ILLUSTRATING THE PERCEPTION OF STUDENTS TOWARDS AUTONOMOUS SERVICE ROBOTS IN THE TOURISM INDUSTRY: AN EXPLORATORY STUDY

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Abstract

Research purpose – The purpose of the study was to explore the students' perceptions towards autonomous service robots, using interviews and, in a novel manner, also their drawings, to generate data. The paper contributes to current knowledge claims around the Techno-Economic Paradigm by providing a greater understanding of, and student response to, autonomous service robots. Additional insights were gained on transformational skills set for tourism practitioners.

Design/Methodology/Approach – A qualitative approach followed a participatory research design which was set in a public higher education institution. Undergraduate tourism and hospitality students who had previous exposure and engagement with robots were the purposive sample. The paper draws on the Techno-Economic Paradigm to illuminate how, according to students' experiences and perceptions, autonomous robots interact in, and disrupt, the tourism industry.

Findings – Four main drawings essentially expressed tourism and hospitality students' perceptions of autonomous service robots in the tourism industry. Centrally there are opportunities for the absorption of robots in certain sectors of the tourism industry. Despite greater use of robots in service-driven industries like tourism, it remains challenging to establish the right balance between humans and robots, and up- and re-skilling transformation would be required of those working in the tourism industry and those studying towards a tourism qualification. This study advances that additional research is still required, including longitudinal studies on the effects of autonomous services in the tourism industry, as well as students' perception on the use of robots, re-skilling as well as ethical risks to customers, the greater value to the economy and those working in the tourism industry.

Originality of the research – The article contributes to the use of visual methodology as part of data generation, specifically how students' perceptions regarding autonomous robots in the tourism industry were graphically distilled using this methodology.

Keywords autonomous robots, tourism industry, drawings, service industry, participatory visual methodology

1. INTRODUCTION

The global travel market has changed extensively, with a substantive knock-on effect on changing of the business practices within the industry. The industry has experienced a fundamental shift in markets, products, and distribution. Significant attention is given to automation and digitalisation within the tourism industry while highlighting that jobs are already susceptible to computerisation, creating the possibility of job extinction (Ivanov,

Webster and Berezia 2017; Fussell 2019; Webster and Ivanov 2019; McKinsey and Company 2019). In the working world, the fear of technological unemployment as a result of autonomous robots replacing human workers has received attention and falls within the remit of this study (McClure 2017).

The global economy is being shaped by the rapid pace of technology development and innovation (Ivanov, Webster and Seyyedi 2018; Briody 2019). This is evident in unprecedented technological and socio-economic interactions in products and services, which evolved due to an interactive and highly coupled nature of the innovative technology and economic relationship (Freeman 1991). Such techno and socio-economic shifts move across sectors or industries (Freeman 1991).Technological competencies are paramount, but also need to be carefully operationalised in geographical areas and industries (Ejo-Orusa 1997). Technological innovation is an engine for productivity, growth and economic development (Bassanini and Duval 2006; OECD 2015), specifically in service industries, and robotics. Robotics therefore contributes to generative human systems, despite a superficial and uninformed view which claims their displacing or replacing of human agency (Crews 2016; Briody 2019).

An industry such as tourism therefore also faces the actuality and potential of disruptive innovation, yet with attendant balancing points and trade-offs to local economies (NDT 2018). It is important to understand the perception of upcoming generations of students, in these disciplinary areas, as the trends above will have a direct impact on systems, including higher education institutions inputs and outcomes, the technology used within different tourism and hospitality education and the sectors themselves, and the adoption of adaptive and/or transformed skills set when working in the industry. An increase in automation eliminates many roles, and workers need to become more flexible (WEF 2018). It is not only the economical and institutional environments which are affected, it is also necessary to understand changes in the systems so as to capitalise on the driving influences that emerge from the natural environment, the built environment and the institutional environment (Freeman 1991). For the body of knowledge, this study discerned how students experience and perceive autonomous robots, within the tourism industry, using a theoretical lens to offer commentary on the systems which are referenced herein.

Following this introduction, the literature review elaborates on the techno-economic paradigm, positioning the technology within the economic situation of South Africa.

2. LITERATURE REVIEW

Systems changes such as the use of robots in tourism, which is a high density service industry (NDT 2018), may be pivotal in increasing tourism's contribution to alleviating the triple challenges. According to the United Nations Conference on Trade and Development (UNCTAD) inequality, unemployment and poverty are interdependent socio economic phenomena labelled as triple challenges in South Africa (UNCTAD 2019), and especially important within the entrepreneurial tourism and hospitality environment in South Africa (UNCTAD 2019). A paradigm shift is a change in the concepts and practices of service is delivers. A paradigm shift often occurs when new

technology is introduces that radically alters the construction process of services. It is the techno-economic paradigm, being expressed through the use of new technologies as they diffuse, that multiplies their impact across the economy and eventually transforms the way socio-institutional structures are organised (Perez 2010).

Within this complex world this paper emphasises a unique features of techno-economic evolution: the techno-economic paradigm involves a complex process between the natural environment (environment-humans), the built environment (tourism industry) and the institutional environment (travellers). Figure 1 below indicates the three pillars of the techno-economic paradigm.

Figure 1: **The Techno Economic Paradigm**
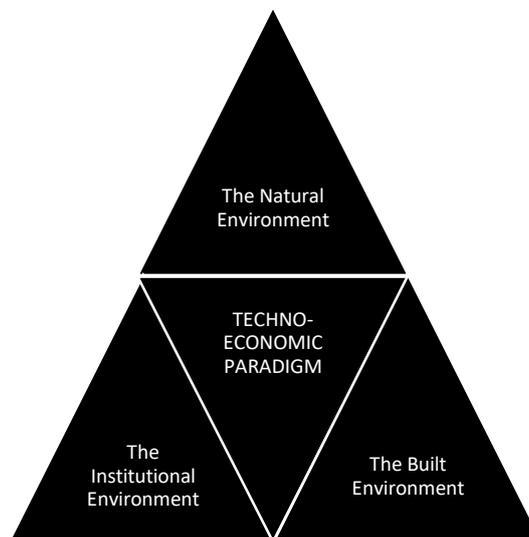
Source: Adapted from Freeman (1991).

The natural environment is about the interaction between environments, humans, social dimensions and technology. According to Freeman (1991) the built environment is about the consideration of location, scale durability and cost of the physical equipment, and the speed of absorption within which innovations may deliver value. The institutional environment relates to the nature, timing and absorption of those innovations under considerations of market demand, cost and profitability in a socio-economic and political climate that allows innovations effectively to be adopted but also to distinguish between different types and levels of selection (Perez 2010). Innovation, changes and technology will influence not only the natural and build environment but also the institutional environment, in this case, the consumer (Freeman 1991). Changes in lifestyle, interest and consumer demands, together with development of new innovative advances in the tourism industry, will stimulate new job opportunities and a transformed skill set. These skills are likely to be highly rewarded as organisations seek more software developers, engineers, scientific experts, and robotics specialists. However according to Perez (2010) these main areas inform an understanding of the relationships between technical and

organisational change, between these and economic performance as well as the mutual relationships between the economy and the institutional context. Perez (2010) highlights that 1) cost structure of inputs becomes the most attractive choice for profitable innovation and investment; 2) advantages of innovation is where entrepreneurial opportunities are recognised and further development within the existing sector/s; 3) within the organisation continuation of taking advantage of the power of new technologies for maximum efficiency and profits. In all three main areas, the appearance of the paradigm depends on the rhythm of diffusion of the revolutionary products, technologies and infrastructures it takes place. At first the impact is local and minor, with time it is widespread. Changes occur in the economy, in behaviours and in ideas.

Many and diverse changes in the tourism industry occur. This paper explores a niche aspect of change based on the interaction between the selected environments, discussed above and what may be seen as disruptive innovation.

2.1. Positioning the techno-economic situation in South Africa

South Africa's local economy is characterised by triple challenges of deepening unemployment, poverty, and inequality. Students and graduates- regarded as youth- are aged between 15 and 34 years (Jones 2011; Statistic South Africa (StatsSA) 2020). They constitute around 66% of the total population Kruss, Wildschut, Van Rensburg, Visser, Haupt and Roodt (2012) who are particularly affected by bleak socio-economic prospects. South Africa's youth unemployment rate increased to a staggering 59% in the first quarter of 2020 (StatsSA 2020). Thus, from a socioeconomic and political perspective, employment remains one of the greatest challenges facing South Africa and, indeed, the world (StatsSA 2020). Unemployment is a result of insufficient economic growth; however, economic growth alone will not ensure job creation (International Labour Organization (ILO) 2011; National Department of Tourism (NDT) 2011; OECD 2015; NDT 2018). Increasing employment requires seeking alternatives and exploring innovations, specifically in high potential growth industries, with entrepreneurial opportunities such as the tourism sector. The sector accounts for 2,9% of GDP (8,6% indirect), supports about 725,000 direct jobs (1,49 million direct and indirect) and accounts for 8,2% of total investment activity in 2019, contributing an equivalent of 9,2% of total national exports (SAT 2020). Until Covid-19 South Africa has benefitted significantly from tourism, yet has often been constrained by lack of systems capacity (NDT 2018).

If technology is not harnessed to connect people to high quality education and jobs, repercussions like greater income inequality, increased unemployment, growing dependency of the state, more mass migrations and failing to train youth for the digital-driven economy are some of the pressing problems which will be exacerbated (Deloitte 2018; UNCTAD2019). Frank, Roehring and Pring (2017) challenge the perceived risk of the elimination of jobs through robotics, as they believe that many new jobs will be created through advances in technology. Wladawshy-Berger (2018) refers to these new jobs as 'new-collar jobs'. Yet, these jobs will require transformation in terms of people being de-skilled, re-skilled, and upskilled (; Webster and Ivanov 2019), in short, a transformation of skills. The WEF (2018) identified and tracked the potential scale of worker displacement globally. Whilst jobs may be displaced by a shift in the division of

labour between humans and machines, more roles may emerge, which are adapted to new division of labour between humans, machines and algorithms (WEF 2020). This change is likely to create further dilemmas concerning employment and geographical location, global and regional economies, and political and technological trends. It is important to look at the adaptation of new technologies such as autonomous robots within the tourism sector; transformed skills offered by higher education to students to meet market needs; how likely it will be that that consumers tap into robotic and other technological trends. This paper addresses these points and the required skills set by tourism and hospitality students to work in the industry.

2.2. Autonomous Robots

It is evident that enhanced application of innovation would greatly benefit delivery of customer experience to service design (Teixeira, Patricio, Nunes, Nobrega, Fisk and Constantine 2012). Service-technological innovation includes robotics. For the sake of clarity, a robot is a machine. Robots are grouped into two distinctive categories, namely industrial robots and service robots (which may resemble a human being) that may replicate certain human movements and functions automatically (Ivanov et al. 2017). Robots are already widely used in agriculture, transportation, manufacturing, and medicine (Arai, Kato and Fujita, 2010; Broadbent, Kumar, Sollers and Stafford 2013). The Sky Hotel in Sandton, Johannesburg, is the first hotel in South Africa to deploy service robots, re-inventing the space. Robots come in many shapes, and differ with respect to their degree of flexibility and the functional autonomy to operate various tasks. Employing robots necessitates greater understanding of the employability skills required to function in the future, as well as the perceptions of future workers, mainly the youth who are most likely to work alongside robots within the future of service industries.

Today, robots are designed to assist humans with physical tasks such as bathing, carrying, fetching, walking, and distributing pamphlets, as well as to entertain. With the advancements in Robotics, Artificial Intelligence, and Service Automation (RAISA), human labour is no longer as essential as before. Robots are now used to execute various administrative and customer-service tasks. DeCanio (2016) further adds to the debate as to whether robots will largely be used to complement skilled human labour or whether robots will substitute unskilled human labour where the outcome will be more uneven.

According to SA Tourism CEO's, Sisa Ntshona's media statements, a fusion of technology and the human element is necessary in the tourism industry to add value to the consumer (News24 2019), and to advance entrepreneurial opportunities. Otley (2016), in an article in Business Traveller titled, *"Robots working in travel industry would improve service"* summarises that travellers are becoming increasingly independent, more knowledgeable, and are seeking self-service methods and automation. The automation of robots appeals to the airline industry, accommodation establishments, restaurants, bars and more lately in museums, train stations and within the events industry - giving rise to the adoption of more robots and adapted work. People's needs and expectations are evolving in pursuance of technologies, with a high-intensity service industry, such as tourism, needing to keep up with these demands if it wants to keep abreast of customer satisfaction and loyalty, and continuously improve the quality of its services (Goetz, Kiesler and Powers 2003). However, according to Ferrein, Schiffer,

Booysen and Stopforth (2016) it is important to involve the South African government and international partnerships and funding to advance the use of service robots. Various mutations of technologies are integrated to improve the service and travellers experiences within the industry, which are, in turn, profitable for the specific sectors within the industry. Related to these technologies, however, are also a different set of skills required by those who will work in the industry and essential to be delivered by higher education institutions (Ferrein et al. 2016).

2.3. Required skill set by tourism students

According to Samala, Katkam, Bellamkonda and Rodriques (2020) technology enhances tourism experiences and complements dimensions to the future of tourism. In a world where volatility, uncertainty, complexity, and ambiguity (VUCA) are the norm, the key to success in tourism is inculcating skills for service innovation (Wakelin-Theron, Ukpere and Spowart, 2019). Noting this requirement, the Top 10 skills required by 2020, in any industry, according to the World Economic Forum (WEF) (2018), are highlighted in Table 1. The comparison noted that, by 2020, different skills might be required, while some of the current ones would have to be fine-tuned to be reskilled.

Table 1: **A comparison between the Top 10 skills required in 2020 and 2005**

	2020	**2005**
1.	Complex problem-solving	Complex problem-solving
2.	Critical thinking	Co-ordination with others (-3 in 2020 ranking)
3.	Creativity	People management (-1 in 2020 ranking)
4.	People management	Critical thinking (+2 in 2020 ranking)
5.	Co-ordinating with others	Negotiation (-4 in 2020 ranking)
6.	Emotional intelligence	Quality control (Not ranked among the Top 10 for 2020)
7.	Judgement and decision-making	Service orientation (-1 in 2020 ranking)
8.	Service orientation	Judgement and decision-making (+1 in 2020 ranking)
9.	Negotiation	Active listening (Not ranked among the Top 10 for 2020)
10.	Cognitive flexibility	Creativity (+7 in 2020 ranking)

Source: WEF (2005, 2018).

The above table shows that *Complex problem-solving* will still be required in 2020. However, *Co-ordination with others* and *Negotiation* are ranked much lower for 2020 than for 2005. *Negotiation* was in fifth position for 2005, but ranked ninth for 2020.Quality control is not ranked amongst the top 10 for 2020.Service orientation dropped position and is ranked 8th amongst the top ten skills required in 2020. It must be noted that it was anticipated that, by 2020, machines will have replaced the decision-making process. Yet, judgement and decision-making is on the increase *Active listening* and *Quality control* are no longer among the Top 10; these skills were replaced by *Emotional intelligence* and *Cognitive flexibility*. It is important to note that *Creativity*, which was ranked 10th in 2005**,** was moved up seven positions, and is now considered

the third-most important skill for 2020 (WEF 2018). These skills therefore are called for in tourism, as for any evolving work domain.

The rationale behind the skills identified as necessary in 2020 presume that the competitive edge that humans have over technology and artificial intelligence (AI) is not based on physicality, but rather on intellectual capabilities and the ability to interpret the emotional landscape of the workplace with robots. It is about creativity and how quickly complex problems can be resolved. According to the latest WEF (2020) Global Risks Report, people will need to escalate their capabilities between now and 2030 if they do not want to be left behind. The risk report places emphasis on skills which will be highly rewarded as: 1) higher cognitive skills, which advance literacy and writing, critical thinking, and complex information processing. The report also identifies the adaptability and for individuals to have 2) social and emotional skills, which advanced communication and negotiation skills related to continuous learning, empathy, the ability to manage others within the work environment. Lastly 3) technological skills, which includes the full range from basic to advances IT skills are vital skills to obtain. These skills are highly rewarded as organisation seek more specialists. Equally, the demand for higher cognitive skills such as creativity, critical thinking, decision-making, and the processing of complex information will grow rapidly up to 2030 (WEF 2020). The McKinsey report, however, highlights the skills shifts will play out differently in sectors, as the sectors are likely to be automated (WEF 2020). This centrally applies to the tourism industry, which has been noted as an intense service industry. A new set of skills will be required for the tourism industry in the future.

Yet, there are a number of occupations categories which are on the spectrum of high risk-to-high opportunity of automation. A good understanding of the perception of the tourism students experience towards autonomous service robots could assist with concerns, lack of skills set and avenues for future employment amongst the youth in the tourism industry. Hsu (2018) suggested that entrepreneurship and innovation be embedded in tourism and hospitality qualifications, and this study intended to uncover some of these more intangible domains.

Indeed with the adaptation of a set of skills, attendant technology can may value through the efficiency that is created, noting that the service offering still requires human intervention, including communication, problem solving, creativity and caregiving, as consumers want to feel that they are looked after, whilst also looking for bespoke experiences.

2.4. The tourism industry

Tourists are in constant need of new and bespoke experiences, and are seeking new destinations and novelties. They have specific personal preferences with regard to destination, accommodation, and activities (NDT 2018). The latest trend in tourism is exploring outer space, and, in the near future, this will be the ultimate tourist experience. The closer an experience can be tailored to clients' desires and expectations, the more likely they are to return and use the same service again, or recommend the service to friends and family (SAT 2020). Thus, the techno-economic progress is dependent not just on the availability of technology but on how the industry adapts to the technological

domains and how knowledgeable they on the delivery of products and services and their willingness to invest therein (Ejo-Orusa 1997).

Tung and Au (2018) posit that robots facilitate the co-creation of experiences, robots increase the service capacity and improve the quality to those sectors that adopt them, improve productivity, save employees time (capacity), and generate additional revenue. While the use of humanoid robots might be more advantageous, they could create a higher expectation than machine-like robots in interactions with customers in the service industry (Frank et al., 2017). Yet, robots are relatively expensive at the moment, with limited technological functionalities, they may require re-engineering of specific service delivery and adapting to the premises of the property to be more robot-friendly (Ivanov and Webster 2017) Thus, organisations that are technically competent to operationalise new products, process or modify existing technologies, as it drives economic development process (Ejo-Orusa 1997). With technology, the tourism industry can co-create unique experiences for customers. A traveller view robots as a service provider that delivers a unique blend of services. Yet, travellers will have different attitudes towards a service robot, which relates to previous travel experiences, occupation, age, and which tasks are suitable for robots, (Ivanov and Webster 2017). These traveller preferences influences travellers' intention to make use of, and relate to, robots in the tourism industry. Notwithstanding the benefits, the question remains whether some destinations will lose their authentic culture through limited access to humans?

Yet, robots are saving companies money. The rationale behind developments in robotics includes productivity, accessibility, and service augmentation. Robots still interface with humans, notably in this case, tourism practitioners. The following section focus on the student as future practitioners, and how comfortable students are with robotic technology.

2.5. The perception of students towards autonomous robots

For the first time in human history, young adults and students may show more knowledge skills and attributes and have more experience in a field than the older generation. The younger generation seem to be born as if plugged into futuristic technologies. Students have more confidence in their own abilities, and this assurance could be considered the motive force for ensuring transformation, with students expressing an appetite for education and training systems that build their capacities and enable their capability formation. This ability liberates and empowers students massively from the older generation (Crews 2016; Frey and Osborne 2017). Students adopt and adapt very quickly to new technology, which is key to technological development and the technological skills of youth to shape the future of the labour market and address the unemployment in South Africa (UNCTAD 2019). According to the WEF (2015), those who enter the world of work in the future are required to have acumen in creativity and flexibility. Problem-orientated thinking will be the most important requirement of employees (WEF 2018). According to the Global Employment Institution (Wisskirchen, Thibault, Bormann, Muntz, Niehaus, Soler and Von Brauchitsch 2017) future employees need to act independently, be able to build networks and organise themselves and teams to be productive and profitable. Students need to be exposed to high-end technology, to equip them well for the world of work. Tourism graduates believe that technology creates more

jobs, and that innovative tourism product development and entrepreneurship will advance the industry (Wakelin-Theron, Ukpere and Spowart 2019). McClure (2017) validates humans' fear of being replaced by robots, noting that reservation, especially within the service industry. Smids, Nyholm and Berkers (2020) acknowledge those working with robots might feel that they serve less of a purpose and will become obsolete, with a feeling of less worth and lower self-esteem. Robotics reduce social interaction and might diminish human autonomy (Otley 2016). The danger of deskilling due robots for their utility within automation technology is real (Frey and Osborne 2017; McClure 2017). However, robots might equally have the opposite impact to those working in the industry (Ferrein et al., 2016). They could enable humans to maintain their current skills and to acquire new and additional complex skills (Smids et al. 2020). Humans will have to change, reinvent themselves, and focus on doing jobs that machines cannot yet do as effectively as humans can. Humans may have to become more creative, interact with others more, and be more flexible in employment. Emotional connections, the survey of humans, are increasingly critical, a dimensions that the Covid-19 pandemic convincingly demonstrated.

It is important to foster an eagerness for students to continuously learn and gain skills which are constantly reconfigured to match the shape and size of new problems, challenges and innovation within the industry (Wisskirchen et al.2017). Changes in the tourism industry may lead to the changes in education and training provided.

3. METHODOLOGY

The research purpose is to:
a) explore the experiences of students regarding autonomous robot in the tourism industry;
b) determine the perception of students regarding autonomous service robots in the tourism industry;

The scope of the study included:
To explore the experiences and perceptions of student towards autonomous service robots in the tourism industry, Tourism and Hospitality Undergraduate students were interviewed from a Public Higher Education Institution in Johannesburg that offers both tourism and hospitality qualifications. The study took place during September 2020, and forty students between the ages of 19 – 24 years participated in the study. All had an interaction with a robot either once or more than once.

3.1. Sample

The final sample includes 40 participants from the public higher education institutions. Table 2 presents a layout of the geographic distribution of participants with a detailed breakdown of gender, age, previous exposure to service robots.

Table 2: **Geographic distribution of participants**

Characteristic	Category	n	Percentage
Sex	Male	16	40%
	Female	24	60%
Background	Urban	20	50%
	Rural	20	50%
Qualification	UG Tourism	26	65%
	UG Hospitality	14	35%
Race	Black	25	62.5%
	White	2	5%
	Coloured	2	5%
	Indian	1	2.5%
Age group	18-20	18	45%
	21-24	22	55%
Interaction with a robot	Once	32	80%
	More than once	8	20%

The participants, both female and male, were of different backgrounds and ages, all studying towards an undergraduate tourism or hospitality qualification. Half of the participants were from rural areas, while the rest were urban dwellers all from a Public Higher Education Institution in Johannesburg.

3.2. Data collection and analysis

The research project received ethics approval from the university (20STH17). Daymon and Halloway (2011) endorse that interpretive researchers seek to interpret human understanding of individual experiences and perceptions, which is in line with the research question.

As introduced and now expanded upon, the study was conducted at a Public Higher Education Institution (PHEI) in Johannesburg, an economic hub and tourist- generating area. The PHEI offers various Tourism and Hospitality qualifications. Key participants of the study were purposefully selected by virtue of their experience previously to robots and who are studying Tourism and Hospitality. Tourism and Hospitality students were thus selected due to their knowledge, exposure and experience as well as insight to autonomous robots. It was deemed critical for them to have a good understanding of the tourism and hospitality industry.

The participants were randomly grouped due to enculturation at the academic institution and knowledge and experience about the tourism and hospitality industry. The four groups were given an A3 paper on which they were to draw their perception and experiences of autonomous robots in the tourism industry. The drawings took between 10 -15 minutes to complete and detailed verbal descriptions of the drawing were elicited. In order to understand the graphical representation, a group representative communicated and reflected the understanding of the group's perception towards autonomous robots in the tourism industry. Additional contributions made by individual participants were welcomed and noted, probing questions were asked when participants raised a new issue. The interview feedback was recorded per group. According to Barley and Russel (2018),

visual participatory methods are an innovative research technique. Making a drawing is contingent on a process of reflection and finding a way to express the pictorially. Several studies have utilised drawing as a data collection method (Guillemin 2004; Mayaba and Wood 2015). Using a visual participatory approach provide a context for reflection, social change and action. In addition, the visual participatory approach allowed participants to voice their experiences and perceptions, which promote trustworthiness (Nowell, Norris, White and Moules 2017). Drawings has an advantage over other visual methods, it has the potential to offer communication other than speech, which encourage team collaboration, stimulate ideas and sharing of information which is more direct and more flexible than verbal communication. Drawings offer a way of exploring both multiplicity and complexity of human experiences (Guillemin 2004). The researcher was able to make new interpretations and ask prompting questions through being speculative. The method amounted to an integration of visual and verbal meaning-making. The use of an integrated approach (images and words) offers a way of exploring multiplicity of human experiences and also encourages collaborative meaning making (Guillemin 2004).

The participants could at any time opt-out of the interview. To maintain anonymity, respondents are indicated by 'G' – group which are assigned by a number (1, 2, 3...) and 'P' – individual participant and a number (1, 2, and 3…10). Quotations are presented to emphasise responses from the group and/ or individuals.

We adopted a draw-and-write approach in this study. This method was selected as it allows participants to elaborate on the meaning of the drawings through oral and written explanations (Mair and Kierans 2007). The students were asked: *Draw a picture and write phrases that describes your perception towards autonomous service robots, within the tourism industry.* The participants in the respective groups were encouraged to draw anything that would describe their reaction towards service robots in the tourism industry. How well they drew was not important.

Participants were also invited to share their thoughts on other groups' drawings. The drawings are described in detail, then individual interviews were coded and themed together with references from relevant literature. The visual presentations were received and coded. Verbal feedback from each group was recorded and individuals were allowed to freely comment and add information that was important to the discussion. This data were also coded. The feedback from the visual drawings and individual feedback were then formulated into themes.

The data from the visual methods is in two parts. Firstly, the pictures are the illustrations of each group, representative of their perceptions of autonomous robots in the tourism industry. Secondly there is a summary of each group's verbal comments below the illustration. These composite data sources formed themes.

4. RESULTS AND DISCUSSION

The picture drawn by Group 1 is shown below in Figure 2.

Figure 2: **Theme 1: Robots do have a place**
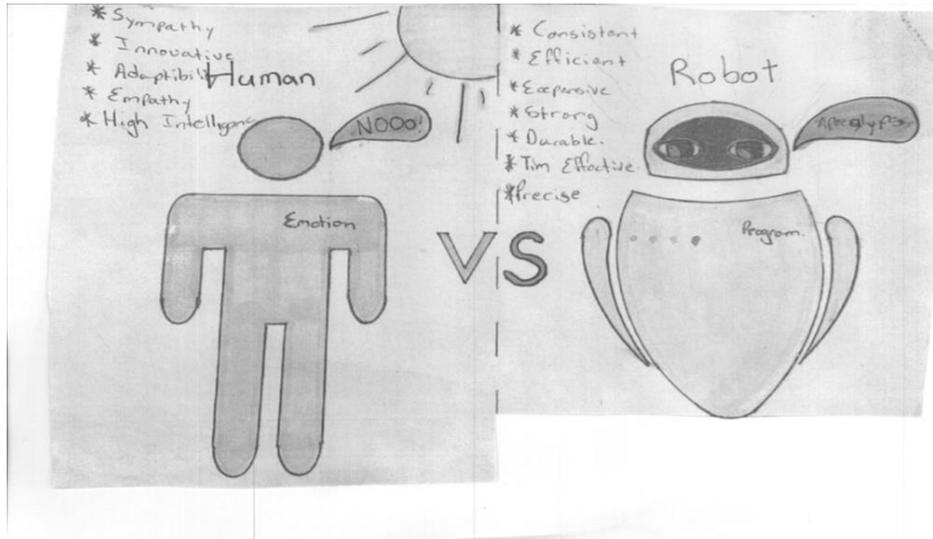
Source: Picture was taken by researcher during data collection.

Group 1 responded: "*There is a place for robots in the tourism industry, but not in our country, due to the high demand for jobs and a shortage of job opportunities. Robots will take jobs away from the people in our country. The illustration depicts the battle between robots and humans. Humans have emotions and the robot is programmed to do certain things within a given sector of the tourism industry. Human show sympathy to others, they innovate on the job, and adapt on a daily basis. Humans also show empathy and have a high level of quick intelligence. Robots are consistent, efficient, cost-effective, fairly strong, durable, and time-effective, but need to be programmed by humans. Robots do have a space in the tourism industry, but not yet in our country, as we first need to secure sufficient jobs and develop technologies to support customers. We also need to get the right skills to operate autonomous robots – as we are not equipped to deal with such high level technology. We felt that we are not equipped with the right skills to enter the work environment in the near future. We need to understand what customers want, and how they want robots to function in their environment when they consume tourism products and services.*"

The drawing of Group 2 is shown below Figure 3.

Figure 3: **Theme 2: Robots effective and efficient use in the industry**
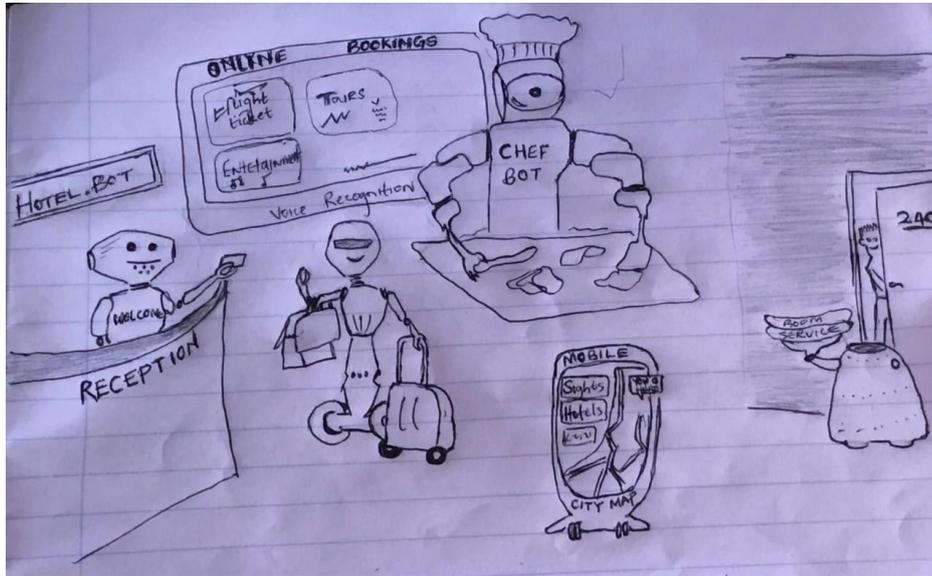
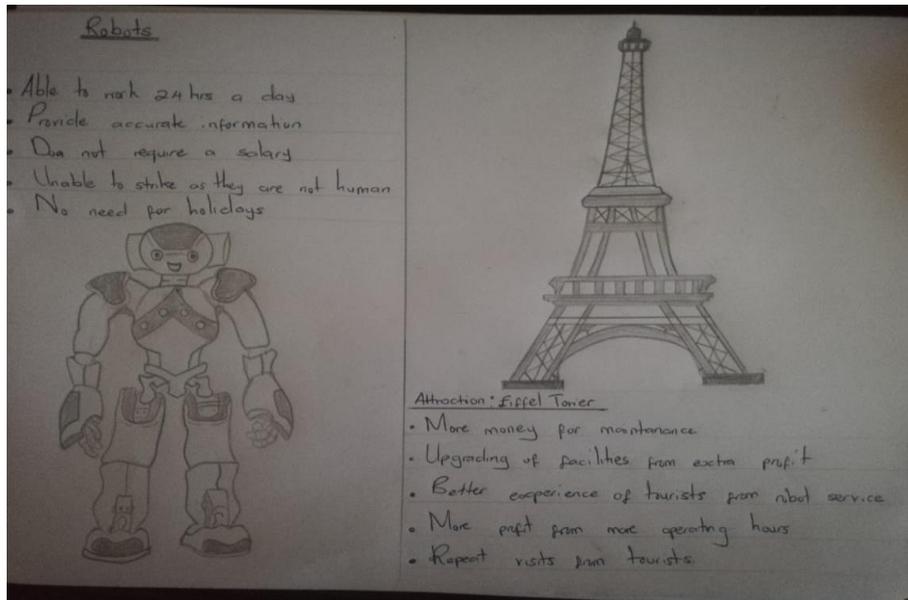Source: Picture was taken by researcher during data collection.

Group 2 responded: *"Robots are machines that perform specific tasks effectively and efficiently. Robots simplify complex tasks that require strength and high levels of energy, e.g., taking guest luggage to a room and cleaning functions. These robots make business travel more appealing, as these customers often seek self-services methods, and robots can provide these with ease. You will be able to operate robots' functions via your phone. Robots make use of voice- and face recognition. AI helps with check-ins and check-outs, they learn from customer interactions, and the more they are used the better they respond to customers' needs.*

The robots will make tourism better and more innovative. Some robots can perform key tasks, e.g., room service, cooking, booking services, and information regarding the hotel and attractions. These robots can communicate in different languages, which are programmed, but will not be able to provide true cultural experiences like religion, cuisine, they cannot showcase archeologically sights, assist with storytelling, the tourist still need to experience this".

Any additional feedback, you would like to provide G2P9 Commented, a female tourism undergraduate student commented "*I feel that robots will be used more at airports, restaurant and hotels, were they have less interaction with direct tourists, but where robots are used to make tourists lives easier" ... I believe leisure tourists would make use of robots less....".*

The drawing by Group 3 is provided below Figure 4.

Figure 4: **Theme 3: Better experiences**

Source: Picture was taken by researcher during data collection.

This group felt that "….*attractions could be upgraded. Robots do not forget; they might provide too much information, which is good, as it may generate repeat visits and make tourist sites more popular, as it is new. There is no overtime with robots; they do not get tired and can work long shifts. They have access to the Internet. Robots can provide relevant information efficiently. If implemented in the industry, we could experience a huge change, and more profit can be generated. Robots do not strike or have go-slows". They will continue working as long as they are maintained*. Yet one black tourism student, G3P6 noted that "…*it depends on the demand tourist have, if they are comfortable with obtaining information from a robot, when on holiday you want to experience something unique, not have a same – same experience from a robot…"* Another Indian student also from the UG Tourism qualification iterated that *…" I am concerned that when I enter the industry I might not be able to operate effectively as I do not have the appropriate skills to function in this new digital environment… we do receive entrepreneurial exposure but not IT skills to operate robots".*

The drawing by Group 4 is provided below figure 5.

Figure 5: **Theme 4: Humans are more powerful than Robots**
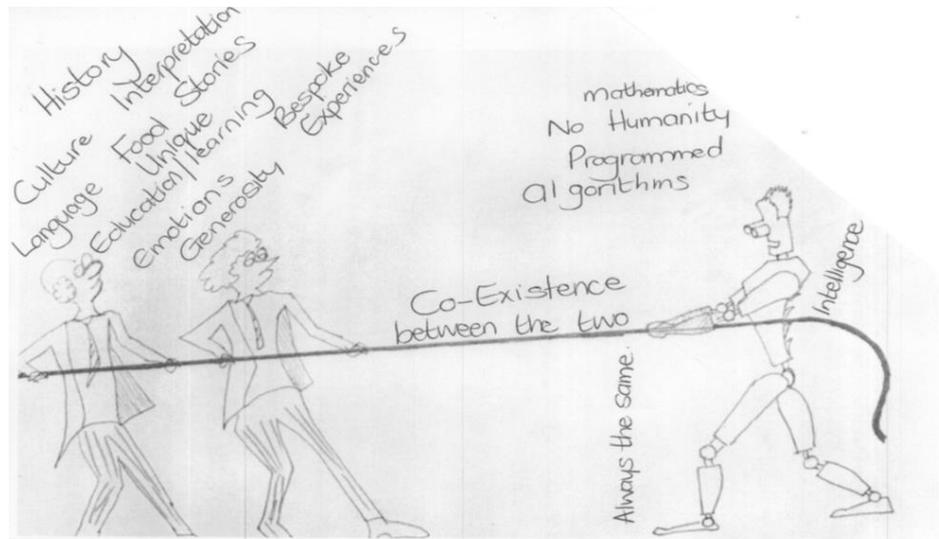
Source: Picture was taken by researcher during data collection.

Group 4 responded: *...Robots will never be able to take over, as humans are more powerful than robots. Robots lack the ability to interact, and will not provide a personal touch in the tourism industry. Robots will not be able to interpret culture and provide an authentic experience, tell stories that spark emotions, and educate people who visit a destination. Robots do not read emotions. Robots will not be able to provide a bespoke experience, as they are pre-programmed, and visitors will receive the same behaviour and services over and over from robots. Robots are pre-programmed; they are intelligent and always the same. Our group believe robots will assist with some aspects that is mandane in nature. Only human beings will be able to interpret and sell real culture, as humans are familiar with their own culture; robots are not. Travellers visit a destination to explore language, food, unique stories, and different religions".*

"If the industry absorbs robots, lots of staff will lose jobs, but technology will never be able to fully replace the experience for tourists. Some additional jobs might be generated in other tourism industries, as one needs to maintain robots. Students will still enter this industry, as robots will not replace the human element, but will need to be flexible and creative with travellers, as robots will not be able to deliver the full experience spectrum – the full experience clients seek.

G4P2 commented additionally "Our group felt that "*...Co-existence will take place, but the tourism industry will not be taken over fully by robots*".

G4P5 Our group felt that the .... "The Tourism or hospitality industry will never be able to offer full services through a robot, as customers want bespoke experiences. Humans need to focus on what they can do and not what robots can do. Robots will not be able

to interpret cultural stories emotionally, as robots are able to do this. People will be most likely not travel if robots are deployed in the industry, as the experiences will be the same, and travellers seek unique, culturally rich experiences. Humans are important in the tourism industry. Robots will not fully take the industry over, but robots will need to be incorporated at some sectors and levels".

Finally one, black African hospitality male student (G4P3) commented …*I am concerned that jobs will become limited with the robots, how will we secure employment in the future in the hospitality industry?*

The four groups were in disagreement with one another half of the groups indicated that autonomous robots will not take over the tourism industry in South Africa and the other half indicated that robots are appealing and or to perform key tasks in some sectors depending on the demand.

From these themes, the following summative assertions and contributions are offered:

4.1. Robots to be absorbed in some sectors, yet the client to demand

Some individual participants from the respective groups commented G1P8, G2P3, G3P9 and G4P7 and were of the view that in some disciplines, [robots] would work and others stated that they would not as it depends on the needs and wants of the customers and again in which tourism sector, hotels, restaurants, airports, attractions, or simply making a reservation of some sort. This is indeed in line with the techno-economic paradigm as it depends on the natural environment, built environment and the institutional environment (Freeman 1991). A range of mutations in technology is required to be deployed in the industry (Freeman 1991). Therefore, employees need to have a clear understanding of their customers and service processes in order to deliver outstanding service to their customers (Goetz, Kiesler and Powers 2003). In the tourism industry customer need to be established which will determine where robots will be deployment with various mutations and what would serve the consumers the best.

4.2. Robots are effective and efficient

Some groups agreed that service robots will proliferate in South Africa, because they have the ability to perform mundane and repetitive tasks traditionally accomplished by humans in service industries such as tourism.

4.3. Positive contributions of robots

Some groups felt that robots would free up humans to focus more on specialised tasks and render personalised individual services, which are essential in a service industry. Robots are consistent, efficient and effective. Robots do perform key tasks and would be able to communicate in various languages (G2P3). Group three was of the view that robots will operate longer hours and in the long run would be more profitable. Yet, group 1 indicated human labour and maintenance of robots will increase. Additional jobs will be generated due to robots within the tourism industry. This is in line with the findings

of Webster and Ivanov (2019). Robots help to unlock new methods of dealing with customers, thereby increasing organisations' operational efficiency, and portray a competitive advantage. Service robots and their supporting systems can provide crucial real-time business intelligence that can enhance any service industry. Yu's (2020) and Satake, Hayashi, Nakatoni and Kanda 2015) findings suggest that robots may currently enhance satisfaction because of the novelty of the practice. The present study elaborates on this stance through the finding that, with the help of a service robot, employees will have more time to spend with their customers, enhance customers' experiences, and provide a higher level of personalised services, which will secure repeat visits. It is foreseen that robots will create new work opportunities for humans, as robots need to be programmed, operated, maintained, and secured. It is likely that robots will increasingly fulfil administrative roles. Yu (2020) noted that, despite the advanced technology available, humans do not find it appropriate that staff is replaced with robots where customers require social interaction.

4.4 .Negative contributions of robots/Innovative human personal touch

G4P7 was of the view that ....*" robots do not provide personal touch, and interpret cultural need and other authentic experiences, nor are they flexible and creativ*e."

Three groups indicated that humans show emotions, would be more in touch with travels needs, wants and desires, yet all four interview groups mentioned that jobs losses will occur if robots are implemented across the industry and South Africa cannot afford this. G3P6 felt very strong and indicated …" *I think we need to stimulate the economy with entrepreneurial opportunities*… isn't that were the job creation is… *robots will increase immediate youth unemployment – skills are required to facilitate students with the right set of competencies to operate in an environment where these type of robots are employed"*.

4.5. Equipped with limited skills

Yet, participants were more concerned about their job prospects after graduation, and noted that an increase in the use of robots would constitute a higher risk of unemployment for humans, especially considering South Africa's high unemployment rate amongst the unskilled youth and the country's substandard infrastructure and maintenance (especially electricity) (G1). However, G1P3, was concerned about his lack of skills, *"I don't have specific IT skills. I will not be able to operate a robot, I don't have enough technological skills, and we are not equipped with these types of skills"*. The tourism industry also has a responsibility to train and retrain its staff. These views are aligned with the top-ranked skills for 2030: *Complex problem-solving*, *Critical thinking*, and *Creativity.*

The responsibility to adapt to advances in technology does not rest solely with higher education institutions. Individuals should take the initiative in equipping themselves with relevant skills (Wakelin-Theron et al., 2019). The private sector also has a critical role to play in elevating the skills of South Africans. Reskilling of the current workforce will require improved integration of government and private-sector skilling initiatives in opening new career paths (NDT 2018). In this regard, McKinsey and Company (2019) identified the top five development strategies in an article titled "The future workforce

strategies". These strategies are: 1) industries need to invest in the reskilling of current staff, 2) companies need to support mobility and job rotation, 3) industry need to collaborate with educational institutions, 4) the tourism industry must target women for advancement, and 5) to offer internships/apprenticeships.

However, participants felt that their own skills of persuasion, social perceptiveness, and creativity minimise this risk, and that there also seems to be no immediate adoption of service robot technology in the tourism industry. One student G2P8 mentioned that "I *think employees need to be more creative in their daily operation, and need to be able to solve problems with the help of robots to make their lives easier".* This is in line with the top three skills indicated by the WEF (2018) for 2020: complex problem-solving, critical thinking, and creativity. The interviews established from participant G4P8 that "*new titles to jobs will become the norm, and upskilling is important to become more inclusive, to drive change in the industry".* As the world of work changes, public higher educational institutions will need to equip students with the right skills sets and relevant knowledge (Wakelin-Theron et al. 2018).

4.6. Different types of travellers seek different robot interventions

G3P4, was of the opinion *"I think robots will slowly be introduced, and it depends on the sector it will be used, but also how comfortable tourists are with a robot" "Business people seek more technology", Cultural travellers will seek more human interaction – I feel it depends on the type of traveller".* G4P9 mentioned that *"robots and humans will co-exist in the tourism industry and deploy what works best for that specific industry"*
The themes and assertions provide foundational evidence that the research question was responded to, and that students are in agreement that positive and negative impacts are associated with service robots and some feel that a co-existence will occur. Students feel they do not yet have the skills to operate effectively with autonomous service robots yet, and have not received such skills from their academic institution as yet. The main contribution of this article established that robots are indeed effective and efficient, do have a place in the tourism and hospitality industry, yet it depends on where is will be deployed, depending on the travellers needs and requirements.

5. STUDY LIMITATIONS AND RECOMMENDATIONS FOR FUTURE RESEARCH

Although the study yielded a number of interesting results, it has some limitations. In spite of the various advantages outlined so far, the participatory drawing method also presents several specific challenges in terms of both implementation and data interpretation. Because of logistical considerations, as well as the highly personal nature of this type of research, it is inherently unfit for use with large groups of participants, and thus samples usually tend to be rather small. While this concern is common in qualitative research in general, it certainly affects the generalizability of the findings.

Psychologists can contribute significantly to the fascinating field of autonomous robot interaction. Additional research is still required, as well as longitudinal studies on the effects of autonomous service robots in the tourism and hospitality industry. A great deal

still needs to be discovered about the development of robots and their interaction with humans, to determine what will be socially acceptable in the future (Broadbent 2017). Drawings contribute to science and the development of new autonomous initiatives. Therefore, collaboration and exploration with other industries, countries and academic institutions are important. Furthermore, additional work is required to formulate regulations and policies regarding digital ethics, personal protection, flexibility in staffing, and security measures (Braindusescu, Freuler and Thakur 2017). There is no doubt that robots offer unprecedented opportunities, for higher education institutions, adaptation of new and alternative skills, entrepreneurial skills to support high unemployment and the need to know more about robots from a consumer/travellers perspective.

CONCLUSION

The current researcher has come to recognise the significance of robots, not just as novelty entertainment and to provide information, but as vehicles to improve service delivery and customer experience in tourism. Drawings contribute to science and the development of new autonomous initiatives and shortcomings in the educational delivery.

Autonomous-robotics education could support the empowerment of student from South Africa. Training or to be future orientated and included in tourism and hospitality qualifications. Technology can be utilised to improve teaching and learning an help students to be successful. The introduction of autonomous robots, especially in the accommodation sector, could help narrow the gap in service between South Africa and developed countries. However, the industry still needs people, as they are the main source of value and a competitive advantage in tourism, which dependent on higher cognitive skills, social and emotional intelligence, quality tourism products and services, and keeping up with global trends. The South African government and international partnership need to work together to establish future orientated training and funding. The industry need to emphasise education and training to keep staff members abreast.

Using robots could lead to higher unemployment, monopolies, privacy infringement, and discrimination, but it could also benefit and create additional employment opportunities, produce services at a lower cost and with higher quality. The tourism and hospitality industry will have to engage in thinking about what space and design robots will inhabit in their respective environment in the future (Ivanov and Webster 2017). Incorporating appropriate technology into coursework can assist educators and the curriculum designers in ensuring that students are well-prepared for an increasing technological working world. Employment may increase as additional skills are in demand, which will create flexible employment opportunities and a demand for various combinations of skills and competencies. It is therefore clear that development and adoption of this technology in South Africa should follow an all-inclusive approach, with the aim of enhancing the economy for all. Innovation and change will vary at different times at different levels and sectors, with uneven opportunities (Perez and Soete 1988).

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