

Smart hospitality: from smart cities and smart tourism towards agile business ecosystems in networked destinations

Smart
hospitality

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Abstract

Purpose – Building on recent smart hospitality systematic reviews and extensive literature analyses, this paper aims to explore recent developments, themes and issues within smart hospitality. It synthesises existing knowledge, extrapolating forward and contributes to the future development of smart hospitality by serving as a reference to enrich academic/industry discussions and stimulate future research.

Design/methodology/approach – The research examined 8 recent review articles on smart hospitality and tourism and extracted 145 articles in peer-reviewed sources from Web of Science focussed on smart hospitality. These publications supported in-depth analysis to explore the body of knowledge and develop foresight for the future of smart hospitality within business ecosystems at tourism destinations. It synthesises knowledge and provides the basis for the development of a comprehensive in-depth research agenda in smart hospitality innovations as well as the formulation of agile hospitality ecosystems.

Findings – This paper illustrates that smart hospitality introduces disruptive innovations that affect the entire hospitality ecosystem. Smart hospitality takes advantage of smart cities and smart tourism towards establishing agile business ecosystems in networked destinations. Having reviewed the existing literature, the study developed a conceptual framework and introduced a comprehensive future research agenda. This includes the drivers of smart hospitality, namely, customer-centricity, personalisation, individualisation and contextualisation; marketing-driven hospitality excellence and metaverse; as well as operation agility, asset strategy, talent management and supplier interoperation. It also identified the foundations that provide the infrastructure for smart hospitality, including ambient intelligence, big data, processes and sustainability, providing the capability blocks to co-create value for all stakeholders in the hospitality ecosystem.

Originality/value – This study conceptualises smart hospitality as a disruptive and innovative power that will affect the competitiveness of hospitality and tourism organisations as part of a comprehensive ecosystem. It identifies the key stakeholders and explores how they can take advantage of emerging developments. This paper proposes the drivers and foundation for future research on smart hospitality. The research provides a conceptual synthesis of the literature and the concepts that have been elaborated. The foundations are effectively the infrastructure that enables the drivers to add value to different stakeholders. Key issues are identified to stimulate further research on the area to support smart hospitality development and adoption.

Keywords Smart hospitality, Hospitality ecosystem, Research directions

Paper type Research paper



Introduction: conceptualising smartness

The prefix “smart” is increasingly applied to numerous emerging technologies that facilitate the interaction between human and non-human actors in prompt, automatic and intuitive ways (Poslad, 2011). Smart cities, smart tourism, smart destinations and smart hospitality have all been used to emphasise technology-based management practices that enhance the tourism experience as well as increase the efficiency of tourism organisations and/or destinations. However, there is a lack of consensus of what is meant by smart and how organisations can improve their smartness.

Buhalis (2020) defined smartness as the structural and transformational revolution of business networks that propel practices empowered by the adoption of innovative technologies. Smartness is about optimising networks and ecosystems rather than merely improving the performance of individual processes or organisations. It requires the interconnectivity and interoperability of stakeholders to facilitate collective agility, which inevitably leads to business process reengineering and innovative approaches to value co-creation, transforming industry sectors (Buhalis *et al.*, 2019). It creates new dynamics between participants up and down the industry value chain (Jiang and Stylos, 2021). Key catalysts include not only new technologies but also the diffusion of thought leadership and innovative ways of thinking (Spencer *et al.*, 2012). Open technological architectures result in the emergence of digital platforms that enable powerful ways of manipulating big data in real-time (Stylos *et al.*, 2021b, Buhalis and Sinarta, 2019). These strengthen synergies in the ecosystem by improving inter-connectivity, operations, interactions and communications, increasing efficiency in business processes and ensuring that all stakeholder needs are being serviced (Stylos *et al.*, 2021a). Smart destinations develop adaptive strategies to face vulnerabilities through dynamic analysis of risks and potential crises and disasters leading to real time response and destination resilience for the entire ecosystem (Bethune *et al.*, 2022).

Already highly dependent on information communication technologies (ICTs) (O'Connor, 1999) tourism has been quick to realise the potential of smart. Smart tourism destinations:

Take advantage of technology embedded environments, responsive processes at micro and macro levels, end-user devices in multiple touch-points and engage stakeholders that use the platform dynamically as a neural system (Buhalis and Amaranggana, 2013).

However, smartness has been less applied to hospitality. Despite early and intensive use of technology-based systems (O'Connor and Murphy, 2004), concrete applications of smartness within hospitality appears lacking, especially for smaller and independent properties. Most hospitality organisations focus merely on operating a Web 1.0 presence through brand.com websites. Web 2.0 activity is often limited to one-directional promotions rather than fully engaging with stakeholders. Despite the potential, most hospitality organisations underutilise ICTs, retaining traditional and often unproductive management processes and legacy thinking despite the need to radically adopt innovations and progress in an incredibly connected world.

An extensive body of knowledge has been established on smart tourism but considerably fewer studies exist on smartness within hospitality (Mehraliyev *et al.*, 2019). Most papers are bibliographic in nature, which, while useful for tracking discipline development, largely fail to facilitate a deeper knowledge and understanding of key concepts. Several authors have called for in-depth qualitative analysis as well as to move beyond such mere academic analyses and demonstrate the concrete benefits smartness can bring to customers, organisations, industries and local communities (Buhalis and Leung, 2018; Huang *et al.*, 2021; Jeong and Shin, 2019).

To address this research gap, this paper leverages several systematic literature reviews of smart hospitality to synthesise developments, themes, and issues. This conceptual development

drives the future research agenda to support the deployment of smart hospitality. Thus, this paper synthesises existing knowledge and attempts to stimulate future research. The paper is organised as follows: First, the concept of “smart” is defined and its application to tourism/hospitality synthesised. Existing research on smart hospitality is then reviewed to identify salient research themes and critical issues for hospitality stakeholders. The drivers and foundation of smart hospitality are established, and future research directions outlined.

From smart cities to smart tourism and hospitality: catalysts and facilitators

As ICTs become more ubiquitous, “smart” is increasingly being used as a prefix for developments powered by the combination of automatic data collection; open, and big data; and artificial intelligence (Buhalis, 2020). With each driver evolving at a rapid pace, what exactly we can call Smart is still fuzzy and often misused. Buhalis (2020) explained that smartness takes advantage of the interconnectivity and interoperability of technologies to reengineer processes to produce innovative products and services, maximising value for all stakeholders. Harrison *et al.* (2010) stressed that smart cities are based on instruments, interconnections and intelligence, using near-real-time real-world data from both physical and virtual sensors. These are integrated through enterprise computing platforms, connecting multiple stakeholders and using complex analytics, modelling and optimisation processes to automate operational decisions. They also engage multiple stakeholders simultaneously, optimising the collective performance of the entire ecosystem. Processes are re-engineered dynamically, in real-time, increasing value for all involved. Ongoing developments in hardware, software and networks serve as enablers for the more widespread adoption of smartness. The concept of smartness does not simply imply technology but requires a plethora of interconnected devices, powered by innovative, smart, dynamic, agile processes to maximise value for ecosystem participants (Buhalis *et al.*, 2019). To be successful, agility thinking and agile transformation processes need to be applied across the ecosystem. Agility is required not only for the management of innovation, operations, back-office functions, corporate headquarters and top management of one organisation but across the entire network (Rigby *et al.*, 2020).

Several technological developments have catalysed change within hospitality, including the development of low-cost, almost disposable, radio frequency identification tags; sensors and beacons; the adoption of Internet of Things (IoT)-type devices; and widespread smartphone penetration. These advances facilitate real-time, geo-located, big data collection. Coupled with low-cost, high-speed networking capabilities, high capacity, low-cost cloud storage, as well as advanced artificial intelligence (AI) and machine learning (ML)-based algorithms, enable personalised and contextualised user experiences (Buhalis, 2020; Buhalis *et al.*, 2019). Blockchain stands to expand this even further, facilitating not just payment, but service customisation tracking, client monitoring, innovative loyalty programs, smart supplier contracts, integrated property management systems, and verified ratings and reviews on user generated content platforms (Kizildag *et al.*, 2019). Together these developments empower big data analysis to better understand consumer needs (Ahani *et al.*, 2019; Stylos *et al.*, 2021b; Loo *et al.*, 2013), satisfy customer requirements and enhance brand loyalty (Purohit and Thakar, 2019).

Technology alone is not enough to drive smart adoption. Agility enables organisations to respond effectively to contextual challenges and disruptive technologies, taking advantage of smart interconnected products and services. Agility creates unprecedented opportunities to co-create new business models within the ecosystem (Porter and Heppelmann, 2014). de Borja *et al.* (2019, p. 63) suggest that an:

Agile mindset can help a company build and sustain competitive advantage, even as small organizations and start-ups gain space, profiting from their ability to rapidly develop products as customer needs emerge.

Profiting from agility requires a fundamental change in both management mindset and organisational business models. Both need to move away from isolationistic competition, towards cooperation and communal value creation. By enabling loosely connected economic and social actors to interact together, responding to emerging value cocreation opportunities spontaneously and serendipitously, smart systems allow participants to redefine value chains and existing producer–client–competitor relationships, by engaging in open innovation and sharing strategic resources, maximising the collective potential for the ecosystem (Buhalis, 2020). Within tourism, a good example of such an approach is TripAdvisor.com. By widely sharing its proprietary review data with suppliers, search engines and others through open-application programming interfaces, the platform provides unbiased measures of product quality that can be leveraged by customers, intermediaries, destination management organisations (DMOs), governments and even competitors, increasing utility for all concerned and ultimately driving increased bookings.

Synthesizing knowledge and research on smart tourism and hospitality

Mehraliyev *et al.* (2020) maintain that smart tourism has its origins in Buhalis and Amaranggana (2013) and Wang *et al.* (2013) who both extended research on Smart Cities into the tourism domain. While technology lies at the heart of smart tourism, it is how this technology is used to make stakeholders, both individually and collectively, operate more effectively that is critical to successful implementation (Boes *et al.*, 2016). Smart tourism continues to evolve, with researchers arguing that applying smart concepts to tourism fundamentally changes the nature of the sector, transforming the conventional roles of both tourists and suppliers, as well as the nature of the tourism experience itself (Buhalis, 2020).

Working with a variety of co-authors over the years, Gretzel helped conceptualise smart tourism (Gretzel *et al.*, 2015a, 2015b, 2015c; Gretzel and Scarpino-Johns, 2018). Corrêa and Gosling (2021) explained that smart tourism is based on online platforms that collect and exchange useful information, connecting travellers, suppliers and other stakeholders together in real-time to enhance the travel experience. Enabled through such technologies, smart tourism helps deliver a memorable tourism experience to visitors, enhancing satisfaction and loyalty towards the destination (Stankov and Gretzel, 2020). It also enhances operational efficiency for other stakeholders, such as employees, suppliers, DMOs and governments (Azis *et al.*, 2020). Gretzel *et al.* (2015a, 2015b, 2015c) suggest that this goes beyond the simple application of technology to operational processes by blurring the lines between physical and digital, increasing cooperation, enhancing competitiveness, resource management and sustainability. Thus, smartness supports tourism systems to develop new levels of intelligence and revolutionise the way in which experiences are created, consumed and managed (Gretzel, 2011). Neuhofer *et al.* (2015) explain that smart tourism functions as a change catalyst to facilitate dynamic service encounters, agile consumer profiling and experience co-creation practices.

To help place smart tourism/hospitality in context, Table 1 provides an overview of multiple systematic reviews on smart tourism and hospitality published recently. The majority reach the conclusion that smart tourism remains a developing field of research. Using a mixed-methods approach, Mehraliyev *et al.* (2020) identified 11 predominant themes within smart tourism, namely:

- (1) effects of smart tourism on consumers;
- (2) development of applications or technologies;

Study	Focus	Database	Analysis period	Papers
Mehraliyev et al., 2019	Smart tourism			96
Johnson and Samakovlis, 2019	Smart tourism	Scopus, WOS	2000–2018	247
Mehraliyev et al., 2020	Smart tourism	Scopus, WOS		86
Ye et al., 2020	Smart tourism	EBSCOhost, Scopus, WOS	To 2020	124
Bastidas-Manzano et al., 2021	Smart destinations	WOS	2013–2019	258
Law et al., 2022	Smart hospitality	Science Direct, Springer, Emerald, Web of Science, IEEE Explore, Taylor and Francis, Google Scholar	To 2020	49
Chen et al., 2022	Smart tourism	WOS	To 2021	441

Table 1.
Recent review studies on smart tourism and hospitality

- (3) consumers' adoption of smart tourism;
- (4) conceptual development of smart tourism;
- (5) smart tourism planning and management;
- (6) effects of smart tourism on suppliers;
- (7) evaluation of smart systems;
- (8) development of analytical methods;
- (9) consumers' preferences on smart tourism;
- (10) suppliers' adoption of smart tourism; and
- (11) suppliers' understanding of smart tourism.

However, macro applications/technologies, such as the measurement and evaluation of smart tourism initiatives at the destination, supplier and consumer levels are less well treated. Papers identified in these studies were consolidated and systematically analysed to identify the salient research themes and critical issues underlying smart hospitality. From this macro-level analysis, the drivers and foundations of smart hospitality were conceptually established, and potential future research directions were identified. Each of these is discussed in detail below.

Smart hospitality stakeholders: reengineering value chains and processes

One of the key findings from the review papers is that hospitality organisations do not operate in isolation. They engage within multiple complex networks and value chains by cooperating dynamically with interdependent partners and the broader environment ([McWilliams and Siegel, 2001](#); [King et al., 2019](#)). Thus, when considering smart hospitality, any developments must be assessed by taking the organisation's extended ecosystem into account ([Buhalis and Leung, 2018](#)). Stakeholder theory provides an appropriate conceptual framework to structure this discussion.

[Freeman \(1984, p. 25\)](#) defined stakeholders "as any group or individual who can affect or is affected by the realisation of an organization's purpose". Stakeholder theory posits that inter-organisational linkages are essential, as they enhance stability through reinforced

power relationships, better resource mobilisation and increased formation of coalitions (Merrilees *et al.*, 2005). To be successful, companies should not just develop competitive advantage for themselves but instead try to maximise value for the entire ecosystem (Jones *et al.*, 2017; Vitolla *et al.*, 2019). Li *et al.* (2021) identify multiple stakeholders within hospitality as illustrated in Figure 1. Stakeholder theory is thus used to explore the potential benefits and challenges of smart technology for each constituent and the ecosystem as a whole.

The hotel property

At the core of hospitality is the hotel property, which coordinates internal and external resources to deliver service to customer (King *et al.*, 2019). It acts as the interface between primary (e.g. employees and operators) and more peripheral stakeholders (e.g. owners, brands, governments), delivering an acceptable experience to guests/customers at a profit (Bowie, 2018). Smart hospitality brings multiple benefits to hotel properties, leading to increased efficiency, streamlined operations, more satisfied customers, and enhanced profitability (Leung, 2019). Within sales and marketing, the availability of accurate, reliable, real-time data enables more precise targeting of customers, based not just on property-level knowledge but on the collective wisdom of the ecosystem as a whole. Similarly, hotels can leverage big data from the smart ecosystem to build more accurate customer profiles. Amalgamating clickstream data from direct marketing and distribution channels; insights from online travel agencies (OTAs); historic consumption data from customer loyalty programs; and real-time operational data hotels improve marketing campaigns, distribution channels and performance measurements (Buhalis and Volchek, 2021).

Based on these deeper data-driven insights, pricing can be adjusted dynamically in real-time, taking into account a broader range of factors than previously possible (for example, upcoming events, social activities and amended regulations and policies), maximising both yield and profitability (Buhalis and Leung, 2018). Using big data and AI-enabled tools, revenue management can shift towards more comprehensive, science-based, predictions incorporating scenario analysis, decision support and yield management (Stylos *et al.*, 2021a, 2021b; Millauer and Vellekoop, 2019). This can facilitate the implementation of dynamic pricing on OTAs and other intermediary platforms, optimising profitability for both supplier and intermediary (Oses *et al.*, 2016).

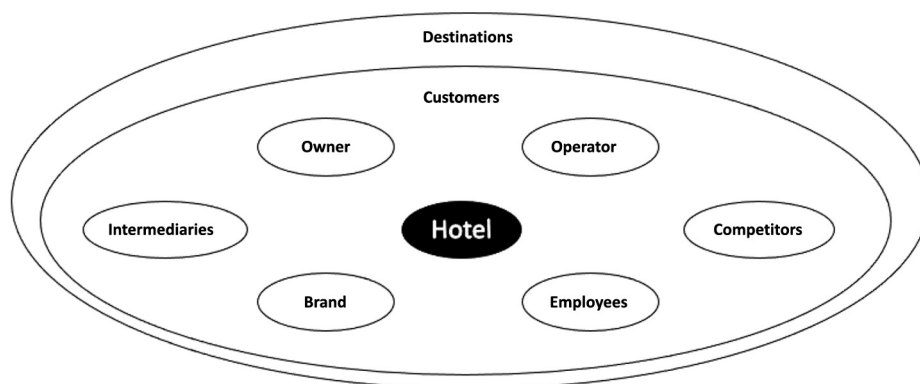


Figure 1.
Hospitality
ecosystem
stakeholders and
value cocreation

Source: Based on Li *et al.* (2021)

More comprehensive insights into guest preferences can also be used to personalise their on-property experience, increasing customer satisfaction and minimising costs (Ercan, 2019). Thanks to data-enabled guest devices, guests can be tracked, monitored and communicated with throughout the hotel property (Richard, 2017). Leveraging this rich real-time data stream and combining it with preferences surrendered voluntarily or collected surreptitiously, allows properties to propose individualised contextualised services more adapted to customer needs (O'Connor, 2020). It also introduces operational efficiencies, with intelligent systems able to leverage new data sources to proactively manage costly resources such as staff (Kim and Han, 2020), energy (Moon *et al.*, 2015) and building management (Leung, 2020). Similarly, AI-driven supply chain management can proactively analyse operational data to achieve efficiencies in inventory management and purchasing (Cole *et al.*, 2019), predict consumption based on anticipated business and optimise replenishment levels (Alharby and van Moorsel, 2017; Diaz *et al.*, 2021).

Implementing smart technologies within hotel properties is not without its challenges. Hotels have traditionally been resistant to implementing ICTs (Siguaw *et al.*, 2000). Existing systems have largely failed to keep up with technological developments, with many core applications lacking the interoperability and interconnectivity needed to empower smart hospitality (Kuo *et al.*, 2017). Advanced technologies, such as beacons/IoT devices; Big Data Analytics capabilities; or AI have not yet been widely deployed (Nadkarni *et al.*, 2019). Often data remain in analogue form or in silos within departmental applications, preventing its diffusion and use. Overall, many hotel properties lack the technological infrastructure needed to exploit Smart Hospitality effectively (Buhalis and Moldavska, 2022). Even though smart hospitality is broader than just technology alone, without this key enabler it is impossible to profit from such developments. Thus, to take advantage of smartness, hotels need to overcome this key barrier by encouraging hotel owners to make the necessary technology investments and develop their intellectual capacity (Raguseo and Vitari, 2018).

Hotel guests

Following the property itself, guests are the second key stakeholder. Hospitality establishments service both accommodation guests and users of food and beverage, meetings incentives conferences exhibitions facilities, casinos, as well as leisure and retail outlets; often as separate strategic business units. They need to engage with local cultures and authentic cuisine that are often not familiar with (Antón *et al.*, 2019). Guests receive hospitality services, with their payments compensating the hotel property and, in turn, other stakeholders (King *et al.*, 2019). In return, they expect to receive value, quality service and memorable experiences (Hosany *et al.*, 2022). This can be significantly enhanced by the successful application of smart hospitality.

Traditionally, hotels have adopted a strategy of mass customisation towards guests, resulting in both unmet needs and wasted effort. By leveraging its rich, multi-sourced, pool of data analysed by AI-based algorithms, smart hospitality can facilitate a more comprehensive understanding of guests' needs leading to reduced wasted marketing/operational effort, enhanced customer satisfaction and enhanced profitability (Kandampully *et al.*, 2018). Customers can instead be offered timely, individualised, options, based on a real-time, in-depth, understanding of their desires (Buhalis and Sinarta, 2019). Such personalisation, individualisation and contextualisation results in more relevant co-creation of experiences and enhanced stays, leading to higher guest satisfaction, more positive word-of-mouth and greater success for the ecosystem as a whole (Huang *et al.*, 2017).

However, customers do not always perceive smart technologies positively. With hospitality perceived as high-touch, many are resistant to self-service technologies,

claiming they lessen the service encounter (Stamolampros *et al.*, 2019; Choi *et al.*, 2020; Chen *et al.*, 2021; Buhalis and Moldavska, 2022). Robotics can be used to create novel experiences (Pizam *et al.*, 2022; Tung and Au, 2018) and have been shown to positively affect service quality and travellers' intention to revisit (Çakar and Aykol, 2021). However, many customers feel hesitant about such interactions (Tussyadiah and Park, 2018; Zhang *et al.*, 2022) and overuse of such technologies has been shown to reduce customer satisfaction (Buhalis and Cheng, 2020; Zhong *et al.*, 2022). Given the key role of data in smart hospitality, increased automation prior to, during and post-stay has also prompted privacy concerns, with customers increasingly concerned about how their personal data is being used (O'Connor, 2007). To take advantage of the smart movement, these privacy challenges must be overcome to give the smart ecosystem the rich data it needs to function (Jabeen *et al.*, 2022; Goel *et al.*, 2022).

Hotel asset owners

Hotel asset owners provide the capital required to develop and operate hotel properties (King *et al.*, 2019). They own the real estate and may manage the property themselves or hire operators and/or hotel chains/brands (Xiao *et al.*, 2012). They set the overall strategic direction, engaging in operating and investment decisions (Corgel, 2005). Research has shown that a data-based approach can improve hotel investment decisions (Lado-Sestayo *et al.*, 2016). Smart hospitality can provide asset owners with valuable insights, increasing the relative attractiveness of an investment. It also supports operational efficiency, increasing value and return on investment. It enhances customer satisfaction, leading to higher utilisation of resources, efficiency, loyalty, revenue and profitability (Anagnostopoulou *et al.*, 2020).

Hotel asset owners should therefore use smart hospitality strategically to enhance their competitiveness (Buhalis, 2020). However, this potential is tempered by the additional capital requirements to finance the investments necessary to facilitate smart hospitality (Leung, 2019). Smartness requires sophisticated interoperable technology-based systems, necessitating expensive enabling hardware, software and communications technologies. Also processes and managerial practices need to be reengineered to take advantage of all smart potential. With return on investment (ROI) difficult to quantify (Schatz and Bashroush, 2016), and returns flowing to the broader ecosystem rather than directly to investors, such expenditures act as a significant barrier to successful smart hospitality implementation. This is especially the case for small hospitality establishments (Buhalis, 1996).

Hotel brands/chains

Although an optional stakeholder (as many properties remain independent), brands/chains form an important component of the hospitality ecosystem (O'Neill and Mattila, 2010). According to King *et al.* (2019), through their brand standards, brands/chains homogenise facilities and interactions to give customers a clearer understanding of what to expect from each stay. Most provide a range of sales, marketing and distribution services to members and flying the flag of a major brand has been shown to have a positive effect on revenues, profitability (Carlbäck, 2019) and hotel property valuations (Singh, 2022).

In addition to generating returns for hotel asset owners, brands/chains also need to optimise value for sister properties in their portfolio and, by extension, the brand itself. For example, automatic data collection allows brands to build up comprehensive customer profiles. Leveraged collectively, and integrated with data from other stakeholders, these insights increase marketing efficiencies to better customise products and services, leading to

increased customer satisfaction; positive word of mouth; increased loyalty; and enhanced brand reputation (Leung, 2019).

However, brands are highly dependent on asset owners to provide the capital to implement the underlying technologies needed to facilitate the collection, management, analysis and use of data for smart hospitality. While brands typically specify the technologies used, investments must be paid for by asset owners who need to be convinced of the ROI. Another challenge revolves around data governance (Piccoli *et al.*, 2003). Properties and hotel chains/brands disagree as to ownership of customer data, while different legislation may apply according to the geographical jurisdiction. For example, a Novotel operated by Accor in China, with headquarters in France, is subjected to both European General Data Protection Regulation (EU) 2016/679 as well as Chinese legislation. Chains/brands also often operate multiple, sometimes competing, properties belonging to different owners. Many owners, therefore, object to allowing hotel brands to leverage their data, fearing that it may benefit their competitors (Piccoli *et al.*, 2003). This contradicts the open innovation and synergistic principles of smart hospitality, which nevertheless needs to be overcome if the concept is to be successfully implemented.

Operators/hotel management companies

Together with the asset owner and the brand, operators (often referred to as hotel management companies) are the third element of the holy trinity that run hotels. These manage properties on behalf of owners, often using the processes and standards of chains/brands (Sandstrom and Reynolds, 2020). Smart hospitality provides powerful tools for operators to manage based on real-time contextual data rather than intuition or feelings (Wong *et al.*, 2022). By consolidating historical and external data to undertake scenario analysis, decision support and optimisation of processes, smart technologies help to improve operational performance. For example, smart technology can help human resources (HR) managers to optimise HR, both strategically and operationally, by facilitating rota management; compensation data; recruitment, and onboarding, in collaboration with external agencies, hotel schools and recruitment companies. Smart hospitality also enables a constant flow of relevant employee performance data (Ahmad and Scott, 2019) and assists in evaluating employee satisfaction, through monitoring social media (Shi and Chen, 2021).

The key challenges preventing operators from profiting fully from smart hospitality revolve around leadership, perceptions and skills. With a traditional, often craft-orientated, management education path, many managers' perception of smart hospitality is limited (Leung, 2019). Their comparatively basic technical and data analytical skills lack the competencies needed to adopt and profit from smart hospitality developments. Most middle-aged general managers are digital immigrants, as their upbringing, experience and training were on analogue management tools. Digital natives have not as yet reached appropriate positions of responsibility and seniority to make radical changes and thus legacy thinking prevails. Operators, thus, not only need access to appropriate technology and data but more importantly to change their mindset towards one based on strategy and innovation (Sun *et al.*, 2020). There is also an urgent need to introduce training at all levels to allow managers to better profit from latest technological developments and the potential of smart hospitality (Ivanov *et al.*, 2020).

Employees and talent management

The concept of service is complexly intertwined with human contact and service. Employees cocreate memorable hospitality experiences (Assiouras *et al.*, 2022; Hosany *et al.*, 2022) by providing guests with services to enhance customer value and satisfaction and drive profitability (King *et al.*, 2019; Stoyanova-Bozhkova *et al.*, 2020). Even though many hospitality jobs are

unskilled (Ahmad and Scott, 2019) and paid minimum wage (Pizam, 2005), labour is typically the largest cost for hospitality businesses (Muller, 2010). The hospitality sector has struggled to attract sufficient qualified staff (Morosan and Bowen, 2022), even before COVID-19, due to low pay, difficult and stressful working conditions and anti-social hours. Smart hospitality can help alleviate these challenges by eliminating repetitive and monotonous tasks; enhancing the work environment; reducing stress; and creating more interesting, fulfilling roles for employees (Ivanov *et al.*, 2020; Liu and Hung, 2020). Smart technologies can also facilitate employee–customer interactions and elevate service effectiveness (Marinova *et al.*, 2017) as well as help housekeeping staff to carry out tasks more safely (Mejia *et al.*, 2021).

However, hotels must carefully weigh up the effect of these possibilities on guest experience (Xu *et al.*, 2020). While automation can increase efficiency and productivity, it often fails to match human employees in terms of emotional engagement, communication, adaptability and friendliness (Stoyanova-Bozhkova *et al.*, 2020). However, technology supports accessibility of destinations and all tourism and hospitality facilities (Fernández-Díaz *et al.*, 2022). More widespread adoption of smart hospitality may also result in challenges for employees. Employees' attitudes towards technology are often a major barrier for hotels wanting to move towards smart processes. Most frontline staff are service-oriented and often lack the skills to work with high-tech software and devices (Okumus *et al.*, 2017). As automation increases, employees worry about job security, with reluctance to change slowing down progress towards becoming smart (Leung, 2019). As hotels are becoming increasingly digital and automated, employee roles are gradually shifting away from providing customer service towards collaborating, operating, controlling and monitoring automated technologies, making training and reskilling an issue (Ivanov *et al.*, 2020). Online reviews by employees often reveal job satisfaction issues and employee turnover determinants (Stamolampros *et al.*, 2019, 2020). Furthermore, university and further education curricula need to strengthen students' ICT competence to be able to better understand and profit from, the potential of smart hospitality.

Intermediaries

Hotels operate at the end of a value chain, preceded by a range of intermediaries (Leung *et al.*, 2014). These include travel agents, acting as information brokers between suppliers and customers, tour operators, assembling travel components into packages and simplifying travel planning for customers and DMOs (see below) (Buhalis, 2000). Newer intermediation forms include OTAs which serve as double-sided platforms, consolidating demand for suppliers and providing one-stop-access to travel brands and trip components for customers (Beritelli and Schegg, 2016). But even though hotels rely on intermediaries (Leung, 2019), relationships have traditionally been conflictual (Buhalis, 2000). While appreciating the business delivered, hotels largely resent the resulting commissions, with many instigating direct-booking campaigns to discourage third-party bookings (Abdullah *et al.*, 2022).

Moving to smart hospitality necessitates an attitude change away from competition towards co-opetition. By working together more closely and considering the macro, rather than the micro perspective, the size of the travel pie can be increased, benefiting all stakeholders. Giving intermediaries real-time access to inventory and pricing through smart hospitality initiatives would allow optimisation of bookings across the value chain, building a more efficient market and enhancing profitability for everyone. However, despite evidence to the contrary, more conflict than cooperation persists, limiting the potential of the smart approach within hospitality.

Destinations

Hotels typically operate within a destination, leveraging their portfolio of activities, attractions and natural resources to attract clients (Buhalis, 2003). Many are managed by

DMOs: public/private partnerships charged with promoting and managing regional tourism by setting macro-level policies, regulations and guidelines for the greater good of the ecosystem as a whole (Buhalis, 2022). Many destinations developed traditional technology platforms to coordinate their offering and facilitate bookings for the entire range of services offered within their catchment area (Buhalis, 1993). Increasingly destinations are developing smart systems to improve their competitiveness and resilience, creating value for all participants (Shafiee *et al.*, 2021; Wang *et al.*, 2016). Integrating data from all tourism stakeholders, as well as from broader smart city technologies (Zhang *et al.*, 2018) in an open and transparent manner accelerates the potential of smart hospitality (Buhalis and Leung, 2018). Decisions no longer need to be made based solely on internal insights but on data, forecasts and trends automatically gleaned from the broader tourism ecosystem (Vecchio *et al.*, 2018). Planning can be coordinated at the macro level, increasing efficiency and reducing challenges such as over-crowding or over-tourism (Koens *et al.*, 2021).

Hotels can leverage these developments to enhance their guest experience by providing access to real-time destination information, such as traffic or tourist attraction capacity through guest devices (Buhalis and Sinarta, 2019; Han and Chan, 2013). By participating as a node in the smart destination, smart hospitality helps increase the power and synergy of the overall ecosystem (Ivars-Baidal *et al.*, 2019). This helps DMOs better manage the destination; match supply with demand; avoid overuse of certain assets; target marketing and expenditure; and enhance the overall tourism experience. Smart destination initiatives help DMOs better understand the needs, business patterns and success factors of participating hospitality organisations. They can then design appropriate policies to support businesses, while optimising shared tourism resources and balancing the needs of the local community (Gretzel *et al.*, 2009).

Connecting smart hospitality to smart destinations is not without its challenges. Data security and privacy are major concerns. Destinations should play a proactive role in ensuring cloud networks and shared databases are well protected (Ivanov *et al.*, 2022). Data governance requires clear rules as to how data is used and accessed (Ioannou *et al.*, 2020). DMOs have a key role in managing this key resource, avoiding ambiguity, and protecting the rights of stakeholders (O'Connor, 2020). However, with such competencies so distantly removed from the traditional work of DMOs, it is questionable as to whether many can in practice carry out such functions. Given that the success of smart tourism and hospitality is dependent on having access to shared, interoperable and interconnected systems, this challenge must be addressed as a priority to help the sector profit from the rollout of smart hospitality.

Drivers and foundations for the future smart hospitality research agenda

Smart hospitality brings a wide range of benefits, co-creating sustainable value for each stakeholder in the destination ecosystem. Guests derive value from memorable and transformative experiences; hotel properties and asset owners from operational and marketing efficiencies that increase profitability; brands and intermediaries from enhanced marketing and DMOs from increased cooperation and coordination. However considerable challenges exist in terms of making smart hospitality a functioning concept. Based on the literature, Figure 2 summarises the drivers and foundations of the future of smart hospitality as a first step in driving a future research agenda on smart hospitality. Drivers illustrate what stakeholders need to prioritise to progress and provide the key requirements, motivations and goals for smart hospitality success. They include customer-centricity, personalisation, individualisation and contextualisation; marketing-driven hospitality excellence and metaverse; as well as operation agility, asset strategy, talent management and supplier interoperation. However, drivers cannot be successful without good technology foundations. These allow drivers to

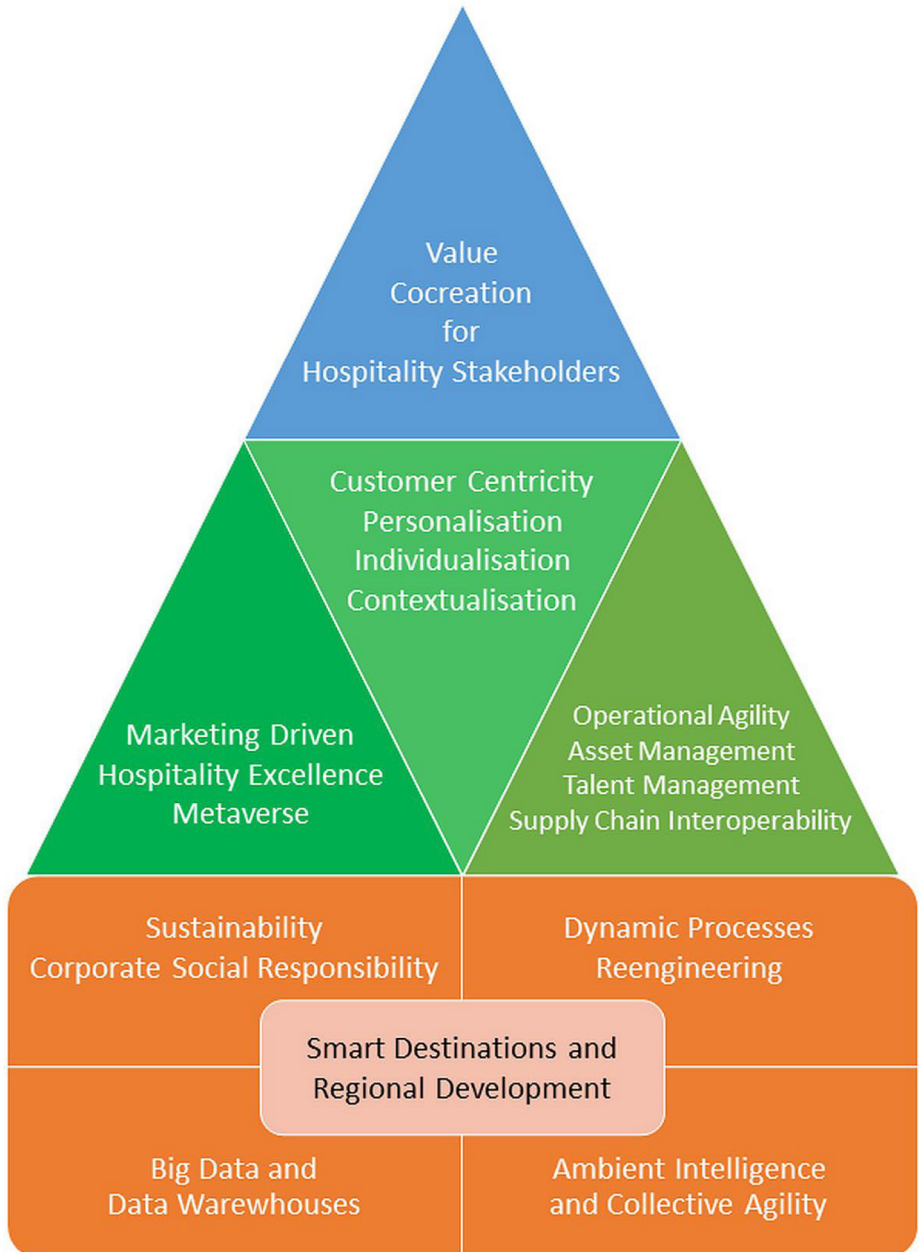


Figure 2. Drivers and foundations for the future of smart hospitality research agenda

provide value to stakeholders through smart hospitality adoption. These include big data, ambient intelligence, dynamic process reengineering and sustainability/corporate social responsibility (CSR) within the context of the destination. An in-depth understanding of each of these drivers and foundations will help establish the future smart hospitality research agenda.

Foundations of smart hospitality–research agenda

Smart hospitality needs to be based on certain core foundations that are primarily linked to the wider smart destination and regional development capabilities. These serve as the capability blocks required to activate subsequent drivers of change, with the ultimate goal of co-create value for all stakeholders in the hospitality ecosystem. Analysis of the literature allows us to identify four key themes for future research:

- (1) *Big data* provides stakeholders with rich, multidimensional data sources for decision support and strategic planning. It helps build collective agility, predict customer behavioural patterns and adjust propositions dynamically (Stylos *et al.*, 2021a, 2021b). Smart hospitality requires distributed and interconnected data warehouses that collect and analyse property-, supplier-, destination- and global-level data. Supporting a comprehensive appreciation of the macro-context will facilitate dynamic operational management decisions as well as inform strategic management. Much of the success of future hospitality organisations will come from their ability to research and develop flexible data warehouses and manage data from their constellation of customers, partners, context and competitors dynamically.
- (2) *Ambient intelligence (AmI)* creates a new infostructure and smart digital grid that support the interconnected and interoperable ecosystem among stakeholders. This provides a sensitive and flexible ecosystem with real-time services offered by extended value chains (Buhalis, 2020). Rapid development and adoption of AI, as well as ambient connectivity introduce paradigm shifts and disrupt hospitality operations (Nam *et al.*, 2021). By combining AI with disruptive technologies such as IoT, 5G mobile networks, wearables, cryptocurrency and sensor networks, hospitality ecosystems need smart hospitality research as a system of collective agility and competitiveness.
- (3) *Dynamic processes reengineering* empowers hotels to use big data to co-create individualised, personalised and contextualised value dynamically for each stakeholder. Implementing technology-supported and people-oriented smart hospitality develops new operational practices, empowers front-line staff and propels the use of automation and robotics throughout service provision. Research on novelty technologies will establish how these will disrupt traditional service delivery and what is required to re-engineer processes and reposition products and services. While COVID-19 catalysed the adoption of such technologies to provide contactless service (Garrido-Moreno *et al.*, 2021), technology alone cannot fulfil customers' needs and provide satisfying service. Hospitality moves away from "high-tech" or "high-touch" to a hybrid service co-creation that involves both tech and touch. Managers need to research and redesign the service delivery process to employ human empathy and emotional intelligence in technology interfaces.
- (4) *Sustainability and CSR* are also key foundations for smart hospitality. Customers are more loyal to responsible organisations that contribute to a sustainable environment through waste reduction, recycling and energy conservation, as well as to those contributing to their communities. With demand for high-quality

service growing, hotels face pressure to improve their environmental performance (Han *et al.*, 2018). Smart hospitality research should investigate how data exchange can reduce manual processes, allowing, for example, smart hotels to automatically adjust ambience, (temperature, lighting, TV, music, blinds etc) and enhance the guest experience. They can simultaneously optimise energy consumption and contribute to eco-friendliness and carbon footprint reduction (Han *et al.*, 2019). By linking with smart cities, smart hotels can connect with communities and ensure CSR actions contribute towards the sustainable development goals.

Drivers of smart hospitality – research agenda

While foundations provide the building blocks of smart hospitality, drivers provide the direction as well as the key requirements, motivations and goals to follow. The ultimate goal is value cocreation for all stakeholders in the hospitality ecosystem. Research needs to identify ways to develop cost-efficient smart hospitality solutions that benefit all and are widely adopted.

Customer centricity research is critical in the co-creation of value and empowerment of smart hospitality. Smartness should examine how big data and ambient intelligence, across different sources, can help to better understand consumer requirements dynamically and address them in real-time. Pre-travel, digital tools allow guests to share requirements and search for suitable providers. Increasingly AI performs unstructured searches, using natural language processing, across all resources available within the customer context. ML allow platforms to better understand both requirements and suitability of possible solutions. At the destination, smartness can fetch contextual information in real-time to support the personalisation and individualisation of value-adding services. Connecting travellers with appropriate resources and introducing them to individuals (both professionals and private) adds value to their experience. For example, hotels can introduce guests virtually before arrival, supporting C2C cocreation and organising virtual welcome parties to allow guests to meet others staying in the hotel, helping to build social connections in both the virtual and physical worlds. Smartness can help collect memories and disseminate user-generated content, contributing to the formation of long-term memorable events and enhancing customer satisfaction. Metaverse will be used extensively in smart hospitality to empower travellers to improve their experience by bridging physical and virtual resources (Buhalis *et al.*, 2023).

Marketing-driven hospitality research should take advantage of the enhanced data available to generate predictive models that dynamically organise processes and resources to bring suitable product propositions forward. Big data can help identify critical contextual information, as well as patterns of behaviour and preferences, to develop adaptive solutions. This supports the development of profitable operations, driving flexible service delivery that meets user requirements profitably. For example, knowing that a customer is departing late in the evening may trigger a late check out process; either complementary to enhance customer service or for an additional charge, enhancing profitability. Similarly, comprehensive data on room availability and demand indicators from the interconnected and interoperable hotel property management system (PMS) system as well as the entire range of distribution partners, can adjust revenue management dynamically, maximising profitability. At the prepurchase stage, Metaverse will revolutionise the ability of prospective guests to experience facilities and ambience in immersive environments (Buhalis *et al.*, 2023; Dwivedi *et al.*, 2023). Rather than relying on pictures and videos, extended reality (XR)/virtual reality (VR) technology showcase facilities, especially for major events, such as weddings or conferences. During visitation,

augmented reality can support experience co-creation and interpretation (Yovcheva *et al.*, 2014). Customers visit sites virtually, synchronised with real-life environment elements (daylight, weather, views from window) (Chung *et al.*, 2015; Leung *et al.*, 2020). Metaverse provide customers with “authentic” virtual in-room experiences, allowing potential customers to better assess the perceived enjoyment and usefulness of potential tourism product and reduce perceived risk (Flavián *et al.*, 2021). With IoT sensory simulators that simulate hotel guests’ five senses, hotel managers can implement sensory marketing to influence their emotions, affective experiences, eudaimonism (well-being), and ultimately the guest behaviour and enhance the in-room experience (Pelet *et al.*, 2021). Hotels also benefit from expanded distribution through virtual communities. Blending physical and virtual communications on virtual platforms, customers interact with hotel staff (real person or chatbot) in real-time through virtual environments to answer questions and access in-depth information. By allowing customers to try-before-they-buy and make customisations, Metaverse-enabled experiences helps make the proposed experience more tangible, giving potential customers a rich, personalised introduction to the proposed experience (Buhalis *et al.*, 2023; Dwivedi *et al.*, 2023). This should increase perceived enjoyment and usefulness and lead to higher booking intention (Israel *et al.*, 2019) and higher room rates (Yoon *et al.*, 2021).

Operation agility research should focus on the data agility organisations need to prosper in this networked world. Smart hospitality has access to a wide range of data sources, broadly classified into four groups, namely, guests, internal departments, external partners and local contextual factors. Agility can be achieved by researching a plethora of information dynamically. These should include internal business data and processes; customer profile and historical visit transactions; destination data such as tourist statistics and upcoming events; location-based data such as weather and traffic conditions and social media data such as user-generated content and reviews (Buhalis and Foerste, 2015). Smart hospitality networks should connect IoT devices and hardware with stakeholders on the smart network, further enriching the data pool. Manual processes should be replaced by interoperable application systems across the ecosystem, supporting the flexible automation of processes.

As a result, research on *hotel asset management* should demonstrate agile management and control of assets using smart hospitality networks. Scheduling staff and processes, allocating customers to space intelligently, as well as managing heating, lighting and energy consumption are some of the processes that can increase efficiency and reduce operational costs. AI-enabled tools consolidate these data to provide accurate forecasts for dynamic manpower and resources management. Understanding what is required supports the reengineering of service procedures and process to cope with dynamic changes and co-create value cost-effectively. Longer term, research should focus on how smart hospitality should provide data inputs for performing asset management, identifying new areas for investment, demonstrating properties for renovations or disinvestment based on the yields generated and the long-term prospects.

Similarly, smart hospitality research should empower HR and *talent management*. Since HR emerges as one of the most critical hospitality challenges in the post COVID era, smart hospitality can support talent management in multiple dimensions. The recruitment process is critical for attracting interest for vacancies; filtering applications; providing online tests for screening and coordinating recruitment processes. Smart hospitality facilitates the raising of awareness through partnerships with educational, employment and professional organisations. Smart hospitality can assist on-boarding, employee training, facilitating promotion cycles and ongoing life-long learning. AI-enabled technologies provide accurate business forecasts to schedule duty rosters, as well as monitor and evaluate employee performance. XR/VR platforms can support immersive training by replicating life scenarios that allow hotel

employees to learn procedures and practice their skills. Virtual environments support collaboration across different properties, countries or continents. For example, research on how multinational remote teams can collaborate effectively can help international brands to deliver consistent experiences across continents.

Finally, research on *supply chain interoperability* should facilitate stakeholder interconnectivity through smart hospitality. This should help optimise the performance of the entire ecosystem. Inter-departmental hospitality applications enable seamless interoperability within the entire supply chain. For example, supplier systems receive and respond to procurement requests to maintain inventory according to demand forecasts. Intermediaries can check last room availability and rates whilst performing bookings directly on hotel PMS systems. Live destination information, such as traffic conditions, weather, event schedules, can be collected via sensors and shared with all stakeholders. For example, a prediction of a heatwave may trigger hotels to procure additional drinks and rent ice cream trolleys, as well as to recruit of casual staff to operate additional points of sales. IoT is the catalyst for interconnecting assets and processes across the network. With standardized communication protocols, data exchange within the network across different platforms is empowered efficiently. Avoiding expensive and complex interface customisations, ensures that the entire ecosystem can work efficiently enhancing the competitiveness of each partner and the network collectively.

Conclusion: smart hospitality innovations and disruptions

Smart hospitality takes advantage of value chain networks to develop an interconnected and interoperable hospitality and tourism ecosystem. Smart destinations and regional development ultimately provide the macro-level infrastructure for smart hospitality, integrating the entire ecosystem within the local economy. Connecting key attractions and resources, as well as integrating all players, is critical for developing chains of value co-creation through the entire ecosystem. Ultimately, smart hospitality takes advantage of innovations in smart cities and smart tourism towards the development of agile hospitality business ecosystems in networked destinations. To profit from this, hotels should use smart connectivity with all stakeholders and the local community via smart networks. The local community can share information with hotel and customers, such as local cuisine and upcoming cultural activities and engage dynamically in the co-creation of value. With translation applications, local residents can interact with guests without language barriers. Smart hospitality operations can also assist the destination and hospitality ecosystems to provide sustainable and eco-friendly environments.

This paper has both theoretical and practical contributions. It synthesizes very extensive research on smart tourism and smart hospitality and conceptualises smartness as an innovative and disruptive development for the global hospitality industry. The paper clarifies that smartness is about integrating the entire value chain and creating an agile hospitality ecosystem that connects all partners. Smartness is supported by technology, but it is about leadership and innovation to optimise the competitiveness of the entire networked ecosystem. Adopting smart hospitality brings many benefits to hotel properties, their stakeholders and macro-level ecosystems. The paper highlights a number of innovations and disruptions that smart hospitality is bringing in the marketplace and identifies key opportunities for the future. Although many challenges remain, the pace of technological development continues to advance, raising consumer expectations. The future research agenda on smart hospitality is introduced through a conceptual framework that identifies smart hospitality drivers and foundations. Drivers are the factors that motivate hotels towards smartness whereas foundations are the infrastructure that supports and drives smartness. Key issues are identified to stimulate further research on the area and to support smart hospitality development and adoption in the future.

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