experience in this area. Out of 331 valid reviews received from hotel guests who made their reservations through an AI service robot, the vast majority consider the experience positive and are ready to repeat it.

Gupta et al. (2023), in turn, considered such an aspect of the use of AI in the hotel industry as the personal identification of guests using face recognition technology. The authors proved that this innovation significantly helps travel and tourism companies understand the needs of each guest, optimise the service offered in each case and facilitate the summation of bills. Nevertheless, the transfer of personal data of this nature opens wide opportunities for manipulation and privacy violations. The ethical aspects of using AI have been discussed earlier in this paper, but there is no unambiguous solution that guarantees a sustainable balance of convenience and security. Smart technologies and formal finance have higher effects on incomes compared to the effects of simple devices or semi-formal and informal finance (Malyarets et al. 2017; 2019).

Foreign economic activity and the inflow of foreign tourists are an integral part of the tourism business, as evidenced by the statistics presented in this paper. Accordingly, as noted above, digital technologies in the travel industry are also being extended to the so-called "smart visas" and "smart borders". Pesch & Boehm (2023) found that such innovations, including models based on machine learning algorithms, are already being used by services in the European Union and will become common practice globally in the future. For the Indonesian tourism industry, this is good news, as fewer human resources will be involved in routine tasks.

As noted above, an important trend in the modern travel industry is the preparation for transformation into Industry 4.0 and the role of AI in this phase of transition. S. Gomes et al. (2024) assessed the conditions for the transition to a new technological mode and studied the role of AI in the upcoming new wave of competition for customers by hotels and resorts. The authors noted the growing role of regional associations in tourism development, the strategic importance of local networks, and the externalisation of staff development systems. Another group of scientists, Ionescu & Sârbu (2024), investigated the prospects of Industry 4.0 using a survey of tourists and analysis of variance. The study determined that the use of smart technologies at all stages of travel has a positive impact on the tourist experience, and the introduction of AI will be crucial in the future to create a comfortable tourist experience.

Returning to the topic of professional development of tourism personnel in the context of the growing role of AI, it is also worth noting the work of Mekinc et al. (2023). The authors emphasize that the necessary qualifications and skills to work with AI should be taught to future employees of the hospitality industry at the stage of studying at universities. At the same time, the educational and training imperatives for future tourism competencies, according to industry experts, continue to be about building positive interpersonal relationships with guests. Marques & Monteiro (2024) also determined that the most important qualities of employees are a high level of hospitality, the ability to work with people, and emotional intelligence. Digital skills, according to the authors, are not crucial signs of competence, and tourism will remain primarily a "human contact" industry. This hypothesis contradicts the empirical data obtained during this study.

The most complete picture of the situation "from the inside" can be obtained by questioning the direct participants in the processes under study, as was done in this paper. Ge & Kim (2023), who studied the peculiarities of the formation of students' professional qualifications, call digital competence one of the most important characteristics of tourism personnel. After surveying three specialised colleges among 50 students and 50 teachers, the researchers found that experience with machine learning and AI algorithms ranks second in the ranking of modern skills of tourism employees, surpassing such indicators as problem-solving (3rd place) and teamwork (4th place), second only to communication skills (1st place). Similar conclusions were also reached by Parsons et al. (2023), who analysed the dynamics of digital transformation of tourism personnel in six OECD countries (Organisation for Economic Co-operation and Development). In particular, the experts from Iceland, New Zealand, and Switzerland clearly stated that improving the digital knowledge and skills of staff is a priority policy for their respective industries. Moreover, AI training also serves as a tool to address broader employee skills gaps. Derco &

Tometzová (2023) also included the ability to work with AI tools in the professional competencies of entry-level tourism employees. According to the authors, this is fully recognised by the relevant academic institutions, which are beginning to adapt their tourism training programmes to the objective needs of the modern market.

In other words, without competent managers with strong AI collaboration skills, no national tourism industry will be able to come close to achieving the sustainable tourism goals discussed in this study. The same thesis is also found in the work of Firman et al. (2022), who studied the impact of social innovations and environmental policy on sustainable tourism development in Indonesia. Using social networks, which were suggested earlier in this article to increase the personalisation of services, Firman et al. suggest keeping in touch with interested customers, exchanging information, and sharing ideas. Font et al. (2021) also addressed the competitive advantages of tourist destinations that use digital technologies and adhere to the principles of sustainable tourism.

The support of sustainable tourism principles by residents and their motivation was studied by Gautam (2022). According to the observations, most communications build emotional solidarity between tourists and residents of tourist destinations, and hospitality in communication levels the stress of living in a popular location. In general, the results of the author's study confirmed the positive and significant impact of the emotional solidarity of residents on their quality of life. This discovery will need to be considered when developing the transformation of Indonesia's tourism industry into Industry 4.0. Purwono (2020). Leadership that encourages the HR team to remain creative and innovative amid high pressure during and after COVID-19.

Thus, the development of the AI era is being noted by researchers around the world. It is extremely important for tourism companies not to miss the moment and ensure that they have enough competent staff.

5. Conclusion

This study has identified current trends in the use of artificial intelligence in the tourism sector, both locally, in the example of resorts on Bali in Indonesia, and globally. The study confirmed that it is important to continuously improve the qualifications of the staff of hospitality and tourism facilities, as well as their skills in interacting with machine learning algorithms. Even though AI performs most of the operations disproportionately faster than humans and the speed of processing the data received also far exceeds the capabilities of any employee, it was concluded that human involvement in the hospitality industry is still mandatory.

Travel industry employees remain the custodians of ethical standards, guarantors of confidentiality, and a symbol of live human involvement, empathy, and friendliness – all qualities that artificial intelligence is not capable of and that are extremely important when communicating with guests and visitors. Consequently, the study proved that at this stage, the relationship between human resources and AI is not a competitive struggle, when traditional workers are gradually being squeezed out of the industry, but rather a symbiosis, in which each participant takes on a separate role, giving the association a synergistic effect. Moreover, employees of the tourism and hospitality industries work on improving their skills to ensure that the interaction with AI is as productive as possible.

The study also noted the effect of the introduction of a new technological way of life through the travel sector – being on a tourist trip, a person is a priori shielded from everyday work and household concerns. In this state, the acceptance of technological innovations and AI achievements is more favourable, and then, after the holiday is over, this positive association is transferred to everyday life, which accelerates the introduction of a new industrial way of life in all areas. However, a more detailed study of the reactions of guests of tourist complexes to AI was limited by client confidentiality. The work also examined the goals of sustainable tourism and noted the high efficiency of recruiting locals who have been trained to work in tourist destinations. Developing the principles and key points of such an educational course could be the subject of future study.

Acknowledgement

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