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The bright and dark sides of artificial intelligence: A futures perspective on tourist destination experiences

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ABSTRACT

The proliferation of digital technologies has received considerable attention in the business landscape. Artificial intelligence (AI) is proclaimed as a transformative technological resource to human experiences, while concrete future scenarios of AI application within contemporary service ecosystems are only little understood. Through the theoretical lens of the service-dominant (S-D) logic and a futures methods approach, this study zooms-in on AI as a resource and sheds light on its bright and dark sides. The theoretical and practical contributions of this paper lie in bridging the S-D logic, AI and tourist experience literature. The developed theoretical model, The Realms of AI Tourist Experiences, holistically shows the positive and negative valences of value formation through AI in tourist experiences, and helps organisations prepare and design for the future of AI-facilitated experiences in tourism destinations and wider service contexts.

1. Introduction

Can machines think? This was a question posed by Alan Turing (1950) 70 years ago, ultimately leading to the 'Imitation Game' and the 'Turing Test', to identify whether machines and humans can be distinguished based on intelligence. Since the invention of the computer, the debate around the potential capabilities of artificial intelligence paralleling human intelligence has been at the centre of technological research and development. Whilst, historically, the pace of the advancement of AI had been repeatedly overestimated, it is not unlikely to say that achieving artificial general intelligence is an impossible goal (Bostrom, 2014). In fact, a look into the future suggests that if AI progresses further, it might lead to a 'technological explosion', where AI could potentially succeed human intelligence some day in the near future (Tegmark, 2017; Yeoman, 2012).

An inspection of AI in the year 2020 reveals that AI has already found its footing in a variety of usage scenarios, including business, tourism and everyday life contexts, although these may sometimes be easily overlooked (Tussyadiah & Miller, 2019). For instance, intelligent systems are used to enhance customer services, to monitor and report specific business purposes and to help customers with questions and transactions (Ivanov et al., 2017). Virtual assistants, such as Apple's Siri, Google's Allo or Google's Duplex, are only but a few applications that have come into use in many people's daily life situations. In tourism and hospitality, there is evidence of AI-facilitated service delivery - from the implementation of voice assistants (Fox, 2018) to room service and further up to service robots (Ivanov et al., 2019; Osawa et al., 2017).

Despite these pioneering examples, the full potential of AI implementation across contemporary service ecosystems, particularly in the arena of tourism destination systems, is still far beyond reach. With a technology of the presence and future, it is thus of critical societal and managerial interest to go beyond the current reality's status quo of 'what is' towards a reality of 'what could be'. Taking this into account, this study adopts a futures research approach to travel to the year 2025 in order to map out the 'bright and dark' sides of AI in tourist destination experiences. While it is impossible to guarantee exact certainties relating to the future of AI (Bostrom, 2014; Tegmark, 2017), the value of future studies, including this one, lies in a) unveiling possible and plausible effects of AI regarding future customer experiences in a tourism destination context, and b) to paint a holistic picture of AI as a value-adding or value-destroying resource and its role in human experience encounters within service ecosystems.

2. Theoretical background

2.1. Artificial intelligence

The possibility of machines reaching human intelligence has been

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anticipated ever since the invention of the computer (Bostrom, 2014). Even though Alan Turing already contemplated the notion of the intelligence of machines in the 1950s (Turing, 1950), it is not clear whether machines will ever match humans in regards to their level of intelligence (Bostrom, 2014; Tegmark, 2017). In order to contextualise what is meant by AI and human intelligence, it is significant to refer to the term 'intelligence'. Intelligence can be seen as the ability to solve complex goals, understand emotional knowledge and apply logic (Tegmark, 2017). Human intelligence is complex and broad, which means that humans are able to overcome challenges and solve difficult tasks. In a similar vein, AI can be categorised into three areas: 1) narrow AI (solving only specific tasks, such as winning a chess game), 2) artificial general intelligence (AGI), which is described as human level intelligence and 3) superintelligence, a form of AI that surpasses human capacity in every aspect (Bostrom, 2014; Kurzweil, 2005; Tegmark, 2017; Wang & Goertzel, 2007).

Current examples of the development of AI often include games, such as 'DeepMind' and 'DeepBlue' (an IBM supercomputer), playing chess or beating the best 'Go' player in the world (Bostrom, 2014; Russel, 2018; Tegmark, 2017). Yet, there are numerous additional applications of AI that have a strong influence on people's daily lives (Ivanov et al., 2017), and the tourism industry (Li et al., 2019; Ritzer, 2015; Tuomi et al., 2019). Service robots, service automation and AI have entered the real world and are no longer a fantasy (Agah et al., 2016; Talwar, 2015). In fact, one can see various service robots and AI in different forms, albeit not always being able to recognise them as such (Tussyadiah & Miller, 2019). For instance, the appearance of AI can be either physical (e.g. robot Pepper), virtual, such as in the case of chatbots and voice-based assistants (e.g. Alexa or Siri), or holographic (e.g. video-based robots) (Van Doorn et al., 2017; Wirtz et al., 2018). Across these manifestations of AI, it is suggested that a physical appearance might improve the customer experience (Van Doorn et al., 2017). As AI has an increasing impact on consumer behaviour (Grewal et al., 2017) and decision-making processes (Van Doorn et al., 2017), it is important to understand exactly to what extent AI creates value and potentially enhances customer experiences when it comes to a destination.

A positive development of AI could lead to unprecedented opportunities for humankind on a larger scale. As a powerful resource, AI could transform how one interacts with others and the world, what society and individuals achieve, what one does and who one becomes (Floridi et al., 2018). On a more concrete level, Floridi et al. (2018) suggest that it is not sufficient to merely look at the promising potential of AI. What is needed is a comprehensive discussion that provides a more detailed understanding of both the bright and dark sides of AI. In fact, a negative development of technology and AI could lead to various unfavorable outcomes (Tussyadiah & Miller, 2019), cyber-warfare (Taddeo, 2018) and technological barriers, which could in turn lead to negative experiences and potential value co-destruction (Camilleri & Neuhofer, 2017; Järvi et al., 2018). Therefore, this paper argues that it is necessary to draw attention to the concrete positive and negative dispositions of value formation, and understand how the integration of AI, as a resource, may co-create or co-destroy value within tourist destination experiences.

2.2. Technology enhanced tourist experiences on the Verge to AI

Ever since the seminal work of Pine and Gilmore in the late 1990s, creating memorable experiences has been the core of business activity, especially in the tourism industry (Pine & Gilmore, 1998). Customer experiences have traditionally received a great deal of attention in tourism research and practice (Cohen, 1979; Kim et al., 2010; Ryan, 2010). Throughout the past two decades, the tourism industry and society have been witnessing the effects of an added technological layer to the tourist experience discourse as tourists increasingly co-create their experiences with multiple actors (e.g. businesses, consumers, locals) and integrate technological resources (e.g. social media, smartphones, AI, smart infrastructure) within the entire service ecosystem (Buhalis & Amaranggana, 2015; Femenia-Serra et al., 2019; Lemon & Verhoef, 2016; Neuhofer et al., 2012a,b; Neuhofer et al., 2015; Tussyadiah & Miller, 2019).

At tourism destinations, a multitude of information and communication technologies (ICTs) have been adopted to make services more efficient and to create experiences that are more personalised and relevant to the tourist in relation to their social and mobile situation (Sinarta & Buhalis, 2018; Tussyadiah, 2020). The integration of ICTs is omnipresent in all stages of a customer's journey, and has led to an integration of physical and virtual elements that foster a new type of tourist experience, a technology-enhanced tourist experience (Neuhofer et al., 2012a,b). In recent years, scholars have focused not only on the technological characteristics of ICTs but, rather, primarily on the value that ICTs provide in experiences. This includes the instant collection of information (Buhalis & Law, 2008; Navío-Marco et al., 2018; Tussyadiah & Miller, 2019) so as to enable better interactions with tourists and to lead to extended virtual and augmented 'phygital' environments (Neuburger et al., 2018); thus, opening possibilities for more value co-creation (Buhalis & Law, 2008; Rihova et al., 2018; Sinarta & Buhalis, 2018).

Amidst these advances, DMOs and tourism service providers are operating in a dynamic and ever-changing technological landscape, requiring a focus on innovation, experiences and value. Destinations need to create experiences that not only separate them from competitors (Sinarta & Buhalis, 2018) but also address tourists' pursuit and longing for extraordinary experiences and value (Camilleri & Neuhofer, 2017; Rihova et al., 2018). In this context, AI has recently been declared the next level of technology-enhanced experiences (Ivanov & Webster, 2017; Simon et al., 2020; Tussyadiah, 2020). At destinations, the latest studies have shown that AI can be used to manage tourist flows, serve as robots and autonomous trolleys at airports (e.g. KLM or Munich Airport) or increase the wellbeing of employees (e.g. through cooperation with intelligent systems). Moreover, AI can increase efficiency and productivity by reducing costs of services, increasing safety and security, supporting decision-making processes and supporting tourists in navigating (through) smart destinations (Huang & Rust, 2018; Kopacek, 2012; Tussyadiah, 2020; Wang, Huang & Morrison, 2020).

An extensive review of the literature shows that the majority of tourism studies focus predominantly on the positive sides of AI (e.g. Ivanov & Webster, 2017; Tussyadiah, 2020). Taking from the S-D logic literature, this study advocates the need to go beyond the representation of a merely positive image concerning new technologies. In fact, one of the core premises of the S-D logic suggests that value formation can occur in multiple forms. This may not only include the positive formation through value co-creation, but also its negative equivalent through value co-destruction (Camilleri & Neuhofer, 2017; Järvi et al., 2018; Johnson & Neuhofer, 2017). In order to understand AI more concretely, this study examines positive and negative value formation to shed light on the bright and dark side of AI in tourist destination experiences.

2.2.1. The bright side of AI: value Co-Creation

When examining AI, it is important to consider AI as a technological resource with the potential to transform existing tourist experiences. Recent studies have shown that AI can change and improve how customers interact with services (Ivanov et al., 2017; Tuomi et al., 2019; Tussyadiah & Miller, 2019), as well as create more innovative service offers due to the access of large amounts of data and increased computing power (McCarthy, 2017). In tourism destinations, which are known to be highly complex and multifaceted service ecosystems (Neuhofer et al., 2012a,b), it is critical to consider the engagement of all actors to maximise the interactions and opportunities towards positive value co-creation (Jaakkola & Alexander, 2014; Voorhees et al., 2017). Recent research (e.g. Tung & Au, 2018) has called for co-creation needs to go beyond traditional actor-to-actor relationships (Vargo & Lusch, 2017). Namely, the views of value co-creation need to expand to the

technological realm, and it needs to be understood that humans and machines can co-create experiences with each other. The tourism literature especially has highlighted that service encounters are often increasingly facilitated and co-created by AI technology. For instance, Ivanov et al. (2017) explored the adoption of service automation and robots, while Tuomi et al. (2019) explored how robots and AI might influence daily service operations. Further studies examined engaged AI scenarios through assisting tourists in the decision-making process of travel packages, flights or hotels (Tussyadiah & Miller, 2019), through robot servers in restaurants, hotels and theme parks, through mobile applications in museums, through self-boarding gates at airports (Ivanov et al., 2017) or through robots as a team member at work (Simon et al., 2020). The majority of these latest studies have looked at positive traits; how, through robots, chatbots or automation, AI has led and contributed to a positive value formation for the tourist and the surrounding tourism ecosystem.

2.2.2. The dark side of AI: value Co-Destruction

In an attempt to recognise that value co-creation is not always positive, the concept of value co-destruction has captured increasing attention in the marketing literature (Echeverri & Skålén, 2011). Plé and Chumpitaz Cáceres (2010) argue that value can decrease when discrepancies between resources and practices or amongst actors emerge. Recent tourism studies have found that a range of value formations have been taking place. For instance, a study by Camilleri and Neuhofer (2017) found that value, in a sharing economy context, can be co-created, co-recovered, co-reduced and co-destroyed. Meanwhile, another study by Sigala (2017) examined the co-destruction of value within service systems based on Tripadvisor. Recent research on AI highlights potential negative aspects. These aspects range from job loss, to privacy concerns, machine ethics, security issues and negative developments of superintelligence (Bostrom, 2014; Russel et al., 2015; Tegmark, 2017). Ivanov and Webster (2017), Tussyadiah (2020) and Tussyadiah et al. (2019) identified negative aspects specifically in relation to tourism. These include privacy and security concerns regarding customer data, the possible reduction of social interactions among tourists during their experiences or technological limitations that can lead to unsatisfied employees and customers. While recent studies have discussed the general issues surrounding AI implementation in the tourism industry, a concrete understanding of the impact of AI on tourist experiences is, however, missing.

2.2.3. From the status quo to the future of AI

Based on a thorough review of the literature, it is evident that the majority of studies on AI in tourism research has focused more so on the current state of AI and its possible implementations. Even though work illuminating possible future scenarios and its consequences (e.g. Yeoman, 2012) exists, the quantity of research in this area still remains relatively low. Most importantly, if the development of AI continues, a view of the status quo will not suffice. It is imperative to explore a variety of scenarios with regard to how AI will shape tourist experiences in the future. As an aid for this paper, Fig. 1 below summarises current areas and examples of AI in tourism in addition to highlighting under-researched areas of AI in tourism research. To narrow the current gaps in research, this study seeks to contribute to the future development of AI in tourism destinations and to holistically understand the dark and bright sides of AI in tourist destination experiences through the means of a co-creation or co-destruction lens.

Furthermore, Table 1 offers an extensive overview of the literature where the subjects of technology-enhanced tourist experience, AI and value co-creation intersect. The reviewed literature provided the interview instrument with the subsequent data collection through the futures wheel method.

3. Futures wheel research design

To explore the impact of AI on the tourist destination experience and uncover its positive and negative value, a futures research approach via the futures wheel method, was adopted. This particular research design has been used in recent studies in order to explore the effects of technological innovations (Farrington et al., 2013), to identify the consequences of trends in tourism (Benckendorff, 2008; Benckendorff et al.,

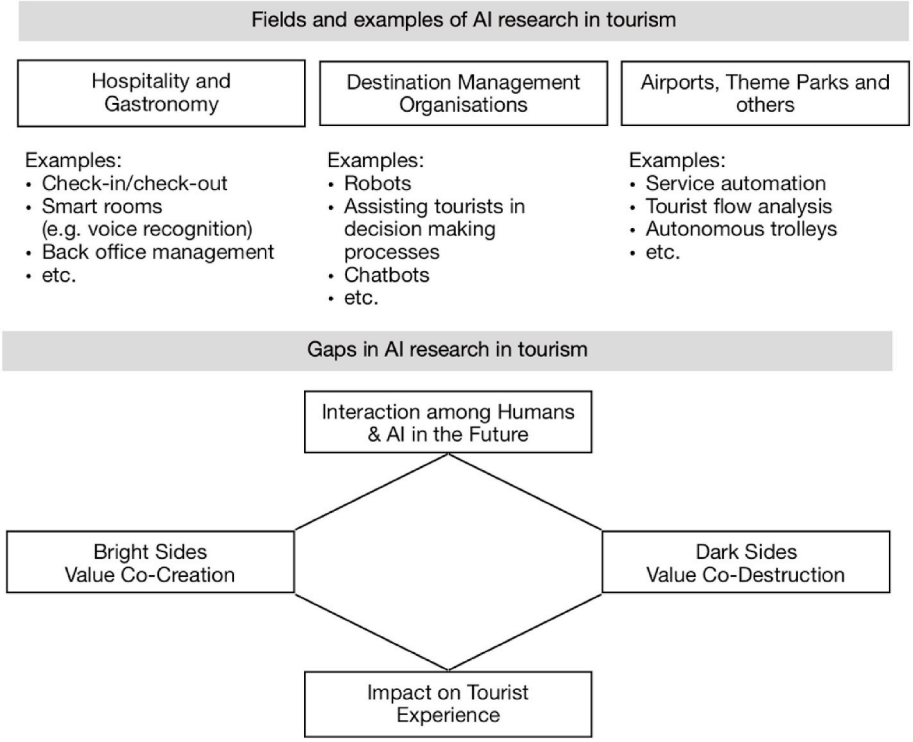

Fig. 1. Visual framework of AI research in tourism.

Table 1
Overview of AI literature in experience and value co-creation.

Reference	Description	Examples	Value Co-Creation and Co-Destruction
Fox (2018)	Adoption of robots, AI and service automation in hospitality, travel and tourism; How AI, robots and service automation can be beneficial in regard to costs, service quality, HR management, service processes etc.	Voice assistants e.g. Amazon Alexa; voice recognition; access to different services (e.g. back office, front desk, housekeeping etc.) via voice interaction;	Value Co-Creation
Ivanov and Webster (2017)	Adoption of robots, AI and service automation in hospitality, travel and tourism; How AI, robots and service automation can be beneficial in regard to costs, service quality, HR management, service processes etc.	Self-service for information/check-in/check-out; autonomous vehicles; biometric passports;	Value Co-Creation
Ivanov et al. (2017)	Adoption of robots and service automation in hospitality and tourism companies; e.g. tourism information centres, airports, hospitality sector, amusement parks, museums etc.	Robots for drink preparation, guest entertainment, information offering; AI-concierge; voice recognition;	Value Co-Creation
Ivanov et al. (2019)	Literature review on the progress of the development of robotics in hospitality and tourism	Helping decision making (e.g. finance department); check-in purposes; delivery robots;	Value Co-Creation
Ivanov et al. (2020)	COVID-19 effects on tourism; discussion of how automation technologies can benefit the industry	Room-service robots; AI-automated pricing systems; chatbots; face recognition; voice systems;	Value Co-Creation
Kuo et al. (2017)	Development of robotics in tourism	Self-service robots; robots at reception;	Value Co-Creation
Osawa et al. (2017)	Exploring the use of AI and robots in hotels, and the question if machines can replace humans in regard to work in hospitality	AI at reception; luggage robots;	Focusing on positive and negative sides
Simon et al. (2020)	Incorporating non-human operators in human teams; human-robot interaction; robots becoming members of human service teams	Robotics	Value Co-Creation
Tung and Au (2018)	Illuminating the interaction of humans and robots in tourism and hospitality, the user experience and the co-creation between humans and robots	Robotics	Value Co-Creation
Tuomi et al. (2019)	Using Lego Serious Play to identify implications and applications of emerging technologies in tourism	Robotics; AI for production & management of tourism services	Focusing on positive sides
Tussyadiah (2020)	Focusing on intelligent automation, on AI and related technologies, and its impacts on travel and tourism	Service robots; autonomous vehicles; AI systems; androids; chatbots; translation systems;	Includes positive and negative examples of AI
Tussyadiah and Miller (2019)	AI to influence responsible travel behaviour; AI for positive behaviour change	Speech recognition; voice assistants; chatbots; robots;	Includes positive and negative examples of AI
Wang et al. (2020)	Relationship between environmental stimuli and tourist experience	Smart tourism destination	
Webster and Ivanov (2020)	Robots in travel, tourism and hospitality; Focusing on the customers' perception on robots within the tourism industry	Robots for information/check-in/check-out; delivery services; service tasks; guest entertainment; robot guides; autonomous vehicles	Focusing on positive and negative sides
Yeoman (2012)	Focusing on the future of tourism, including resources, and economical or technological aspects	Cyborg; virtual autonomous avatar; AI systems (e.g. speech recognition)	Focusing on positive and negative sides

2009), or to develop forecasts of different scenarios (Glenn, 2009).

This study followed Glenn's (2009) process of the futures wheel method, which will be explained further in this section. The first step starts with a group brainstorming activity in which the subject of discussion regarding a future event, trend, idea or value is written in an oval in the centre of a paper or blackboard. In the second step, the group identifies the primary impacts of the subject while the moderator writes them down in further ovals, which are arranged around the main oval. The ovals are linked to each other and can be visualised as a wheel with spokes. In step three, the topic in the main oval is ignored for the time being so as to focus on exploring further impacts concerning the primary impact, leading to a round of secondary impacts. To continue with the layers of impacts, tertiary impacts are developed in the next round.

In other words, the core idea of this process is to use the preceding impact as a starting point for the subsequent impact, rather than limiting the focus of discussion on the initial topic. This results in layers of in-depth understanding of a specific topic. Following this process, the group carries forward by evaluating and refining the futures wheel to create a more rational outcome (Glenn, 2009) and to make the results plausible and realistic and, thus, also valuable (Wagschal, 1981).

3.1. Sampling strategy

Following the development of an interview guideline, grounded in the literature around the S-D logic, AI and tourist experiences (see Table 1) (Bostrom, 2014; Kurzweil, 2005; Rihova et al., 2018; Tegmark, 2017; Vargo & Lusch, 2017; Wang & Goertzel, 2007), study participants were then recruited. A purposive sampling approach was used to select participants based on a set of inclusion criteria; namely, a) having an understanding of and/or experience of using AI b) experience of working in the tourism industry. In addition, a third sampling criterion was used to recruit participants representing a wide range of educational and practice backgrounds to mirror a wide set of stakeholders found in tourism destination systems. Potential participants were recruited in the researchers' proximity and were invited via emails and personal phone calls, with no incentives being offered. In a few cases, this led to a

snowball-effect through word of mouth and thus to more participants.

Overall, as tourism destinations include a number of different actors and organisations, the sample represented mainly employees from destination management organisations, cable car companies and hospitality businesses. Additionally, several participants, who (also fulfilled the inclusion criteria mentioned above and) represent the younger age group, included students from the tourism, marketing and engineering field.

The data collection period of all six futures wheel groups took place in 2019. The final sample consisted of 31 participants, divided into six focus groups, and each group lasted about 50–60 min. The sociodemographic profile of the sample is as follows. The age range was distributed into three groups: 18–27 (n = 19), 28–37 (n = 6) and 38–47 (n = 6). The sample showed a distribution of male (n = 18) and female (n = 13), and educational background as having no academic degree (n = 11), bachelors degree (n = 18) or masters degree (n = 2). Although the sample consisted of 11 different nationalities, due to the sampling approach mentioned above, the majority of participants (22) were from Austria.

Before the start of the futures wheel process, and in line with sampling criteria, participants had to self-report their own understanding or experience with AI on a scale with values from 1 (no understanding of AI) to 5 (high understanding). To create valuable outcomes and to guarantee that the knowledge gap within groups was not too large, participants had to have rated 3 or above on the scale to be included in the study.

3.2. Futures wheel – data collection

At the beginning of each focus group, an introduction to the research topic on AI in tourist destination experiences was given along with information to think about AI approaching the future. Each group started with the topic of AI in the oval centre and identified primary, secondary and tertiary impacts of the futures wheel (see Fig. 2). The groups worked on the futures wheel with a focus on three main areas: a) the impact of AI on the tourist experience, b) the potential human-AI interaction and co-creation and c) potential opportunities and risks of AI in order to extract issues related to co-creation and co-destruction outcomes. The breakdown of these manageable topic categories was critical in that it enabled participants to focus on specific areas and to generate outcomes for all set research objectives. All participant comments, ideas and discussions were recorded and written on sticky notes, which provided the flexibility to move concepts into different segments around the oval and to create connections in areas related to each other. Participants were asked to discuss all impacts in their groups, further helping to identify contrary opinions and generate results that were as rational and plausible as possible.

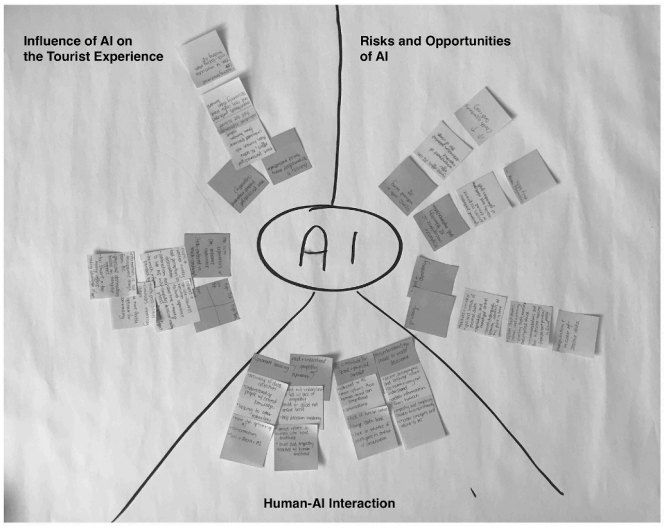

Fig. 2. Example of the futures wheel process.

3.3. Futures wheel – data analysis

For the data analysis process, the combination of written outcomes, verbal recordings and photos of the futures wheels were examined in detail. The data analysis process consisted of six transparent steps, visually summarised in Fig. 3. The first phase (P1) consisted of transcribing the results and getting an overview of the outcomes, followed by the second step (P2) focusing on thematically categorising the results into the defined areas of the futures wheel and conflating the results from the different focus groups. In phase 3 (P3), the main statements were selected and then compared to the written outcomes of the futures wheels in phase 4 (P4). This comparison was valuable in order to verify the main areas and confirm that all of the important aspects had been considered. Before the final visual model was created (P6), six participants were invited to cross-check the results (P5) to guarantee reliability and validity and to ensure that the results were reflective of the experiences and thoughts of the participants as well as representive of plausible future scenarios.

4. Findings

This study illustrates the most important themes identified through the futures wheel method, leading to the development of a novel theoretical model known as 'The Realms of AI Tourist Experiences' (Fig. 4). The model is four-dimensional with two axes. The first axis depicts the valence of positive and negative value formation manifested in the terms value co-creation and value co-destruction. The second axis shows the two realms, 1) AI interaction & co-creation and 2) AI and the tourist experience, in which the top realm consists of three sub-dimensions; namely, a) information, b) personalisation and c) integration. In each realm, a set of factors offering concrete evidence on how value may be co-created or co-destroyed when AI is integrated in tourist destination experiences is presented. Despite the topics being separated into three segments, many aspects demonstrate an interrelation. It should be noted that there is no differentiation regarding the level of importance within the realms. The results are supported by participant statements to provide a transparent narrative and understanding of AI through the participants' eyes.

4.1. Realms 1 and 3: Interaction & value Co-Creation with tourists

To gain a better understanding of AI as a resource and its effects within the destination service-ecosystem, this realm highlights the results regarding the relationship and co-creation between humans and AI. Even though many participants emphasise that there is no real interaction between humans and AI at the current point in time, there is agreement on the possibility of AI 'learning to understand' humans in the future. It can be seen that some participants display hesitation and argue that AI might not fully understand individuals' feelings and

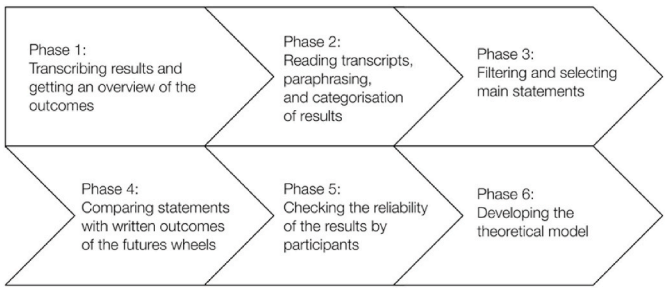

Fig. 3. Data analysis process.

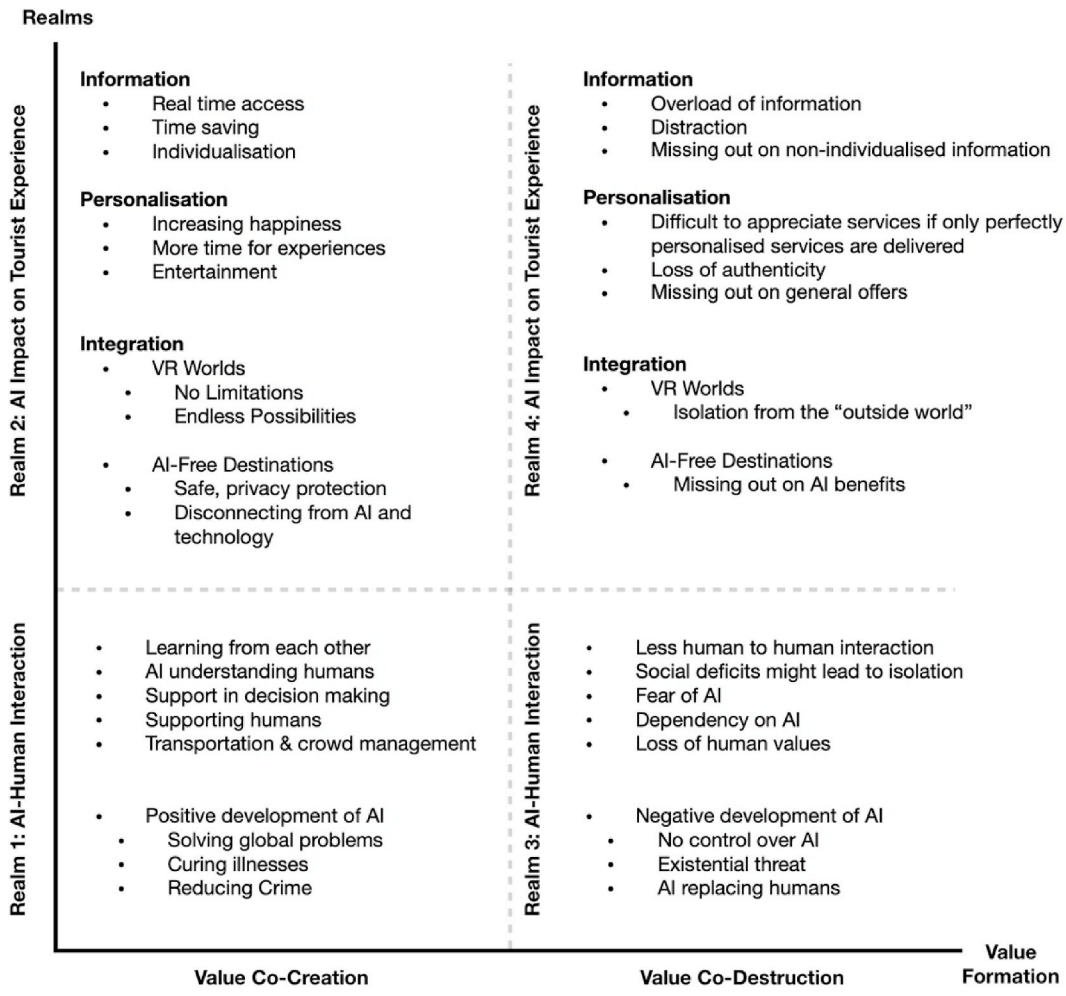

Fig. 4. The Realms of AI Tourist Experiences model.

emotions when it comes to travel.

> "Right now there is no real interaction between humans and AI. E.g. robots decode what humans say and answer because it is programmed in a certain way. Whereas, in the future, AI probably actually understands. Understands the actual meaning what a human being says." (Participant 1)

Previous research shows that AI could serve a high number of people at the same time (Ivanov & Webster, 2017) and that the quality of a service could be enhanced by engaging with customers, by offering better communication and by facilitating more interactions (Kuo et al., 2017). At the same time, participants expressed a sense of 'fear' that the interactions and communication amongst humans themselves may decrease as a consequence. Social actors, including service providers, others tourists and locals, form an essential part of the social fabric of a tourist experience (Neuhofer et al., 2012a,b); as a result, potential value co-destruction may occur if and when AI is overdone. The scenarios indicate that this might not only lead to 'social deficits' but may also lead to then 'isolation' of humans in otherwise currently social situations.

> "Social deficits could lead to the fact that people cannot have real conversations or cannot hang out with each other anymore, leading to missing communication among humans." (P16)

Particularly, if AI is able to 'understand humans' and is empathetic of their feelings, tourists might become more dependent on AI because of its level of intelligence, resulting in a preference for AI and AI-led 'decisions for and instead of humans'. Participants described this scenario as follows:

> "People are probably getting used to asking AI what they have to do, so they become unable to make decisions on their own. Thus, people might get dependent or addicted to AI." (P27)

> "The fact that AI might have empathy etc., does not mean that the decisions are going to be influenced by emotions. AI can show empathy and still be rational – it is AI. It is smarter than humans. However, it should be possible that AI learns from humans, and humans learn from AI." (P22)

The latter statement shows that value may be co-created when AI and humans interact and 'learn from each other'. In this context, AI is pictured as a key 'supportive resource' in various daily tasks (e.g. planning trips or making decisions). Second, solutions might indeed make use of the idea of AI serving as a 'personal friend', listening to the problems of tourists and offering suggestions based on a person's mood and feelings in a specific context or situation. This is consistent with the work of Sinarta and Buhalis (2018), suggesting the valuable impact of ICTs on destinations, when technology is able to recognise a tourist's social context and makes suggestions relevant to a context and location in real-time.

> "AI should learn from you and if you talk to AI you should learn from it." (P22)

> "The AI listens to you and is there for you." (P29)

One further distinct value-adding feature of AI is that it might 'solve

problems' that humans cannot. In this regard, certain scenarios indicate that AI could co-create value in the area of mobility and transportation in tourism destinations. For instance, AI could make transportation more organised, leading to fewer accidents or traffic jams. Another example would be at tourism sites, where crowds could be managed more efficiently, leading to less overcrowded sites and attractions in general.

Going beyond the status quo and aiming more towards the year 2025, participants also expect AI to become a form of 'support' in tourism scenarios for certain challenges and to solve complex problems that cease to be solved by humans. In consideration of the three intelligence stages of AI (e.g. Bostrom, 2014; Kurzweil, 2005; Tegmark, 2017; Wang & Goertzel, 2007), the 'development of AI' could lead to different futures. This includes the forms of AI (virtual, holographic and physical) mentioned by Van Doorn et al. (2017) and Wirtz et al. (2018), which might change over time as well. Some participants imagine, through the advancement of AI, humans and technology merging to such a degree as to where people integrate AI into their human bodies, leading to a modification or enhancement of human capacity both in travel and everyday life. This not only has critical implications for the co-creation of experiences in tourism but also for larger lifelong implications.

> "I think humans and AI are combined, like "cyborgs". Humanity will modify itself. But [with] humans being in control of the modification." (P17)

With regards to value co-destruction, the findings revealed that some participants 'fear the development' and, thus, the adoption of AI, especially if AI surpasses human intelligence. Built on the argument that the creators of AI might not be able to identify how intelligent AI will be, and whether AI learns by itself, it could feasibly become smarter than humans.

> "I think we should stop the development of AI at some point. If we assume AI starts learning by itself and even though humans created AI, AI could outrun us (humans). It could turn out to be great, or really bad." (P9)

> "Moreover, if AI learns by itself, and it gets smarter over time, I believe that humans should stay the most intelligent species on earth. If AI gets smarter than humans, then AI could control humans. This might lead to war or other catastrophic situations." (P16)

Regardless of the advancement of AI, the futures wheels indicate that tourists strongly evaluate the interaction with AI based on its ability to understand humans and emotions. From a S-D logic perspective, Vargo and Lusch (2016) suggest that all actors within the ecosystem benefit from interactions with each other due to the fact that all actors use their knowledge and skills to form value. The exact role and value that AI generates is thus solely dependent on its development towards levels of general artificial intelligence (Bostrom, 2014; Kurzweil, 2005; Tegmark, 2017; Wang & Goertzel, 2007) and its ability to imitate human capabilities. Related to previous research, explaining that AI still has agency despite it missing human traits (Koski & Bäcklund, 2017), the futures wheel findings suggest that AI could learn by itself and become its own entity with agency in the future. Hence, value co-creation could occur in two of the following scenarios: a) AI as a resource that is integrated and acted upon by tourists or b) as an independent actor (e.g. robot) that autonomously acts, interacts and co-creates with humans. In the latter scenario, AI would transcend its role as an operant resource and take on the role of a non-human actor.

4.2. Realms 2 and 4: AI and the tourist experience

The findings revealed that the main impacts of how AI may influence the tourist experience in the future year of 2025 emerge in three distinct themes, namely (1) 'information' (2) 'personalisation' and (3) 'holistic technological integration'.

Information. The first emerged theme was labelled as 'information'. The model summarises the bright and dark sides of AI, as value co-creation occurs through 'real time presentation of information', 'access to information' regardless of location and time, and the 'individualisation' of offers. Contrary, value co-destruction is identified primarily linked to 'information overload', 'distraction' and 'missing out on certain information'.

Within tourism destinations, it has been previously noted that AI can occur in different forms (Van Doorn et al., 2017; Wirtz et al., 2018). In this study, participants agreed that offers, information and experiences might be presented in the form of robots, machines and software. While AI-supported applications, managed from the tourist's own mobile device, could display or even book individualised offers, DMO-provided robots could add value by guiding people through urban destination areas. This could lead to a spectrum of AI, operated by end-users and DMOs alike, with the ultimate purpose of holistically enhancing the tourist's experience of a particular place. In addition, participants discussed AI as a mode for autonomous busses, which may identify points of interests or objects, display the information via augmented reality (AR) on the windows and tell stories about an area or object. This scenario illustrates that tourists could gain instant access to information wherever they are. What emerges is an AI-enhanced tourist experience that is perceived as more informed when relevant information is accessed via a certain device, presented in form of a robot, or displayed on bus windows. The following quotes demonstrate how AI could create informational value in tourist destination experiences.

> "AI-city-guide-robots could enhance the experience because tourists would receive information just right on time, which could be combined also with video and audio. Even though the service is not delivered by a human, every tourist could have its own guide if needed. There would not be a shortage of tourist guides. Maybe it is even cheaper to get an AI-guide than a human guide." (P8)

> "AI could also be combined with augmented reality. For example, self-driving busses could identify areas and objects it is driving by and present information on the windows. This would allow tourists to receive explanations to everything within a destination. In addition, it might even tell a story of the area or point of interest." (P30)

On the contrary, potential value co-destruction also emerges in the realm of information. Depending on the level of automatisation regarding information, tourists might be overwhelmed by the information, offers and notifications communicated through AI systems. This could lead to a decline in the quality of the tourist experience as well as to an overall increased stress level (when multiple means of information are being pushed upon the end-user.) Therefore, a good alternative could entail giving tourists a choice and allowing them to select what and how much information they wish to receive via AI.

> "There should be a kind of regulation, how much information you want and get. And everybody should have the choice how often and to which topic they are notified." (P5)

In line with previous research highlighting that technology enhances the means of accessing information (Buhalis & Law, 2008; Navío-Marco et al., 2018; Tussyadiah & Miller, 2019), our participants agreed that the benefits of AI may outweigh its disadvantages and that AI will improve the instantaneous collection and transmission of information, regardless of time and location.

An additional factor that may lead to value co-destruction of experiences through AI in a tourism destination is distraction. For instance, if tourists visit an area because of its natural aspects and beauty, the findings reveal a general concern that AI might interfere with, and potentially ruin, the experience for the individual and surrounding tourists. Yet, AI could be a valuable resource for an overall experience if integrated at the right moments (e.g. when tourists need certain information in a certain context and/or at a certain time). Compared to ICTs

used most commonly in tourism, the findings suggest that AI may offer additional benefits by decreasing the time spent on specific tasks. This means that tourists would have more time for experiences, and people would only receive the information they actually want and need. The following quote exemplifies how AI may lead to positive and negative value formation.

> "If you say it is going to be a nature holiday and then you are only on your smartphone it is a negative impact. But on the other hand, it can enhance your experience because you do not have to do as much research as in the past because all the information is directly available on your smartphone, or on whatever AI device it is." (P27)

Furthermore, the findings revealed that when an AI algorithm only suggests the best possible experiences, other experiences, which are slightly worse but are still valuable, might become unappealing or remain hidden. This could lead to a downside of people no longer appreciating what they have as they get more and more used to AI-generated suggestions perfectly matching one's preferences. Thus, the happiness and satisfaction of tourists might decrease long-term.

> "If people only have the best experiences possible all the time, then experiences, which are only slightly worse, but still really good, might feel really bad. People can no longer appreciate what they have." (P20)

One further major theme indicates that tourists might interact less with other tourists, thus decreasing social interactions. Participants raised concerns regarding whether robots might replace hotel employees, whether information in tourism offices may be presented by a specific software or whether tourists might be guided through destinations by robots and be isolated in self-driving vehicles. While AI definitely co-creates value in such a scenario, there is a consensus amongst the participants that AI could also co-destroy experiences by decreasing interactions between humans. In the end, this might weaken the quality of a tourist experience especially since tourists often seek the authenticity of a place manifested through personal interactions within a society and its culture.

> "Especially in tourism, the interactions among people make the stay so special. Many people travel somewhere because of the culture and the hospitality of the people and locals." (P10)

> "It is also about the atmosphere and that's why I like to be there." (P31)

Personalisation. Within the realm of personalisation, value co-creation is present through 'satisfaction' and 'happiness', 'more valuable time for experiences', and 'entertainment', while value co-destruction themes are connected to the 'loss of authenticity', 'high expectations' and 'missing out on certain offers or information'. The participants reveal that AI might be able to understand tourists and identify their exact needs and wants, thus delivering the best products, services and experiences for each individual, and thereby also saving valuable time in decision-making processes, as seen in the following quotes.

> "The whole travel procedure of being on site might be more flawless. For instance, when you wake up and it is rainy, AI might be faster to create a certain offer as a substitution for the planned activity. So, it might save time and money. If AI knows your preferences, it is just easier." (P24)

> "The result would be that it saves time and that tourists have more time for experiences, more leisure time, more time for activities or to relax." (P17)

The futures wheels presented the fact that personalisation with relation to offers and experiences not only occurs during one's stay at the tourism destination, but also during the pre-travel and post-travel stages. For instance, AI is predicted to create offers of destinations or activities within destinations, leading to tourists only having to make simplified 'yes' or 'no' decisions. Anr example thereof would be that AI might book the offer on its own, based on known user preferences, and present other personalised offers as well. This next-level personalisation and automation of tourist experiences – from suggesting ideas to booking – is in line with Ivanov and Webster (2017) who argue that AI and robotics can enhance tourism experiences and improve a variety of services and processes. In the case of this study, evidence can be seen through the themes of personalised inspiration, supported decision-making and automated booking.

Regardless of the specific type of AI, enhancing experience personalisation might give tourists more time to explore a destination, relax and participate in a higher number of activities. If data processing becomes more efficient, it could reduce waiting lines in amusement parks, museums and other attractions.

> "AI can be used for improved time management. If people go to a destination and have only two days to experience everything, a place with no waiting lines, impacts the experience positively." (P8)

Participants also mentioned that AI could be used for entertainment contexts. For example, an AI-robot that looks like a local person, could entertain tourists by offering local information or telling stories. Therefore, a connection to existing studies (Van Doorn et al., 2017; Wirtz et al., 2018) can be made, which suggest that robots could be designed as humanoids and that a physical look could enhance future destination experiences. The following quote explains a humanoid scenario in entertainment in more detail.

> "For example, if you go to a certain destination and you see a robot that looks like a local person, and speaks in a weird and funny way, it could be an improvement for the tourist experience. So, in this case, it does not save time or effort but it gives a smile to a human." (P1)

Overall, it can be noted that AI can positively affect the tourist experience by 'satisfying customers' and meeting their wants and needs, by 'saving time' and thereby also creating 'more valuable time for experiences' and for on-site 'entertainment' at destinations.

Integration. As previously mentioned, there is impressive potential for AI to transform tourist experiences. Yet, more specifically speaking, the combination of AI integrated with other ICTs could open the gate for holistic experiences. Our glimpse into the future exhibited that AI might fuse with virtual reality (VR). Even though studies have shown that different technologies, including VR, are used nowadays to create a virtual experience for tourists by allowing them to explore a destination before physically visiting the area (Hopf et al., 2020; Marasco et al., 2018), coupling the potential of AI and VR might create experiences that transcend the level of immersion, information and personalisation seen today. Tourists might visit destinations in VR and enter worlds that allow them to experience destinations from a distance. Due to current travel restrictions, this is a possibility that may be particularly relevant to explore in the post-COVID19 era of tourism (Chinazzi et al., 2020; Gössling et al., 2020; Ivanov et al., 2020). Technology could offer new avenues for experiential travel – both physically and virtually.

> "People do not have to go on vacation physically. It is probably not about wearing glasses and specific destinations. More like going online, into a world, which has its own infrastructure where people can meet others and explore everything. A place where people can be whatever or whoever they want to be, and do whatever they want to do." (P19)

> "If people do not want to or do not have the resources to travel, AI might bring the destination to you, in an interactive form. If it is 10 pm and I would like to go to the mountains, then I might do that from home. It might even be possible to create the same feelings, e.g. sweating etc. So that it feels 100% real." (P28)

While AI may fully support the tourism destinations of the future, the findings also point to a notion known as 'AI-free-destination'. In a future scenario in which destinations may be highly dependent on AI, participants touched upon the idea that some destinations may choose to offer completely AI-free areas. Similar to digital detox (Dickinson et al., 2016), in these areas, tourists could essentially detach from their devices and reduce the interaction with technology and AI. With data privacy being a main concern in the realm of AI (Russel et al., 2015), value may be created for some tourists not through the availability of AI but, in fact, through its absence.

> "A different kind of experience could be if a destination decides to be a 'NO AI DESTINATION'. Therefore, people who are scared, who do not want to feel transparent or are worried about data etc., also have a place to go. A completely AI-free-zone." (P11)

The futures wheels indicate that the level of tourist experiences will heavily rely on the development of AI. With narrow AI, certain developments in the fields of AI and VR might be possible, but with AGI and superintelligence, the limitations of what is possible vanish altogether.

All in all, the model and its four realms unveil the potential integration of AI as a resource within the destination service-ecosystem, and present concrete future scenarios of how AI could shape customer experiences. This research confirms the results from existing studies (e.g. Tung & Au, 2018), which show that co-creation among machines and humans is probable and state that value formation must be recognised as positive and negative. Understanding potential value formation is of particular relevance when it comes to future ICTs that have yet to achieve mainstream adoption. Especially due to the fact that technological insufficiencies, malfunctions and usability difficulties can negatively affect tourist experiences (Neuhofer et al., 2015; Webster & Ivanov, 2020), AI could eventually lead to co-destruction. Additionally, the outcomes of this study show that tourists might miss out on broader offers and information as AI only presents narrow suggestions of what it thinks is suitable for a certain individual. With advances in technology, smart devices and AI, people have added a technological layer between themselves and an experience (Neuhofer et al., 2015), which has the potential of inducing a personal and social distance and distracting tourists from fully immersing in the destination experience.

5. Discussion

Through a futures methods approach, this study explored the impact of AI on the tourist experience and its potential for value co-creation and co-destruction in a destination context. Although AI is currently still in its early stages with respect to tourism (e.g. chatbots, service robots, face recognition), the findings paint a picture of the year 2025 in which participants have split opinions regarding the development of AI.

On the one hand, the increasing use of AI in tourism may lead to a diminishment of experiences in that it reduces social contact, isolates people and leads to overwhelming situations where technology overpowers the underlying autonomy of an experience. On the other hand, the findings also point towards a brighter side of AI in the context of tourism. Here, the futures wheels paint a picture in which AI enhances the life of individuals and the tourist experience pre, during and post travel. AI could help by creating individualised offers that meet the wants and needs of tourists, providing hyper-personalised information within specific contexts and real-time, developing existing technologies even further (e.g. self-driving busses that tell stories or robotic city guides) and by connecting and creating an integrated network of technologies with AI (e.g. through VR giving birth to next-level experience environments and maximising the value of all available technological abilities in the year 2025).

The developed model, 'The Realms of AI Tourist Experiences', zooms-in on the impacts that AI has on the tourist experience and maps out the realms of AI tourist experiences, which are systematically divided into interaction & co-creation, information, personalisation and integration.

Within these realms, value co-creation primarily occurs when AI, as a resource, is integrated in a way that it understands tourists' wants and needs and is able to make individual suggestions that solve problems. AI can be seen as a particularly supportive resource in helping tourists make useful decisions, especially when options are vast and complex. Yet, when it comes to depending on its development and when there is human dependency on AI, AI could diminish the social value of tourist experiences, create social deficits among actors as well as lead to isolation from the present surroundings due to a highly automated and individually planned and tailored experience guiding tourists on different paths.

On a wider societal level, the outcomes also show that participants believe that humans should always stay in control of AI and should have the possibility to interfere if necessary. While existing studies (e.g. Neuhofer et al., 2015) have discussed that tourists might have a negative experience due to technological barriers, this paper suggests that value co-destruction may occur rather because of an over-presence in technology, leading to a latent fear of over-dependency on AI.

Depending on whether these technological concerns can be overcome, AI may be successfully adopted and lead to a positive value formation. In a plausible future where AI is commonplace, and tourists' concerns relating to technology remain, the findings lead to the possibility of AI-free tourism contexts that would allow tourists to feel safe and reassured about technological engagement and their use of data. Yet, in such instances, tourists might *miss out* on the potential value creation that comes with the full adoption and integration of AI throughout the whole customer journey – pre, during and post travel. Supported by the fact that AI will appear in different forms (Van Doorn et al., 2017; Wirtz et al., 2018), this paper shows that the exact role of AI within the tourism service-ecosystem is not predictable, as it depends heavily on its type and development. What is, however, known at this point is the extent of the expectations placed on AI as a transformative resource and non-human actor that can enhance or destroy tourist experiences in the near future.

The question remains: when will human-level AI become a reality? In a series of interviews, Martin Ford (2018) asked leading AI experts a similar question. While the mean of the results was the year 2099, some experts had more optimistic answers. For example, Ray Kurzweil estimated the year 2029 as a turning point of AI developments (Ford, 2018). This would mean that humanity could be in contact with human-level AI within a few years. Thus, looking beyond the timeframe of this paper (2025) to the decades from 2030 to 2050, today's unimaginable and unrealistic ideas could eventually indeed become a reality.

By accelerating the timeline of the findings of this study to the years 2030 and beyond, an imaginable vision of experiences in the tourism destinations of the future could involve an intelligent, ambient harmony of sustainable, autonomous transportation systems, sophisticated AR applications that seamlessly integrate human and digital aspects within the real world, VR worlds or VR attractions that are almost indistinguishable from reality or highly developed androids. AI could also serve as an innovation catalyst for various forms of space tourism and make space travel accessible for everyone. Ultimately, according to Ian Yeoman (2012), the future might even offer cyborgs in information centres and interactive real-time 3D communication in the form of virtual humans.

The future could look completely different than what these current speculations allow us to presume, assuming that highly developed forms and systems of AI may at some point be intelligent enough to create solutions, as well as problems, which are impossible for humans to fathom or let alone, solve. However, on the contrary, perhaps the assumptions of other experts are more accurate, and human-level AI will cease to exist within our lifetime.

6. Conclusions and implications

By taking a journey into the future of the year 2025 with the futures wheel method, this study aimed to explore the future of AI and its impact on the tourist destination experiences through a value co-creation and co-destruction lens (Buhalis & Law, 2008; Camilleri & Neuhofer, 2017; Järvi et al., 2018; Johnson & Neuhofer, 2017; Rihova et al., 2018; Sinarta & Buhalis, 2018). While the question of whether machines can think has accompanied us ever since Alan Turing's time (Turing, 1950), to date it still remains largely unclear how AI will develop and what this could mean for humanity. In 2020, one can see glimpses of AI applications in tourism, but, beyond that, AI lingers only as a technological buzzword and proclaimed game changer.

6.1. Theoretical implications

Drawing upon the S-D logic (Lusch & Nambisan, 2015; Vargo & Lusch, 2017), this study took a value formation perspective in order to explore the potential value co-creation and value co-destruction in the case of when AI is integrated as a resource into tourist experiences. The futures wheel gave rise to a new model, 'The Realms of AI Tourist Experiences', which offers several theoretical and practical implications as well as suggestions for future research. The theoretical contributions first lie in interconnecting and bridging S-D logic, value co-creation and tourist experience literature and generating a better understanding of the impact of AI on the tourist destination experience. Second, this paper contributes to the S-D logic field (Vargo & Lusch, 2017), where discourse surrounding technology resource integration is still rather scarce (Akaka & Vargo, 2013). By zooming-in on AI as a resource, a holistic view is offered, revealing the manifestation of value formation across the co-creation and co-destruction spectrum. Especially when it comes to emerging technologies that have yet to be fully adopted, a qualitative exploration of its perceived value, as well as obstacles causing value destruction, is relevant.

The study offers an original theoretical model (through 'The Realms of AI Tourist Experiences') in which it maps out the four concrete realms and its sub-factors leading to value formation when AI is integrated in tourist experiences. By doing so, the study adds to existing AI literature (Ivanov et al., 2017; Tung & Au, 2018; Tuomi et al., 2019; Tussyadiah, 2020; Tussyadiah & Miller, 2019) as studies advocate the need to better understand the role of AI as a non-human actor and how it might influence the interactions between services and customers. While S-D logic largely speaks of operand and operant resources that require human capacity (skills and knowledge) to be acted upon in order to generate value (Vargo & Lusch, 2016), AI manifests features that transcend the pure resource level. Our study suggests that AI is expected to understand human needs, emotions and real-time situations and offer individualised suggestions in a tourist experience. While the exact future has yet to unfold, the futures wheels have opened the doors and started a debate regarding if AI needs to be conceptualised differently - not as a resource, but as an autonomous non-human actor within the wider destination eco-ecosystem.

6.2. Recommendations for practice

Several practical implications for tourism and destination management emerge from this study. First of all, for tourism businesses, it is necessary to find a balance of how much technology and AI should be implemented. Within a tourism destination, a combination of destination-operated and user-owned AI solutions are likely to be seen, which could lead to a technology-enabled experience environment that may be distracting, reduce authentic experiences of a place or diminish the quality of experiences. In order to create positive and valuable experiences, it is necessary to focus not only on the type of technology/AI but also on its usability and functionality. On the bright side, AI could lead to enhanced experiences and value, especially when looking at AI tapping into the realm of emotional understanding, tourists' need anticipations, suggestion generation as well as real-time planning on-site and guiding based on personalised preferences. As a result, AI has the potential to unlock a whole new level of tailored tourist experiences that go beyond personalisation and are designed entirely around the individual's contextual wants and needs. Here, based on the findings of this paper, it is recommended not to overwhelm tourists with suggestions or notifications as this might lead to a negative experience.

From a wider business perspective, the study's realms show that AI can create a competitive advantage by optimising processes, increasing efficiency and creating new innovations. This can be achieved, for example, through transportation and crowd management (e.g. within the destination, at events, or theme parks, etc.), decision-making support, a better understanding of customers' feelings and emotions and through the creation of integrated technological ecosystems involving AI and virtual and augmented reality solutions. In the latter, tourists can travel to distant places, try new activities and explore unknown territories and fictional worlds.

This research is not without its limitations. A futures study aims at mapping out the potentialities even though there is never a guarantee of certainty regarding if and when exactly the identified scenarios could take place. In addition, AI is a research field that highly depends on its technological development. Since society is only at the beginning of narrow AI, scenarios relating to AI superintelligence, which, according to Gartner, will not occur in the next ten years (Goasduff, 2019), were not considered in this study. Therefore, sa suggestion for future research would be to collaborate with AI experts, futurists and technological developers, who could offer further glimpses into next level AI developments, and combine this knowledge with experts from tourism, who could envision concrete cases and usage examples. Generally speaking, further research on the impact of AI in tourist experiences is needed to better understand the types of AI in the stages of the tourist experience (pre, during, post) and to see how the transformational power of AI for tourists and service providers could take effect.

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Author statement

This paper adopts a servic-dominant logic theoretical lens and a futures method to explore a) the impact of artificial intelligence on customer experiences in the context of tourism destination for the years 2020–2025 through a value co-creation and co-destruction approach, and to paint b) a holistic picture of AI as a resource, and its role in human experience encounters in future service ecosystems. The study's main theoretical and practical contribution is a conceptualisation of the theoretical model *Realms of AI Tourist Experiences* that map out the positive and negative valences of value formation through AI in destination experiences.

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References

Social robotics. In Agah, A., Cabibihan, J. J., Howard, A., Salichs, M. A., & He, H. (Eds.), *Proceedings of the 8th international conference, ICSR 2016, Kansas city, MO,* (p. 9979). (2016) (p. 9979). Cham: Springer.

Akaka, M. A., & Vargo, S. L. (2013). Technology as an operant resource in service (eco) systems. *Information Systems and E-Business Management, 12*, 367–384.

Benckendorff, P. (2008). Envisioning sustainable tourism futures: An evaluation of the futures wheel method. *Tourism and Hospitality Research, 8*(1), 25–36.

Benckendorff, P., Edwards, D., Jurowski, C., Liburd, J. J., Miller, G., & Moscardo, G. (2009). Exploring the future of tourism and quality of life. *Tourism and Hospitality Research, 9*(2), 171–183.

Bostrom, N. (2014). *Superintelligence: Paths, dangers, strategies*. New York, NY: Oxford University Press.
Buhalis, D., & Amaranggana, A. (2015). Smart tourism destinations enhancing tourism experience through personalisation of services. In I. Tussyadiah, & A. Inversini (Eds.), *ENTER 2015 proceedings Lugano* (pp. 377–390). Vienna: Springer.
Buhalis, D., & Law, R. (2008). Progress in information technology and tourism management. 20 years on and 10 years after the internet. The state of etourism research. *Tourism Management, 29*(4), 609–623.
Camilleri, J., & Neuhofer, B. (2017). Value co-creation and co-destruction in the Airbnb sharing economy. *International Journal of Contemporary Hospitality Management, 29*(9), 2322–2340.
Chinazzi, M., Davis, J. T., Ajelli, M., Gioannini, C., Litvinova, M., Merler, S., Pastore y Piontti, A., Mu, K., Rossi, L., Sun, K., Viboud, C., Xiong, X., Yu, H., Halloran, M. E., Longini, I. M., Jr., & Vespignani, A. (2020). The effect of travel restrictions on the spread of the 2019 novel coronavirus (COVID-19) outbreak. *Science, 368*(6489), 395–400.
Cohen, E. (1979). A phenomenology of tourist experience. *Sociology, 13*(2), 179–201.
Dickinson, J. E., Hibbert, J. F., & Filimonau, V. (2016). Mobile technology and the tourist experience: (Dis)connection at the campsite. *Tourism Management, 57*, 193–201.
Echeverri, P., & Skålén, P. (2011). Co-creation and co-destruction. A practice-theory based study of interactive value formation. *Marketing Theory, 11*(3), 351–373.
Farrington, T., Crews, C., & Blenkle, J. (2013). Implications wheels: Structured brainstorming about the future. *Research-Technology Management, 56*(3), 56–58.
Femenia-Serra, F., Neuhofer, B., & Ivars-Baidal, J. (2019). Towards a conceptualisation of smart tourists and their role within the smart destination scenario. *Service Industries Journal, 39*(2), 109–133.
Floridi, L., Cowls, J., Beltrametti, M., et al. (2018). AI4People–An ethical framework for a good AI society: Opportunities, risks, principles, and recommendations. *Minds and Machines, 28*, 689–707.
Ford, M. (2018). *Architects of intelligence. The truth about AI from the people building it.* Birmingham: Packt Publishing Ltd.
Fox, J. T. (2018). *With Alexa for hospitality, Marriott adds Amazon to the guest experience.* Hotel Management. Retrieved 28.04.2019. from: https://www.hotelmanagement.net/tech/alexa-for-hospitality-marriott-adds-amazon-to-guest-experience-0.
Glenn, J. C. (2009). The futures wheel. In J. C. Glenn, & T. J. Gordon (Eds.), *Futures research methodology version 3.0*. The Millennium Project.
Goasduff, L. (2019). *Top trends on the Gartner Hype cycle for artificial intelligence, 2019.* Gartner. Retrieved 18.06.2020. from https://www.gartner.com/smarterwithgartner/top-trends-on-the-gartner-hype-cycle-for-artificial-intelligence-2019/.
Gössling, S., Scott, D., & Hall, M. (2020). Pandemics, tourism and global change: A rapid assessment of COVID-19. *Journal of Sustainable Tourism, 29*(1), 1–20.
Grewal, D., Roggeveen, A. L., & Nordfält, J. (2017). The future of retailing. *Journal of Retailing, 39*(1), 1–6.
Hopf, J., Scholl, M., Neuhofer, B., & Egger, R. (2020). Exploring the impact of multisensory VR on travel recommendation: A presence perspective. In W. Wörndl, & J. Neidhardt (Eds.), *Information and communication technologies in tourism* (pp. 169–180). Cham: Springer.
Huang, M. H., & Rust, R. T. (2018). Artificial intelligence in service. *Journal of Service Research, 21*(2), 155–172.
Ivanov, S., Gretzel, U., Berezina, K., Sigala, M., & Webster, C. (2019). Progress on robotics in hospitality and tourism: A review of the literature. *Journal of Hospitality and Tourism Technology, 10*(4), 489–521.
Ivanov, S., & Webster, C. (2017). Adoption of robots, artificial intelligence and service automation by travel, tourism and hospitality companies – a cost-benefit analysis. In *International scientific conference 'contemporary tourism – traditions and innovation'. Sofia University, 19-21 october, 2017*.
Ivanov, S., Webster, C., & Berezina, K. (2017). Adoption of robots and service automation by tourism and hospitality companies. *Revista Turismo & Desenvolvimento, 27/28*, 1501–1517.
Ivanov, S., Webster, C., Stoilova, E., & Slobodskoy, D. (2020). Biosecurity, automation technologies and economic resilience of travel, tourism and hospitality companies – a conceptual framework. *Tourism Economics*. August 2020.
Jaakkola, E., & Alexander, M. (2014). The role of customer engagement behavior in value co-creation: A service system perspective. *Journal of Service Research, 17*(3), 247–261.
Järvi, H., Kähkönen, A. K., & Torvinen, H. (2018). When value co-creation fails: Reasons that lead to value co-destruction. *Scandinavian Journal of Management, 34*(1), 63–77.
Johnson, A. G., & Neuhofer, B. (2017). Airbnb – an exploration of value co-creation experiences in Jamaica. *International Journal of Contemporary Hospitality Management, 29*(9), 2361–2376.
Kim, J. H., Brent Ritchie, J. R., & McCormick, B. (2010). Development of a scale to measure memorable tourism experiences. *Journal of Travel Research, 51*(1), 12–25.
Kopacek, K. (2012). Roboethics. *IFAC Proceedings Volumes, 45*(10), 67–72.
Koski, L., & Bäcklund, P. (2017). Whose agency? Humans and dogs in training. In T. Räsänen, & T. Syrjämaa (Eds.), *Shared lives of humans and animals: Animal agency in the global north* (pp. 11–23). Abingdon: Routledge.
Kuo, C.-M., Chen, L.-C., & Tseng, C.-Y. (2017). Investigating an innovative service with hospitality robots. *International Journal of Contemporary Hospitality Management, 29*(5), 1305–1321.
Kurzweil, R. (2005). *The singularity is near: When humans transcend biology*. New York, NY: Viking.
Lemon, K. N., & Verhoef, P. C. (2016). Understanding customer experience throughout the customer journey. *Journal of Marketing: AMA/MSI Special Issue, 80*, 69–96.
Li, J., Bonn, M. A., & Ye, B. H. (2019). Hotel employee's artificial intelligence and robotics awareness and its impact on turnover intention: The moderating roles of perceived organizational support and competitive psychological climate. *Tourism Management, 73*, 172–181.
Lusch, R. F., & Nambisan, S. (2015). Service innovation: A service-dominant logic perspective. *MIS Quarterly, 39*(1), 155–175.
Marasco, A., Buonincontri, P., Van Niekerk, M., & Orlowski, M. (2018). Exploring the role of next-generation virtual technologies in destination marketing. *Journal of Destination Marketing & Management, 9*, 138–148.
McCarthy, E. (2017). Augmented intelligence: Combining human intelligence and technology. *CFA Institute Magazine, 28*(3), 54–65.
Navío-Marco, J., Ruiz-Gómez, L. M., & Sevilla-Sevilla, C. (2018). Progress in information technology and tourism management: 30 years on and 20 years after the internet - revisiting Buhalis & law's landmark study about eTourism. *Tourism Management, 69*, 460–470.
Neuburger, L., Beck, J., & Egger, R. (2018). The 'Phygital' Tourist Experience: The use of augmented and virtual reality in destination marketing. In M. A. Camilleri (Ed.), *Tourism planning and destination marketing* (pp. 183–202). Bingley: Emerald Publishing Limited.
Neuhofer, B., Buhalis, D., & Ladkin, A. (2012a). Conceptualising technology enhanced destination experiences. *Journal of Destination Marketing and Management, 1*(1–2), 36–46.
Neuhofer, B., Buhalis, D., & Ladkin, A. (2012b). A typology of technology-enhanced tourism experiences. *International Journal of Tourism Research, 16*(4), 340–350.
Neuhofer, B., Buhalis, D., & Ladkin, A. (2015). Technology as a catalyst of change: Enablers and barriers of the tourist experience and their consequences. In I. Tussyadiah, & A. Inversini (Eds.), *Information and communication technologies in tourism 2015* (pp. 789–802). Cham: Springer.
Osawa, H., Ema, A., Hattori, H., Akiya, N., Kanzaki, N., Kubo, A., Koyama, T., & Ichise, R. (2017). Analysis of robot hotel: Reconstruction of works with robots. In *2017 26th IEEE international symposium on robot and human interactive communication (RO-MAN). Lisbon, august 2017* (pp. 219–223).
Pine, B. J., II, & Gilmore, J. H. (1998). *The experience economy: Work is theater and every business a stage*. Cambridge, MA: Harvard Business School Press.
Plé, L., & Chumpitaz Cáceres, R. (2010). Not always co-creation: Introducing interactional co-destruction of value in service-dominant logic. *Journal of Services Marketing, 24*(6), 430–437.
Rihova, I., Buhalis, D., Gouthro, M., & Moital, M. (2018). Customer-to-customer co-creation practices in tourism: Lessons from customer-dominant logic. *Tourism Management, 67*, 362–375.
Ritzer, G. (2015). Hospitality and presumption. *Research in Hospitality Management, 5*(1), 9–17.
Russel, S. J. (2018). In M. Ford (Ed.), *Architects of intelligence: The truth about AI from the people building it* (pp. 39–69). Birmingham: Packt Publishing Ltd.
Russel, S. J., Dewey, D., & Tegmark, M. (2015). Research priorities for robust and beneficial Artificial Intelligence. *AI Magazine, 36*(4), 105–114.
Ryan, C. (2010). Ways of conceptualizing the tourist experience: A review of literature. *Tourism Recreation Research, 35*(1), 37–46.
Sigala, M. (2017). Value co-destruction in service ecosystems: Findings from Tripadvisor. In M. Sigala, & U. Gretzel (Eds.), *Advances in social media for travel, tourism and hospitality: New perspectives, practice and cases*. New York, NY: Routledge.
Simon, O., Neuhofer, B., & Egger, R. (2020). Human-robot interaction: Conceptualising trust in frontline teams through LEGO® Serious Play®. *Tourism Management Perspectives, 35*, 100692.
Sinarta, Y., & Buhalis, D. (2018). Technology empowered real-time service. In B. Stangl, & J. Pesonen (Eds.), *Information and communication technologies in tourism 2018* (pp. 283–295). Cham: Springer.
Taddeo, M. (2018). The limits of deterrence theory in cyberspace. *Philosophy & Technology, 31*(3), 339–355.
Talwar, R. (Ed.). (2015). *The future of business*. Tonbridge: Fast Future Publishing.
Tegmark, M. (2017). *Life 3.0: Being human in the age of artificial intelligence*. New York, NY: Alfred A. Knopf.
Tung, V., & Au, N. (2018). Exploring customer experiences with robotics in hospitality. *International Journal of Contemporary Hospitality Management, 30*(7), 2680–2697.
Tuomi, A., Tussyadiah, I. P., & Stienmetz, J. (2019). Leveraging LEGO Serious Play to embrace AI and robots in tourism. *Annals of Tourism Research, 81*, 102736.
Turing, A. M. (1950). Computing machinery and intelligence. *Mind, 59*, 433–460.
Tussyadiah, I. (2020). A review of research into automation in tourism: Launching the annals of tourism research curated collection on artificial intelligence and robotics in tourism. *Annals of Tourism Research, 81*.
Tussyadiah, I., Li, S., & Miller, G. (2019). Privacy protection in tourism: Where we are and where we should be heading for. In J. Pesonen, & J. Neidhardt (Eds.), *Information and communication technologies in tourism 2019* (pp. 278–290). Cham: Springer.
Tussyadiah, I., & Miller, G. (2019). Perceived impacts of artificial intelligence and responses to positive behaviour change intervention. In J. Pesonen, & J. Neidhardt (Eds.), *Information and communication technologies in tourism 2019* (pp. 359–370). Cham: Springer.
Van Doorn, J., Mende, M., Nobble, S. M., Hulland, J., Ostrom, A. L., Grewal, D., & Petersen, J. A. (2017). Domo Arigato Mr. Roboto: Emergence of automated social presence in organizational frontlines and customers' service experiences. *Journal of Service Research, 20*(1), 43–58.
Vargo, S. L., & Lusch, R. F. (2016). Institutions and axioms: An extension and update of service-dominant logic. *Journal of the Academy of Marketing Science, 44*, 5–23.
Vargo, S. L., & Lusch, R. F. (2017). Service-dominant logic 2025. *International Journal of Research in Marketing, 34*(1), 46–67.
Voorhees, C. M., Fombelle, P. W., Gregoire, Y., Bone, S., Gustafsson, A., Sousa, R., & Walkowiak, T. (2017). Service encounters, experiences and the customer journey:

Defining the field and a call to expand our lens. *Journal of Business Research, 79*, 269–280.
Wagschal, P. (1981). Futuring: A process for exploring detailed alternative futures. In *World future society bulletin (now the futures research quarterly), september/october, 25-31*.
Wang, P., & Goertzel, B. (2007). *Introduction: Aspects of artificial general intelligence*. Amsterdam: IOS Press.
Wang, J., Xie, C., Huang, Q., & Morrison, A. M. (2020). Smart tourism destination experiences: The mediating impact of arousal levels. *Tourism Management Perspectives, 35*.
Webster, C., & Ivanov, S. (2020). *Robots in travel, tourism and hospitality: Key findings from a global study*. Varna: Zangador.
Wirtz, J., Patterson, P. G., Kunz, W. H., Gruber, T., Lu, V. N., Paluch, S., & Martins, A. (2018). Brave new world: Service robots in the frontline. *Journal of Service Management, 29*(5), 907–931.
Yeoman, I. (2012). *2050 – tomorrow's tourism*. Bristol: Channel View Publications.