4IR IMPACTS ON TOURISM EDUCATION AND INDUSTRY

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Abstract: The advent of the 4th industrial revolution demands changes in the way Higher Education Institutions approach the future of tourism education and business. Issues raised in this paper concern the ways artificial intelligence (AI) is changing the tourism and hospitality industries. This paper questions the dynamics of Robotic teaching and expresses concern about the future of tourism education. Although the acceleration of the workforce reskilling or deskilling is as an imperative requirement, the paper argues that digital transformation and AI are more likely to depersonalise tourism through robotic management. The question that arises is whether this development substitutes for the human touch in a very socially interactive industry. Issues concerning recent technological developments and their impact on tourism education and industry are explored and discussed in this paper.

Keywords: Industrial Revolution (1,2,3,4), Impacts, Tourism Education, Tourism and Hospitality Industry, AI, Robotic Management

Introduction

The underlining concern of the paper is how to prepare students for a career in tourism related services in the 4th Industrial Revolution era. Skills such as empathy and problem solving, time management, communication, customer care, teamwork are essential for a career in tourism (Littlejohn & Watson, 2004; Kruss, 2004; Busby, 2005; Tymon, 2013; Ito, 2014; Wakelin-Theron et al., 2019). The paper argues that digital transformation and Artificial Intelligence (AI) in the industry are more likely to depersonalise tourism through robotic management (Rosete et al., 2020; Stankov et al., 2018). The question arises whether this development can substitute for the human touch in this very socially interactive industry (Ivanov, 2019a, 2019b). In what follows, the paper briefly outlines the impacts of the 1st, 2nd, and 3rd Industrial Revolution on Higher Education and society. It then goes on to discuss in-depth the concept of the '4th Industrial Revolution' and its current impact on Higher Education in tourism. Furthermore, the paper considers the impacts of the 4th Industrial Revolution on the tourism industry and labour market. The relationship between, jobs, and education which is central to the development of human capital according to the UN sustainable development goals 2030 is at the heart of the debate and discussion in this paper.

1IR Impacts on Higher Education (1760-1860)

The literature shows that the Age of Mechanical Production arose from harnessing steam power in manufacturing. For instance, steam engines applied to mining and steam power enabled big increases in the scale of manufacturing. Coal was central to the development of the steam engine and in turn, the steam engine dramatically increased the efficiency of coal mining. It accelerated growth through economic and social transformations. There is a large body of studies detailing how the 1st industrial revolution changed the world completely. The evidence discussed by analysts shows that the 1st Industrial Revolution led to the age of mass production generating big profits for capitalists. During this period, higher Education was dominated by the classics, limited to privileged males. Women were excluded and treated as second class citizens. The majority of the working population were uneducated, worked long hours, and

child labour was a dominant feature during the first industrial revolution (see Heywood, 1988; Humphries, 2011; Nicholas & Oxley, 1993).

2IR Impacts on Higher Education (1870-1940)

The Age of Science and Mass Production accelerated further industrialisation, mass production, assembly line and electrification. This is associated with new manufacturing technologies based on electricity. The 2nd Industrial Revolution launched the 'new economy' known as Taylorism (Thayer, 1972; Wagner-Tsukamoto, 2007). In the 'Principles of Scientific Management', Frederick Winslow Taylor introduced work methods based on scientific observation, advocating that managers should always analyse and plan work. Managers should scientifically select, train, and develop workers to perform their allocated tasks (see Wrege & Stotka, 1978; Wren, 2011). Studies show that the key feature of this period was that most of the training was undertaken on shop floor. This was the start of technical education and during this period vocational education became dominant for the masses (Buenstorf & Murmann, 2005; Spender & Kijne, 1996).

3IR Impacts on Higher Education (1950-1990)

The Digital Revolution is attributed to computerization and web-based interconnectivity, developed in the 1980-1990s. It is having rippling effects upon society, politics, economics, and education (see Railean, 2017). The global 'information society' offers a complex web of forces. It is claimed that the 3rd Industrial Revolution has arrived in the midst of a data-driven industrial internet revolution that is redefining how tourism and travel business operations are processed, optimised, and executed (Lamberton & Stephen, 2015). It is suggested that Higher education during this period has become accessible to all. Several studies discuss the massive expansion of access to higher education with a proliferation of multiple types of institutions both public and private, opening educational opportunity for the working classes. Responding to social and economic changes, higher education has become accessible to both men and women regardless of their background. What we are now witnessing is the existence of a more equal society with the increased role for women in industry and academia (see Boserup, 1970; Luedtke, 2011; Oppenheimer, 1994, 1997).

4IR Impacts on Higher Education

The 4th Industrial Revolution is characterised by a range of new technologies that are fusing the physical, digital and the biological world. This industrial revolution has been impacting all disciplines, economies and industries, and even challenging ideas about what it means to be human (see Bowen & Morosan, 2018). It is the result of integrating the technologies of big data, internet of things, 3d printers/additive manufacturing, cloud computing, cyber security, simulation, horizontal and vertical system integration, augmented reality, robotics, and smart factories (Kontogianni & Alepis, 2020; Kwok & Koh, 2018; Nam et al., 2019). Internet of things means taking all the things in the world and connecting them to the internet (e.g., air travel, hotels, smart phones, radio etc.) (see Buhalis & Sinarta, 2019; Buhalis & Leung, 2018; He et al., 2018; Inanc-Demir & Kozak, 2019; Law et al., 2014; Li et al., 2019; Tung et al., 2017; Tung et al., 2018). 3D printing (additive manufacturing) is a manufacturing process where a 3D printer creates three-dimensional objects by depositing materials layer by layer in accordance with the object's 3D digital model. Cloud computing refers to how data is stored on physical/virtual servers, controlled by a cloud computing provider (e.g., Amazon), sharing of software and information through a network of internet connection. Cyber security (IT security) refers to technologies and processes designed to protect from attack, damage, or unauthorised

access. Simulation is the process of designing a model of a real system and conducting experiments with this model to understand the behaviour of the system or evaluate strategies for its operation. Augmented reality is the result of using technology to superimpose information (sounds, images, and text) on the real world. Robotics refers to the creation and building of computer programming.

These technologies are said to be transforming industrial production (see Kasza, 2019). The Vs of big data include volume, variety, velocity, veracity, value, and variability (Oztemel & Gursev, 2018). Volume refers to the amount of data from a variety of sources; variety describes the types of data such as structured, semi-structured and unstructured; velocity represents the speed at which big data is generated; veracity is the degree to which big data can be trusted. Value describes the business value of the data collected and variability is the ways in which big data can be used and formatted.

Horizontal and Vertical System Integration (Resources, Manufacturing, and Distribution)

A smart factory is a highly digitised and connected production facility that relies on smart manufacturing (Hwang et al., 2016; Ivanov et al., 2016). It employs technology such as artificial intelligence (AI), robotics, analytics, big data, and the internet of things (IoT). It is self-correcting and run largely autonomously. Fears of 'Playing 'god' are echoed by those who view this technological development as a threat to humanity Gent (2015). The reality in the 4th Industrial Revolution is the development of synthetic organisms – such as life from DNA created within computers and bioprinting, a process combining cells to create tissues that imitate natural tissues. Manufactured using robotic assembly lines, not humans, nanomaterials claimed to provide improvements in production efficiency (see Garcia et al., 2010; Ozbolat & Yu, 2013). What is clear is that the 4th industrial revolution extends the paradigm of industrial revolution into a future and many of the elements of what we might consider industry would no longer exist, e.g., fixed, and centralized factories, and massive labour forces within large corporations (see Lee & Pilkington, 2017; Loebbecke & Picot, 2015). Will machines replace us all? Digital technologies combined with biotechnology, nanotechnology, and artificial intelligence, have been increasing the pace of change. Some have described the convergence of these technologies as providing benefits to humanity. Others claim that machines will be the new workforce and robots will take over the world (see, Timms, 2016; Wirtz et al., 2018; Yu, 2018; Yu et al., 2012). What is clear is that we are dealing with the 'unknown' in the 4th industrial revolution. Is it a threat to the structure of society and humanity? These issues are still debated amongst analysts. For an in- depth debate please see, Hanson and Tang (2020), Mpofu and Nicolaides (2019) and Onditi and Gateru (2020), and others.

4IR Impacts on Higher Education in Tourism (1990-x)

There has been an expansion of access to higher education, an increased diversity, globalization of academic research and accelerated online technologies. The core mission of Higher Education remains the same whatever the era. The goal of Higher Education is to ensure quality of learning via teaching, to enable students to gain the latest knowledge and to sustain the development of societies by means of service. It is necessary to implement appropriate teaching strategies and to organise work in a way that fosters student leaning. This has implications on learning programmes, student learning experience, and their lifelong learning attitude. There has been a proliferation of on-line and tech-enhanced teaching. Higher Education institutions have shown preference to this type of teaching for the reason amongst others that by adopting on-line teaching would enable a more efficient delivery of courses including tourism related subjects. It is argued by several thinkers that on-line teaching benefits students with diverse

backgrounds, including women. It is therefore, not a surprise to see that many campuses in both developed and developing countries are open to a more global community of students (see Azmi et al., 2018; Barron, 2007; Cervera-Taulet & Ruiz-Molina, 2008; Domina & Luka, 2014; Fidgeon, 2010; Ilori & Ajagunna, 2020; Lou et al., 2019; Nadkarani, & Morris, 2019; Ring et al., 2009; Roberts, 2009; Sheldon, 2007; Wakelin-Theron, 2015; Wakelin-Theron et al., 2019; Zehrer & Mossenlechner, 2009).

The massive proliferation of mobile devices, internet, broadband connectivity started this trend of transforming how tourism education is delivered. Tourism and Hospitality courses are taught via videoconferencing, new ways of merging social media with small-class seminars. There has been growth of online tourism education businesses partnering with universities, creating newer and more interactive formats for their online courses. The 4th industrial revolution demands changes in the way tourism education approached its future. It should be noted that there is currently a debate about reskilling or deskilling in tourism education. The technologies of the 4th industrial revolution have become widespread, creating massive social, economic, and political changes. In the labour market of tourism, these changes are making significant impacts on travellers and hosts, and tourism related services. One of our concerns is with how to prepare students for a career in tourism related services in the 4th Industrial Revolution era.

Skills such as empathy and problem solving, time management, communication, customer care, teamwork are essential for a career in tourism and hospitality. Digital transformation and artificial intelligence in the industry are more likely to depersonalise tourism through robotic management. The question arises whether this development can substitute for the human touch in these very socially interactive industries. Students gain skills needed to succeed in travel, tourism, and hospitality industries. There are opportunities for them to continue their education at higher levels (Masters and PhD levels). Specializations include cultural, sport, medical, environmental, religious/spiritual, urban, rural, aviation and hospitality. This vocational subject encompasses sustainability, management, marketing, economics, travel and transport, development, policy and planning, hospitality, leisure, museums, attractions, recreation, events and festivals, conferences, aviation, and sports. Tourism is a complex multi-disciplinary field and is approached by geographers, sociologists, psychologists, economists, anthropologists, lawyers, planners, statisticians, managers, and marketeers.

Tourism Employment

Tourism is an important sector of the service economy with many employment opportunities in hotels/accommodation, restaurants/catering, airlines, airports, tour operators, tour guides, travel agencies, souvenir businesses, national, regional, and local authorities, museums, and several entrepreneurial online businesses. Other employment opportunities are found in transport, tourist attractions, conference businesses, information services, government offices, souvenir shops, NGOs, tourism consultancies and educational establishments (see Dhiman, 2012; Hjalager, 2003; Liu & Wall, 2006). There is a large body of knowledge discussing the role of tourism as a driver of economic prosperity, job growth, and a vital force for peace. According to WTTC, 319 million jobs are supported by travel and tourism-related services. This is 10% of global employment (2019).

'Yet again, the strong economic performance of travel and tourism proves the power of the sector as a tool for governments to generate prosperity while creating jobs around the world' (Gloria Guevara Manzo, President and CEO World Travel and Tourism Council, 2019).

4IR Impacts on Tourism Business

Big data, cloud system (mass data sharing), IoT and simulation can cause radical changes in service delivery and marketing in the tourism industry (Kwok & Koh, 2018). Digitization of products, big data and cloud computing make understanding and meeting individual customer needs more accurate (Vecchio, 2017). Smart buildings and cyber security can cause major changes in the environment in the accommodation sector (Bernhardt et al., 2003). Sightseeing of destination and facilities in virtual environments, reservations, room selection, pre-ordered food, and drink (Cai et al., 2004). Intelligent robots may offer services such as greeting, transfer, bell-boy services, payments, promotion, on-site guidance, food, and beverage orders (see Ivanov, 2019a, 2019b). Producers and consumers share creative experiences based on the use of high technology. Virtual reality allows immersion in computerised programmes providing contact in real time, enabling people to share holiday experiences (Guttentag, 2010). New transportation technologies will cause radical changes in the tourism industry: comfortable seats, entertainment options on bus, mobile applications providing travel information, shuttle scheduling (Wang, 2010). Robots carrying out strenuous jobs such as waitresses, cleaning, and garbage (Murphy et al., 2017). Tourism supplies benefit from reservation, marketing, guest services, operational management, human resources, and security. It is claimed by some proponents that the 4th industrial revolution requires fresh approaches to the reskilling of tourism workforce (Lee et al., 2019). Yet others claim that the 4th industrial revolution will accelerate the deskilling of the tourism workforce (Howcroft & Och Rubery (2019). There are several examples of loss of employment at airports, hotels, restaurants. Is there any other evidence? The sector is a digital pioneer. It was the first sector to digitalize business processes on a global scale (UNWTO). For example, flight and hotel bookings online. Tourism is an adopter of new technologies and platforms. Several studies show that tourism has been leading the way in 4th industrial revolution. Travellers are constantly connected e.g., search for information, share experiences on social media and demand instant gratification. Applying technology to enhance travellers experience. Airports are introducing biometric technology to identify travellers and make trip frictionless. There is some evidence showing that artificial intelligence allows hotels to offer different experiences.

Why use robots? There is a debate. Hoteliers claim that guests have positive memories, customer loyalty, share experience with others. From this perspective robots free up the time of human staff. In other words, the use is limitless. However, our study shows that people will always remain at the core of the tourism experience. Robots depersonalise guests' experience. Technological innovation should not be a goal in itself. There is an underlying fear that robots will take over the world and the tourism industry. How do you better serve customers? With luggage-carrying robots, with front desk robots, concierge robots would enhance the customers' experiences. It is believed that technology connects people e.g., Airbnb is a people-powered platform underpinned by technology has been used to take tourism to communities that have not previously benefitted from tourism. Hosts have access to a global audience of travellers who are looking for authentic experiences in visited destinations. However, we need current studies in this age of the 4th industrial revolution to be able to make informed decisions about the costs and benefits of tourism.

Conclusions

Past research indicates that technologies powered by artificial intelligence are transforming the world of Higher Education and workplace. As this paper has shown this transformation is ongoing. Education has advanced over the past few decades. Travel, tourism, and hospitality

students face a world transformed by technology, in which the internet, cloud computing, and social media have been creating different opportunities and challenges. As students consider life after graduation, they are faced with questions about their own employment in tourism related services. Their needs should be met effectively. There is a need to prepare students for a new job market. We also need to remember that concepts such as post-work define present times. 4IR has been revolutionising tourism industry so that much of work that exists today will not exist in 50 years.

Reflecting upon past experiences a new form of a university is emerging where teaching, research and service are done differently. In closing, we trust that improving the quality of student experience in Higher Education can bring the right changes in society. We believe that the following student skills are needed to be taught in a physical environment. Critical thinking, people management, emotional intelligence, judgement, negotiation, and cognitive flexibility. The convergence of human and machine reduces the subject distance between science and technology. However, technology does not change society. It is people with right attitudes and expertise who change society.

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