R-Tourism: Introducing the Potential Impact of Robotics and Service Automation in Tourism

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Abstract

Robotics and artificial intelligence are expected to reach their 'tipping points' over the next decade. Digitalization and service automation are already visible in the tourism sector, raising questions on their wider impact on the industry and the holiday-experience per se. Numerous application examples and cases of those technologies across the entire holiday value-chain are outlined and their diffusion drivers are discussed. Apart from providing a typology for R-tourism applications, this paper makes a strong case for the incorporation of this interdisciplinary area into mainstream tourism research.

Key words: tourism, service, robotics, automation
J.E.L. Classification: L83, D73

1. Introduction: Henn Na Hotel – A Robotic Theme-Park or the Beginning or a New Era

The concept of 'Henn Na Hotel' (http://www.h-n-h.jp/en/) in Japan underlines a commitment to introducing state-of-the art technologies in order to maximise excitement, efficiency and comfort for the guests. Amongst other innovations (e.g. voice- and face-recognition), this hotel is mainly staffed by robots. The reception is staffed by 3 multi-lingual robots (one of which is a talking dinosaur), responsible for greeting, checking-in and assisting guests. At the cloakroom, a robotic arm stores luggage, and porter robots carry them to the rooms. A standard room, accommodating 2 guests, costs between approx. €80 (Weekdays) and €250 (Weekends / Holidays) per night. Replacing a friendly, human receptionist with a robotic dinosaur may appear questionable for hospitality aficionados, but the concept appears to be successful. A second 'Henn Na hotel' has been built and is in operation (http://www.hennnahotelmaihamatokyobay.com/), featuring a guest rating of 7.4/10 (https://www.booking.com/hotel/jp/henna-hotel-maihama.de.html) in booking.com. The question here is whether such a concept is indicative of the near future.

In the late 90s, the diffusion of the internet initiated a debate concerning the transformation of the holiday-distribution channel. The so-called 'disintermediation effect', postulated that the potential of information and communication technologies and the corresponding reduction of transaction costs, could lead to the emergence of electronic markets for holidays (and holiday components), at the expense of brick-and-mortar tourism intermediaries (i.e. travel agencies and tour operators). As we approach 2020, the development and diffusion of robotics and artificial intelligence in services spark a second debate. Could the productivity- and competitiveness-related potential of those technologies enable a 'dehumanisation effect'? Subsequent to the gradual mutation of traditional intermediaries, could the future of tourism's evolution be the gradual mutation holiday service encounters? The answer is clearly a 'no'. This is not about the future; The future is already the present!

2. Tourism-4.0: Digital Transformation and Intelligent Automation in Tourism

According to World Economic Forum's (2017:05) latest report: *"The greatest societal impact may be the effect of digital transformation on the travel workforce, which could represent as many as one in every 11 jobs worldwide by 2025. Intelligent automation will change the nature of some travel jobs and eradicate others altogether."*

Within the next 5 years, Tourism 4.0-related technologies such as: cloud computing, mobile internet, robotics, artificial intelligence, autonomous vehicles and even 3D-printing are expected to have a considerable impact on the skillset-requirements, as well as on the composition of the global tourism workforce (World Economic Forum, 2016). Cognitive abilities and systems-related skills are becoming increasingly vital, within a social-skill-focused tourism education and training.

It is estimated (World Economic Forum, 2017) that the digital transformation of the tourism and travel sector implies:
- $780.000 displaced jobs, mainly front-line functions in airports and hotels
- $305 Billion value-addition for tourism companies, due to productivity and improved capacity utilisation
- $100 Billion value-migration, from traditional players to new entrants
- $700 Billion value-addition to society as a whole, due to end-customer time/money savings and by reducing security- / impact-related costs.

3. Robotic Prototypes and Application Examples in Tourism

Robots are making their appearance in practically all levels of the holiday distribution chain. The primary drivers of their adoption are: productivity, accessibility and service augmentation.

Figure no. 1: Robot Applications in Tourism – Typology and Adoption Drivers
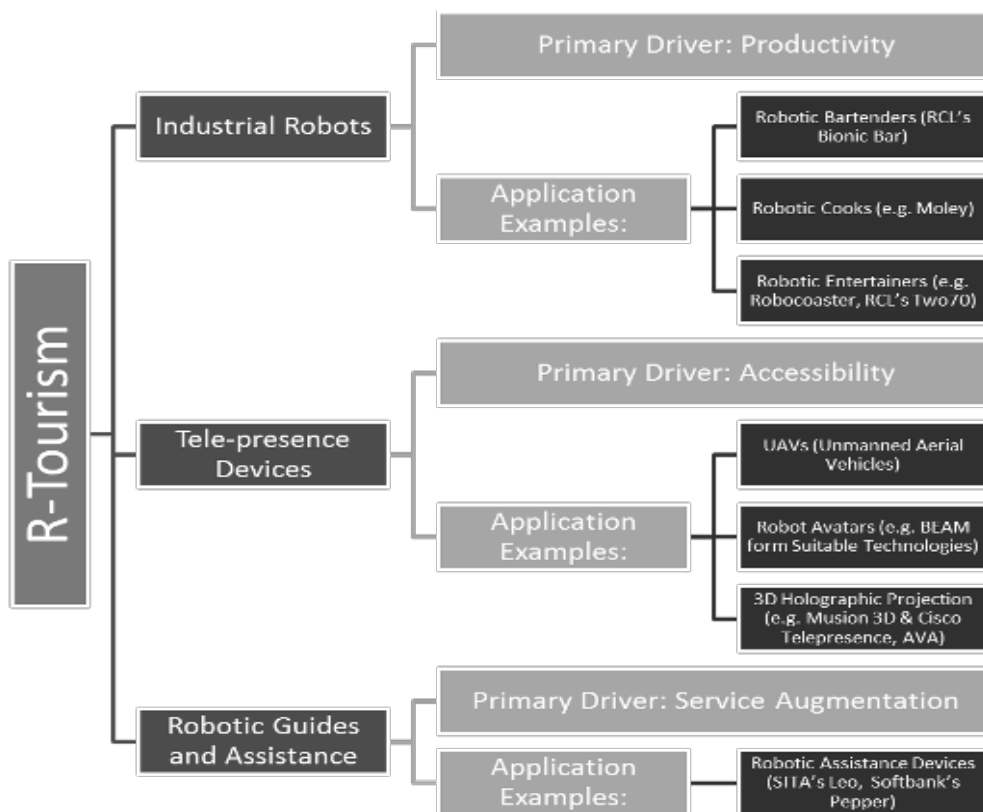
Service Augmentation: Chat Bots and Robotic Assistance Devices

Chatbots are infiltrating online communication between customers and holiday intermediaries, enabling users to interact with digital assistants, using natural language to answer travel-related inquiries and process bookings. (Sheffield, 2016). According to Sheffield (2016), those so-called 'Travel-Bots' can be categorised as:

- Customer-service Bots: Usually incorporated in the provder's website and their functions are limited to answering basic questions and assisting the user with navigating through the homepage (example: Sofia – TAP Portugal Airlines)
- Facebook Chatbots: More interactive than customer-service bots, allowing a possibility to enter search and booking-related data using another interface (Example: Expedia's or Skyscanner's Facebook Messenger Bots)
- Travel AI (Artificial Intelligence) Bots: Such applications still rely on instant messaging to interface with the customer, but also utilise algorithms and access to information to make recommendations (Example: Hello Hipmunk – A virtual travel agent using calendar and email information to produce personalised recommendations).

Robotic Assistance Devices (abbr. RADs) are currently being piloted in travel agencies (e.g. AMADEUS' Pepper), Hotels (e.g. Marriott's Mario, Botlr Robot Butler) and Airports (KLM's Spencer, SITA's Leo). Their functionality ranges from interacting and entertaining travellers to physically assisting them (e.g. transporting and checking-in luggage, guidance to departure gates).

Accessibility: Telepresence Technology

Beyond mainstream tele-conferencing and video-communications, 3D-holograms and telepresence devices promise to eliminate geographical distance enabling travellers to be virtually present in any location at any time.

Telepresence devices (e.g. BEAM Pro (https://telepresencerobots.com/robots/suitable-technologies-beam-pro), Unmanned Aerial Vehicles (New Zealand Tourism Drones: https://www.airshare.co.nz/)) combine tele-conferencing and mobility-technology to create personal 'avatars', allowing travellers and interactively visit attractions while being physically at another location. The main aim and benefit of those technologies is not replace the actual holiday experience, but to provide increased accessibility. Apart from the obvious application in accessible tourism, other examples involve the possibility to tele-visit an attraction during night-time/after-hours (http://www.nma.gov.au/engage-learn/school-programs/digital-outreach), or an otherwise not accessible, dangerous or sensitive natural environment (Rutkin, 2015).

Productivity: Industrial Robots

Industrial robots for entertainment purposes in tourism have been present for a long time, mainly due to their efficiency and reliability. A classic example are roller-coasters like RocoCoaster (http://www.robocoaster.com/). More recently, Royal Caribbean Cruises introduced robotic bartenders on their newest vessels (Quantum Class). Those robots can mix 2 drinks per minute (or 1000 drinks per day) and offer a menu of 21 cocktails aside their ability to handle custom orders (https://www.royalcaribbeanpresscenter.com/press-release/1117/bionic-bar-infographic/). Moley Robotics has constructed a robotic kitchen and is currently developing an end-consumer version of its product (http://www.moley.com/). The robotic chef can cook over 100 different meals and provide unlimited access to chefs and recipes. Its estimated price is $92.000 (Huen, 2016).

4. Tourist Acceptance: Human-Robot-Interaction and Robotic-Design

Whilst a number of the above-mentioned technologies are already a reality in tourism, they might appear counter-intuitive and unsuitable for service-encounters. Can the magnitude of automation in services match the one of manufacturing? Can technology adequately replace the

'human-face' and 'dream-inspiring hospitality' of the tourism-sector? At the end of the day, to what extent are tourists willing to adopt interact with robots during their holidays and what is their perceived optimal trade-off between efficiency and humanity.

A recent survey (sample size > 6000) on tourists' acceptance of robots (Travelzoo, 2016) reported that the majority of international travellers are comfortable with the idea of robots. The main perceived advantages were the robots' ability to handle data, deal with many languages and function non-stop. Main disadvantages included: fears of job loss and robots being 'too impersonal'. The survey also highlighted national differences in terms of adoption-readiness, with Chinese (92%) and Brazilian (73%) respondents being the most comfortable; while German (37%) and French (47%) respondents were the least. The potential of robots and their acceptance in tourism represents a novel research domain and needs to incorporate Human-Robot-Interaction (abbr. HRI) and robotic design aspects (Murphy et al, 2017).

5. Smart-Ships and Cruises 4.0: Service Augmentation as Driver of R-Tourism in Cruises

Cruise vessels have been getting larger over the last decade. Oftentimes they are described as 'Floating resorts' or 'Superliners'. This mega-ship trend is due to potentials economies of scale and on-board revenue growth, accompanying the growth and popularity of cruising as a mainstream holiday form. But ever-increasing cruise-vessel size has downsides such as: Itinerary restrictions, increased security, health and safety risks (Papathanassis, 2017).

Over the last couple of years, and complementary to the Mega-ship trend, so-called 'Smart-Ships' are appearing in the global cruise fleet. Royal Caribbean's new 'Quantum class' vessels feature a number of 'smart-features' such as (http://www.royalcaribbean.com/anthemoftheseas/already-booked/): online check-in, RFID armbands, cruise-apps, virtual balcony-staterooms, and affordable high-speed internet connectivity on-board. Smart-ships also feature robotic technology ranging from robotic bartenders, dancing robots and digitally-enabled, transformable public venues (e.g. Royal Caribbean's Two70º). Considering that Royal Caribbean's new cruise-vessel generation is smaller than the previous one, may signal a trend-shift towards smaller-but-smarter cruise vessels.

What could be the drivers behind this? Automation, digitalisation and robotics could, at least theoretically, help reduce staff costs. In the case of cruise tourism, less crew could be translated to less staff-related costs and more space and cabins for revenue-generating guests. Yet, when comparing the Quantum class with the previous generation (Oasis Class), a different picture emerges. In Table 1, a comparison between RCL's Oasis of the Seas (Megaship) and the Anthem of the Seas (Smart Ship), details and illustrates this point.

In this example, it becomes evident that the primary driver of technological innovation is not human-related cost-reduction. The 'smarter' Anthem of the Seas is smaller, cost more to construct, carries fewer passengers, while offering more space per passenger (Difference of 1.98 GRT/Passenger more) and better service (difference of 0.15 Passenger /Crew Ratio). The technological innovation appears to be employed mainly for enhancing the holiday experience (see 'Service Augmentation' Driver – Figure 1).

Table no. 1: Smart vs Mega: A Comparison between RCL's Oasis of the Seas and Anthem of the Seas

Indicator / Metric	Oasis of the Seas	Anthem of the Seas	Difference
Passengers	5412	4100	*1312 (25%)*
Max Passengers	6318	5400	*918 (14%)*
Crew	2394	2165	*229 (10%)*
GRT (Size)	225300	210600	*14700 (6.5%)*
Construction Cost	$900 Mil	$950 Mil	*$50 Mil (5.5%)*
Length (m)	362	347	*15 (4%)*
Width (m)	60.5	41.4	*18.6 (30%)*
Space Indicator (GRT per Passenger & Crew)	**25.86**	**27.84**	*1.98*
Service Quality Indicator (Max Passengers per Crew)	**2.64**	**2.49**	*0.15*

The differences between the two ship class examples may appear minimal, but a comparison of those metrics across the global cruise fleet underlines the potential implications of digitalisation and robotics for the cruise sector. Both RCL vessels (i.e. Oasis of the Seas and Anthem of the Seas), despite being Superliners, offer space and service ratios superior to average superliners and megaliners. In fact, their indicators match those a smaller, mainstream cruise-vessels (see Figure 2).

Figure no. 2: Service- and Space-Indicators - Comparison across 264 cruise vessels

Source: http://www.cruisemapper.com/wiki/761-cruise-ship-passenger-capacity-ratings
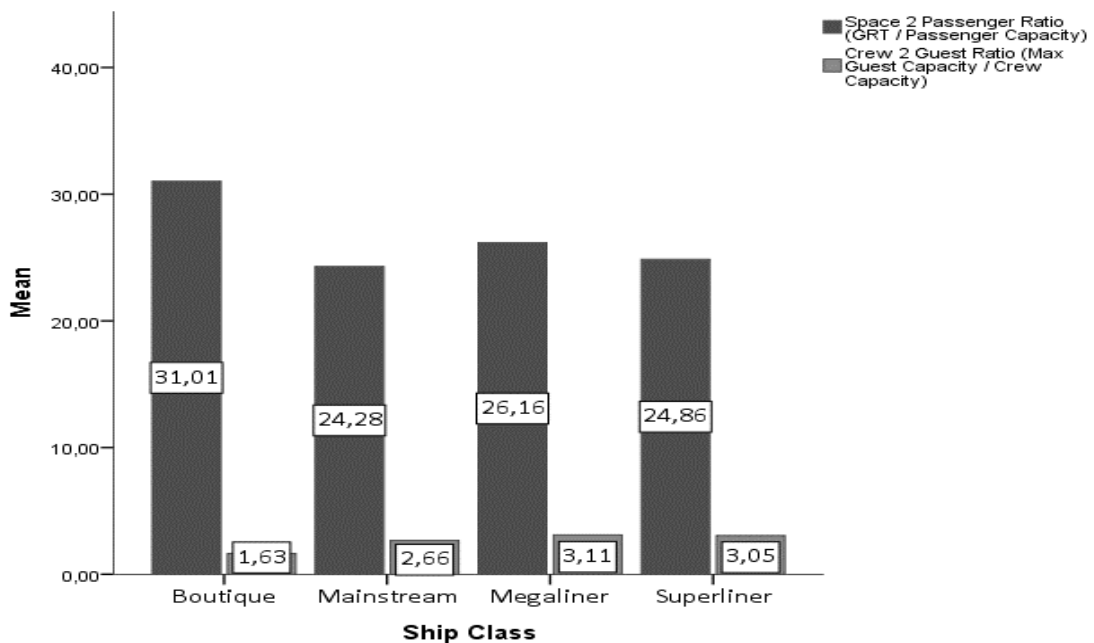
Based on Cruise Market Watch's (2016) data, crew-related costs are relatively low ($83 / passenger / day), whilst the daily average revenue per passenger sums up to $254. Therefore, it could be asserted that a more intensive service interaction, leading to higher sales on board, is economically more attractive than saving staff-costs. Indeed, this example demonstrates that R-tourism is not merely about replacing humans with robots; it bears the promise to individualise mass-tourism and standardise service exclusivity.

6. Conclusion

This paper addresses a novel aspect of tourism and explores it implications. Tourism research in the diffusion of robotics and artificial intelligence is rather limited and mainly conceptual / experimental at this stage (e.g. Yeoman & Mars, 2012; Dialo et al, 2015; Navarro et al, 2015). Nevertheless, tourism practice is rapidly evolving towards this direction, creating a research relevance gap for the next years.

Tourism companies are becoming increasingly indistinguishable to technology suppliers. In the words of TUI's CEO Fritz Joussen:

"In Silicon Valley there is little to learn about software development and technology… One can learn everything that has to do with reach, ambition, changing the world, total focus on the product, speed and competition around the clock."

Embracing, as opposed to resisting, the potential of R-tourism is exactly about that and we hope that this paper will inspire more tourism researchers and educators to incorporate this interdisciplinary area into their activities.

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