Received 30 September 2022
Revised 9 January 2023
Accepted 23 February 2023

Digitalizing business models in hospitality ecosystems: toward data-driven innovation

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Abstract

Purpose – Digitalization accelerates the need of tourism and hospitality ecosystems to reframe business models in line with a data-driven orientation that can foster value creation and innovation. Since the question of data-driven business models (DDBMs) in hospitality remains underexplored, this paper aims at (1) revealing the key dimensions of the data-driven redefinition of business models in smart hospitality ecosystems and (2) conceptualizing the key drivers underlying the emergence of innovation in these ecosystems.

Design/methodology/approach – The empirical research is based on semi-structured interviews collected from a sample of hospitality managers, employed in three different accommodation services, i.e. hotels, bed and breakfast (B&Bs) and guesthouses, to explore data-driven strategies and practices employed on site.

Findings – The findings allow to devise a conceptual framework that classifies the enabling dimensions of DDBMs in smart hospitality ecosystems. Here, the centrality of strategy conducive to the development of data-driven innovation is stressed.

Research limitations/implications – The study thus developed a conceptual framework that will serve as a tool to examine the impact of digitalization in other service industries. This study will also be useful for small and medium-sized enterprises (SMEs) managers, who seek to understand the possibilities data-driven management strategies offer in view of stimulating innovation in the managers' companies.

Originality/value – The paper reinterprets value creation practices in business models through the lens of data-driven approaches. In this way, this paper offers a new (conceptual and empirical) perspective to investigate how the hospitality sector at large can use the massive amounts of data available to foster innovation in the sector.

Keywords Digital transformation, Smart tourism ecosystems, Hospitality ecosystems, Data-driven innovation, Data-driven business models

Paper type Research paper

1. Introduction

Over the last decades, digitalization has redefined the rules of competition in markets by forcing companies to reread their strategies, processes and business models (Zott and Amit, 2017) through the application of technology (Corvello *et al.*, 2021). The adoption of smart technologies

European Journal of Innovation Management
Vol. 26 No. 7, 2023
pp. 242-277
Emerald Publishing Limited
1460-1060
DOI 10.1108/EJIM-09-2022-0540

has brought disruption in many business sectors, including services industries, which depend on human interaction. In the context of tourism and hospitality industry, smartness can provide a series of tools and platforms that can boost buying process and emphasize the delivery of an all-encompassing experience along the value chain and the different phases of provision (Buhalis, 2019; Jayawardena *et al.*, 2023).

The pervasive role of technologies in tourism service led to the redefinition of tourism businesses as smart tourism ecosystems (STE), interconnected networks (Valeri, 2016) that create, manage and deliver intelligent touristic experiences through technology-mediated information sharing and value co-creation (Gretzel *et al.*, 2015a; Boes *et al.*, 2016).

The digital remodeling of value creation lays the foundation for a transformation of business models that offer a comprehensive description of how a network, organization or actor can create and capture value from its activities (Zott *et al.*, 2011). Hence, the exploration of how contemporary tourism ecosystems are transforming their business models digitally can permit to analyze the new ways of creating value in tourism service and the ways in which this value can give birth to innovation (Barile *et al.*, 2017; Polese *et al.*, 2018).

The redesign of business models through new technologies requires that a strategic data management is implemented to improve decision-making processes and prompt innovative insights. In this regard, data-driven decision-making (DDDM) suggests the need to reframe and rethink business orientation and practices (LaValle *et al.*, 2011; McAfee *et al.*, 2012) through a mind-set grounded on the relevance of data in the different business processes and steps of buying behavior. Data analysis allows companies at increasing their value: then, redefining contemporary business models implies the consideration of data as a strategic resource for the improvement of value creation. By impacting on value creation, data can also have an impact on knowledge creation and on the development of innovation (Trabucchi and Buganza, 2018; Troisi *et al.*, 2020a, b). Thus, business models can be reread through the lens of data-driven approach to detect the mechanisms that can foster value creation and innovation in tourism ecosystems. For this reason, in extant research the concept of data-driven business models (DDBMs) (Hartmann *et al.*, 2014) has been introduced to investigate how contemporary business models should be redefined through the strategic inclusion of data to transform value proposition, creation and capture.

Despite the interest in the analysis of smart tourism, extant literature seems to provide limited insight on how digitalization can modify business models design (Ammirato *et al.*, 2021; Linton and Öberg, 2020) in tourism industry and in SMEs context (Andersen *et al.*, 2022). There is also little research on how the adoption of DDBMs in tourism ecosystems can enable innovation (Visvizi *et al.*, 2021; Mostaghel *et al.*, 2022).

Moreover, previous studies have focused mainly on the analysis of digitalization and of DDBMs in tourism ecosystems, without nevertheless offering a more precise analysis of sub-fields such as hospitality (Mehraliyev *et al.*, 2019; Buhalis *et al.*, 2022).

To address the abovementioned gaps, the study seeks to address the following research objectives: (1) to reveal how the key dimensions of business models in smart hospitality ecosystems can be redefined through a data-driven approach; (2) to conceptualize the key drivers for the emergence of innovation.

The results of the empirical research provide a classification of the enabling dimensions of DDBMs in smart hospitality ecosystems by shedding light on the strategies needed to comply with the mounting requests of digitalization and the underlying mechanisms for the development of data-driven innovation. The framework derived from the findings can introduce a conceptual tool for future research that aims at studying the impact of digitalization in other service industries and a practical tool for SMEs managers that can better understand the different possibilities offered by data-driven management strategies to stimulate innovation.

The paper is structured as follows. In the next section, a theoretical background on digital transformation in STE and hospitality ecosystems and on DDBMs is proposed. Then, the methodology of the research is discussed and the conceptual framework that guided the analysis is introduced. Lastly, results, discussion of the findings and conclusions are debated.

2. Theoretical background

2.1 Digital transformation in tourism ecosystems: toward data-driven orientation

Over the last decade, advances in digital technologies are creating new opportunities for services by proposing not only new platforms to increase value delivery and creation but also new ways of providing offerings to customers (Sklyar *et al.*, 2019) and of conceiving business models (Lerch and Gotsch, 2015; Parida *et al.*, 2019). Digital transformation, i.e. the process of significantly altering businesses through the use of technology, introduced new technical and technological solutions that can remodel provider's and consumer's behaviors and decision-making processes and reshape service experience along the entire consumer journey (Van Bommel *et al.*, 2014; Del Val Román, 2016).

Due to its intangible nature, mainly based on the exchange of experiences and interactions, tourism was one of the first service industries to comply with the requirement of digital transformation (Zentner and Spremić, 2021). The new technological solutions launched in contemporary tourism (from e-booking systems to social media and apps for ratings and users-generated contents) can enrich tourism experience lifecycle, enable the creation of an integrated set of travel-related activities (Ammirato *et al.*, 2015) and ensure customer engagement and pervasiveness through mobile technologies such as Internet of Things (IoT) and cloud computing systems.

2.1.1 Redefining business models in smart tourism ecosystems (STE). Digital transformation is forcing companies to increase agility and proactiveness, to implement continuous change and to constantly adapt strategies to market demand. To develop flexibility, businesses should employ innovative business models (Tohanean *et al.*, 2018; Lambert, 2018) and conceive new ways of designing customer experience.

The opportunities offered by digital platforms and technologies can multiply the touchpoints with customers and then, boost value creation, which is the core element of business models. The possibility to establish technology-mediated interactions with actors more simply and rapidly can allow at establishing collaborations with other partners and stakeholders by enriching the exchange of resources and improving strategies and revenues, other key elements of business models.

In general, the business model can be considered as a conceptual tool that allows the identification of the key components of a business (i.e. revenues, costs, providers, channels, etc.) and of the interactions among components into a comprehensive framework (Ammirato *et al.*, 2021). From an architectural point of view, a business model specifies the process of creation and offering a specific value proposition to existing and potential customers and the way in which the company captures the created value (Osterwalder and Pigneur, 2002; Hartmann *et al.*, 2016; Teece, 2018). Business models are intended as the synergistic result of three interconnected dimensions: value proposition, value creation and value capture (Richardson, 2008; Bocken *et al.*, 2014; Täuscher and Laudien, 2018). The three processes define different moments of value propagation deriving from the combination of the key elements of business models (strategy, partnership, resources, technology, economic capital and human capital). Value proposition is the offering of products-services intended for a given target of users and adapted to stakeholder needs. An effective value proposition aims at producing economic, social and overall sustainable value (Boons and Lüdeke-Freund, 2013). Value creation is at the heart of any business model (Teece, 2010) and represents the diffusion of value through the sharing of experiences and interactions

with customers aimed at seizing new business opportunities, new markets and new revenue streams. Lastly, value capture is the process of generation of new value by retaining, re-using and regenerating the value created, in terms of profit, social and economic value, sustainable competitive advantage. Value capture implies the identification of new business opportunities, which can involve changes in the social, technological and context in which the company operates (Cheah and Wang, 2017) and can, then, stimulate the digital transformation of businesses.

The conceptualization of business models confirms the relevance of the adoption of a system-level approach for the observation of the way in which companies create value (Zott *et al.*, 2011). For this reason, it follows that the digitalization of business models not only affects their individual elements but also redefines them holistically along the value chain and requires the alignment with other firm's business models within the ecosystem in which a company operates by creating a value-added network (Schallmo *et al.*, 2017). Hence, the adoption of ecosystems perspective and of a networked and multi-level perspective to analyze the process of digital transformation in business models (Reinhold *et al.*, 2017) seems to be appropriate (Tretheway and Mak, 2006). Business models can be intended as a key strategic lever for value creation across different levels of exchange in contemporary complex ecosystems of interrelated actors, relationships and activities.

Ecosystems view can provide some interpretative schemes that consider the impact of digital mind-set, strategies and tools on the different relationships and resources integration practices that occur between the actors involved in service. It is used to describe the relationships among actors (providers, users, distributors, government institutions, etc.) who collaborate to product-service exchange to enhance the creation of value (Moore, 2006; Lindgren, 2016).

For this reason, in extant service studies, the need to adopt a synthesis and multi-leveled viewpoint to analyze the incorporation of digital technologies in tourism is emphasized (Kohtamäki *et al.*, 2019). Tourism destinations have been reconceptualized to advance their digital redefinition through the concept of smart tourism destinations (STD) (Buhalis and Amaranggana, 2013; Boes *et al.*, 2016; Del Chiappa and Baggio, 2015), intended as digitized systems, processes and services (Boes *et al.*, 2015).

The ecosystems' view has been applied by Gretzel *et al.* (2015a) to introduce STE. STE are complex systems of actors (suppliers, consumers, intermediaries), whose interactions are supported by smart technologies that can help the creation and delivery of intelligent tourism experiences characterized by intensive information and resources sharing and value co-creation (Gretzel *et al.*, 2015b; Liburd *et al.*, 2017; Valeri and Baggio, 2020). The actors included are suppliers, users, tourism intermediaries (offline and online travel agencies (OTAs) such as Booking, AirBnb), residential consumers, platforms and media (Facebook, Instagram, TripAdvisor), public and voluntary organizations, data companies (Amadeus, Sabre, etc.), touristic and residential infrastructure (pools, parks, museums, etc.) and companies of other industries for complementary services (healthcare, food industry, cultural industry, etc.).

Smart technologies in STE are composed of a cohesive system of cloud computing technologies, social networks, IoT and mobile applications. These tools can enhance the interactions between actors, the human-technology interaction and information exchange by providing the possibility to establish real-time communication, personalized interactions and to increase engagement (Del Chiappa and Baggio, 2015; Valeri and Baggio, 2021). Resource integration is the process of dynamic combination of knowledge, skills and rules that actors integrate every time in a unique manner to give birth to unique practices for the co-creation of value in the whole ecosystem (Storbacka *et al.*, 2016). The choice of a given set of technology should be harmonized with the strategic goals of businesses through a coherent process of strategic design. Technology should be accepted by all the actors in the ecosystem

(Pantano and Corvello, 2014) that should possess the shared intention to exchange value through the new digital tools.

The goal of a STE is the synergistic combination of smart technology for the provision of enhanced experiences and value co-creation based on the proper integration of entrepreneurship, technology, people (human capital), relationships (social capital) information and (Buhalis and Amaranggana, 2015; Boes *et al.*, 2016).

Extant literature agrees with the need to observe STD through a holistic approach (Baggio and Del Chiappa, 2014; Zheng *et al.*, 2022). The suitability of systems view is confirmed by recent literature that analyzes smart destinations as tourism ecosystems (Arenas *et al.*, 2019; Baggio *et al.*, 2020), by reinterpreting them as networked configurations of actors who collaborate and exchange resources and knowledge (Valeri and Baggio, 2022) through technologies in a digital environment.

Despite the large number of contributions on smart destinations, there is still the need to observe this concept from a multi-leveled standpoint. For this reason, it is imperative that future research analyzes smart destinations according to a multi-disciplinary standpoint that observes how technology and data analysis can reshape strategies, business models and information and knowledge management according to an all-encompassing and process-based perspective that observes strategic, infrastructural and operational levels (Baggio *et al.*, 2020).

2.1.2 Data-driven decision-making: impact on tourism and hospitality ecosystems. Tourism digitalization can provide companies with the opportunity to gather a massive flow of data generated by tourists and captured by an interconnected set of sensors, mobile devices along with the different phases of travel journey (Ardito *et al.*, 2019). This data can help managers and providers develop personalized tourism services and stimulate loyalty. Despite the opportunities offered from digital technologies a lot of criticalities can emerge from the improper and non-strategic use of data, such as security risks, digital exclusion, information overload and the threats to the human component involved in face-to-face interactions (Buhalis, 2019).

To challenge these risks there is the need to integrate technology use and adoption with the redefinition of entrepreneurial attitude, managerial orientation and the increase in users' skills to enhance the transparency of information (Visvizi *et al.*, 2021) and promote human intervention (Kartajaya *et al.*, 2021).

DDDM (LaValle *et al.*, 2011; McAfee *et al.*, 2012) has been introduced to conceptualize the key strategies to avoid transforming the opportunities of Big data into threat. Even if introduced in decision-making studies, the data-driven concept can be broadened to identify the all-encompassing redefinition of attitude, strategies, processes, value creation and the generation of innovation opportunities in contemporary businesses that adopt a mind-set focused on the role of data as a strategic asset.

Based on a critical re-elaboration of the contributions proposed in the literature (Troisi *et al.*, 2020a, b), it is possible to identify the key dimensions of the data-driven approach: (1) data-driven culture; (2) integrated infrastructure of intelligent technologies; (3) data analysis skills; (4) process management; (5) continuous improvement. The first dimension is linked to the strategic need to establish and disseminate inside and outside the company an orientation to learning based on the constant collection of data in view of continuous improvement and dynamic adaptation to environmental changes (Medina-Borja, 2015). From a technological point of view (Järvinen and Karjaluoto, 2015), is necessary to implement a technological infrastructure that allows information to be collected, extracted and managed by increasing the accessibility of data and reducing heterogeneity and complexity (Chaffey and Patron, 2012). Therefore, to extract relevant information from data, human intervention is required through the application of technical and managerial skills (Gupta and George, 2016; Alkhatib and Valeri, 2022) capable of transforming data into (oriented) information, (targeted) knowledge and new value.

This complex process requires careful management of information and data flows along the entire value chain (dimension 4: proactive management of processes) between heterogeneous data sources (O'Neal, 2012) which are processed and optimized within the different contexts of the ecosystem (micro-corporate sphere, macro-external sphere, environment) in order to react to environmental changes and to be able to predict their evolution. Through an effective integration and use of the information and knowledge extracted, the value can arise if, through multiple technological tools, the data is properly "used", reconfigured and directed towards common purposes to generate sustainable competitive advantage, co-evolution and continuous improvement (Spohrer and Demirkan, 2015).

As discussed in paragraph 2.1.1, the collection, processing and exchange of data is one of the core elements of STE (Zhang, 2012), whose goal is the creation of value resulting from a smart technology integration (Guo *et al.*, 2014). The interactions and experience generated through the smart combination of technology can give birth to an underlying data flow (Gretzel *et al.*, 2015a) that surrounds and guides communication and information management and resource sharing. Therefore, exploring the adoption of data-driven orientation in tourism can help detect the drivers for the competitiveness and innovation of STE and for the proper involvement of users as sources of unique resources and knowledge. Moreover, data analysis can have an impact on value proposition (Sigala *et al.*, 2012) and can suggest the right strategies to manage information flows and to transform the knowledge exchanged into new value and innovative insights.

However, in extant research the studies that apply the conceptual lens of data-driven approach to observe the digital transformation in tourism ecosystems are still limited (Del Vecchio *et al.*, 2018a, b). Additionally, there is still little research that investigates how tourism enterprises can exploit the massive amount of data collected along tourism experiences tourists for the enhancement of value creation and co-creation.

Companies that operate in the hospitality industry, intended a sub-field of tourism, can benefit from the application of digital technologies and platforms such as OTAs that can offer the possibility of collecting customer's review and feedback is an industry. Big data analytics and data-driven orientation can provide to numerous opportunities to hospitality companies by supporting decision-making and permitting to explore hotel guest behavior through consumer generated content (Xiang *et al.*, 2015). Hence, the application of smart technology to hospitality can enhance competitive advantage by offering the tools to predict customer's behavior and the continuous improvement of service (Jeou-Shyan *et al.*, 2011).

Extant literature focuses mainly on the analysis of digitalization in tourism by underrating the implementation of smart ecosystems in hospitality (Mehraliyev *et al.*, 2019; Buhalis *et al.*, 2022). This lack can be related to the most common adoption of websites and OTAs and to the limited adoption of data analytics.

Since little research has been devoted to observing how the traditional elements of business models can be reframed in hospitality enterprises to comply with the demands of digital transformation (Ammirato *et al.*, 2015; Buhalis *et al.*, 2022), this study seeks to employ the principles of data-driven orientation to attain an all-encompassing interpretation of digital transformation in hospitality business models in an attempt to address the following research questions:

RQ1. Which are the key levers for the data-driven transformation of business models in smart hospitality ecosystems?

2.2 Data-driven business models (DDBMs) and innovation in smart hospitality ecosystems

The disruptive impact of big data can affect business strategies and processes. Since business model is one of the most effective tools to bridge the potential gap between strategies and

their adequate implementation, it can be derived that data should be taken into account as one of the key sources of value creation in business model design (Del Vecchio *et al.*, 2018a, b; Jin *et al.*, 2021). Therefore, to redefine contemporary companies in favor of a strategic incorporation of data, data should be integrated with new business models to bring in them a drive toward transformation (Loebbecke and Picot, 2015; Woerner and Wixom, 2015).

For this reason, businesses are redefining the mechanisms that guide the implementation of business models based on the exploitation of big data analytics to extract value (Hartmann *et al.*, 2014). This need is introduced in literature by Chesbrough and Rosenbloom (2002) and Manyika *et al.* (2011) who lay the foundations for the redefinition of business models in favor of digitization and data analysis to acquire value (Hartmann *et al.*, 2014) and encourage innovation (Schüritz and Satzger, 2016).

Consequently, DDBMs (Hartmann *et al.*, 2014; Schüritz and Satzger, 2016) have been conceptualized as the result of the inclusion of data into business models as key resource for the development of new insights and for the redefinition of value proposition, value creation and value capture (Kühne and Böhmann, 2019; Paiola *et al.*, 2021).

DDBMs can be considered as a source for innovation based on the exploitation of the knowledge gained from the analysis of data from internal and external knowledge (Sun and Liu, 2021; Mosig *et al.*, 2021). Due to the impact of DDBMs on the development of innovation, the concept of DDBMs innovation (DDBMI) (Sorescu, 2017) has been also introduced.

According to Sorescu (2017), data collection, organization and analysis can stimulate innovation in DDBMs, by using data as a key lever for transformation opportunities (Cheah and Wang, 2017). Data can envelop the process of innovation generation deriving from business models (Hunke *et al.*, 2017) by enhancing the definition of customer segments, the design of revenue model, the assessment of technological feasibility and value capture. Collecting data allows at constantly performing a systems assessment of customer needs and concerns to design more focused and personalized value propositions (Osterwalder and Pigneur, 2010). Fruhwirth *et al.* (2020) affirm that DDBMs can introduce new methods, technology tools and processes and can support the diffusion of creativity by strengthening value proposition, creation and capture (Günther *et al.*, 2017; Woerner and Wixom, 2015).

The data-driven transformation of business models is a necessity for contemporary small and medium enterprises (SMEs) that aim at improving performance and competitive advantage by developing a proactive attitude that can help them survive and overcome the challenges of a turbulent context (Deb *et al.*, 2022; Toanoglou *et al.*, 2022).

Data-driven business models can help SMEs identify innovation opportunities by enhancing their capabilities to analyze the environment, to explore new chances and improving decision-making by focusing on data rather than on intuition (Andersen *et al.*, 2022; Jayawardena *et al.*, 2023). Due to their potential limitations in financial and human resources (Laudien and Daxböck, 2017), SMEs can risk more than large companies in the development of digital business models. However, their greater flexibility makes them more agile in the establishment of external relationships for knowledge exchange. Thus, the application of DDBMs can help SMEs overcome their dimensional and resource constraints (Scuotto *et al.*, 2017; Del Vecchio *et al.*, 2018a, b; Bresciani *et al.*, 2021a).

Technologies (from information systems in general to platforms and big data analysis tools) play an important role in DDBMs, but their use does not automatically translate into the creation of innovative outcomes (Doganova and Eyquem-Renault, 2009). Companies should associate the adoption of data analysis technology with their inclusion upstream of the strategies and business models and with the human and cognitive dimension. In fact, extant literature shows that the development of DDBM in SMEs involves not only technologies and the digitalization of processes but also the possession of skilled human resources (Almeida and Wasim, 2022).

The incorporation of data-driven orientation into business models to stimulate innovation gives birth to the concept of data-driven innovation (Trabucchi and Buganza, 2018) which describes the role of data management, from collection to integration and analysis, in the research for continuous improvement through the synthesis between incremental (exploitative) and radical (exploratory, Lee and Trimi, 2018) innovation, which can help transform data into new knowledge, new value, innovation and continuous learning.

Considering the ecosystems approach adopted here, innovation can be understood as a process generated throughout the data creation cycle. In this way, data-driven innovation (a concept not yet clearly defined and formalized in the literature) can be reformulated as a data-oriented reinterpretation of business models (Sorescu, 2017; Yu *et al.*, 2020) that can improve creation of value which, in turn, allows the emergence of innovation (Trabucchi and Buganza, 2018).

The implementation of DDBMs in hospitality can permit firms to improve customers' satisfaction by assessing and measuring their experience (Lyu *et al.*, 2022) and to innovate services through the constant analysis of high-volume data on users' trends gathered from multiple sources (Sorescu, 2017). Data-driven orientation in hospitality can reframe value creation from the strategic level to the operational level of big data management capabilities (Jeou-Shyan *et al.*, 2011).

The potential of big data in hospitality can emerge from the development of flexible data warehouses and cloud computing systems, from the ability to acquire, collect, transmit and analyze data from multiple stakeholders through IoT and from the capability to co-create value with guests by customizing experience through an integrated set of technologies (Buhalis and Leung, 2018).

For this reason, there is the need to shed light on the technological tools and on the key data-driven strategies employed in smart hospitality ecosystem to reframe business models, improve value creation and the development of innovation.

Despite the interest in the topic, the key levers that can allow the transformation of existing business models into DDBMs have not been investigated sufficiently (Brownlow *et al.*, 2015; Kühne and Böhmann, 2019) and the potential of data-driven orientation in the business models of hospitality ecosystems has not been analyzed so far (Bresciani *et al.*, 2021b). Moreover, even though extant research emphasizes the need to involve data in business models for the development of innovation, the different enabling dimensions and the barriers to DDBMI have not yet been identified (Mosig *et al.*, 2021; Mostaghel *et al.*, 2022).

Due to the significant impact of data-driven orientation on the development of innovation, this study aims at bridging this research gap by addressing the following research question:

RQ2. How can Smart hospitality ecosystems generate innovation based on DDBMs?

3. A framework for the analysis of data-driven business models in smart hospitality ecosystems

Starting from the literature review introduced above on STE and hospitality ecosystems (Gretzel *et al.*, 2015a, b; Boes *et al.*, 2016), business models (Chesbrough and Rosenbloom, 2002; Teece, 2010; Bocken *et al.*, 2014) and on data-driven orientation (Chen *et al.*, 2013; Gupta and George, 2016) it is possible to introduce a conceptual framework based on the integration of the main dimensions of business models and data-driven orientation that can represent an analytical tool for understanding the enabling factors of innovation in DDBMs. According to a systems view, the key processes involved in the business models and the key enabling elements for value co-creation in STE identified above can be reinterpreted based on the key dimensions of the data-driven orientation. The aim is to introduce a scheme that identifies the main elements of DDBMs in smart hospitality ecosystem (as sub-systems of STE) and the

relationships between them, by providing a visual representation of theoretical constructs of interest to bridge the gaps identified in literature and to guide the design of an empirical analysis aimed at addressing the abovementioned research questions.

As noticed in the overview on business models (see paragraph 2.1.1), the most accepted definitions describe business models as sets competitive of strategies based on the selection of resources, primarily technologies and human resources, for the proposition, creation and capture of value (Chesbrough and Rosenbloom, 2002; Bocken *et al.*, 2014). The latest contributions (Teece and Linden, 2017; Pucci *et al.*, 2017) emphasize the need to adopt an integrated perspective that considers the single components of the business models both statically and dynamically, in the complex relations between them. Hence, an overall vision should be introduced to observe the phenomenon. The different dimensions of business models (technologies, resources, human resources) that are in line with the main elements of service ecosystems and STE (actors, technology, information and resources sharing) should be reread through an ecosystems approach that observes the key levers for the attainment of value creation and co-creation. In fact, such as the elements of service ecosystems the different components of the business models are interrelated in view of the creation, diffusion and regeneration of value (Johnson *et al.*, 2008) and need to be linked in a synergistic synthesis that leads to the achievement and constant renewal of the value generated.

As emerged from the overview on data-driven decision-making (DDDM) presented in paragraph 2.1.2, it is possible to adopt a systems' view that reinterprets this concept, initially introduced to study decision-making in contemporary companies. Data-driven principles can not only redefine decision-making cycle but should also reread strategies and processes management in contemporary businesses.

A proper exploitation of big data should necessarily be integrated with the ability of mangers to make decisions in response to the information extracted from the data (McAfee *et al.*, 2012) in order to favor the strategic alignment of data analysis objectives (LaValle *et al.*, 2011; Gupta and George, 2016) with the overall strategic objectives shared within the ecosystem.

Therefore, a data-oriented mind-set should create a cohesive culture (data-driven culture) and a set of values that guide the collection and organization of data. Big data should be incorporated into the business starting from the enhancement of the managerial intention to adopt data analysis technologies up to the selection of specialized big data analysts (data analysis skills) and the development of an adequate architecture (technological infrastructure) that supports the process of extracting data. At the end of the process, feedback, opinions, insights expressed by users -but also by managers, employees and other stakeholders-are collected (process management) to produce new knowledge that can be stored and reused (continuous improvement) to enhance innovation.

Accordingly, data-driven orientation, business models and ecosystems are based on the intersection of technological, managerial, human and resource-based dimensions for the creation of value and new value through data analysis strategies that are aligned with overall business strategies.

The core element of business models, value creation, is totally redefined by data analysis and by the complex process of transformation from data into information and value. In this way, data-driven orientation helps redefine value creation and co-creation in digital era as a complex process that is boosted by technology and data analysis tools and that can redefine actor's interactions in contemporary ecosystems.

In line with this conceptual intersection, starting from the enabling factors for data-driven orientation (culture, technology infrastructure, skills, process management, continuous improvement), from the key dimensions of ecosystems (actors, technology, resource and information integration) and from the main processes involved in business

models (value proposition, creation, capture), a framework that classifies the key theoretical dimensions to observe data-driven businesses models (DDBMs) is proposed in Figure 1.

4. Methodology

The research questions introduced above ("which" and "how" that aim at inspecting deeply a phenomenon and not at validating causal effects) requires the adoption of an exploratory approach. Qualitative methodology is selected to explore deeply the phenomenon of innovation emergence through data-driven orientation and to reveal the actors, resources and skills that surround the process. As highlighted in the theoretical background, hospitality companies are suitable for an ecosystems analysis of the impact of technology and of digital transformation in the relationship between actors and in the redefinition of value co-creation. Thus, a qualitative approach seems to be suitable for a systems-level analysis (Gummesson, 2017).

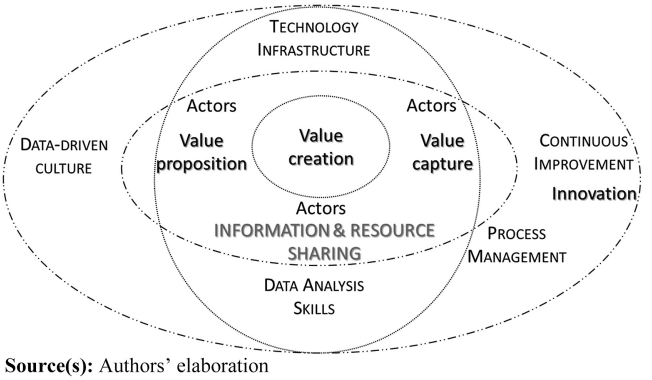
The empirical research is based on the administration of semi-structured interviews (Schmidt, 2004; Harrell and Bradley, 2009). The key data-driven strategies and practices of 15 companies operating in hospitality sector which provides three different accommodation services (hotel, house and bed and breakfast (B&Bs)) in Salerno (South Italy, Campania region) are analyzed. The aim is to detect the enabling factors for a proper digital transformation of business models and to propose a classification of the key dimensions of DDBMs and of the potential enablers of data-driven innovation.

4.1 Research design and sampling

Fifteen interviews have been conducted by three researchers through an interview sketch based on the different variables investigated (corresponding to the components of DDBMs in STE identified in the framework, see paragraph 3).

Even if a sample composed of 15 interviewees does not allow any generalization of results, this seems to be suitable for exploratory research. The goal of the paper is to classify the different potential indicators of the variables analyzed and to lay the theoretical foundations for their measurement. The empirical research aims at shedding light on emerging phenomena not fully conceptualized in extant research by catching insights on their enabling factors and by identifying macro-categories and sub-categories of analysis, rather than showing empirical evidence.

Moreover, the research based on qualitative approach should not comply necessarily with an acceptable threshold of units in the sample. The adequate number of interviewees cannot



Source(s): Authors' elaboration

Figure 1.
A conceptual framework for the analysis of DDBMs

be predetermined *a priori* and can vary depending on the specific research aims and context investigated (Addeo and Montesperelli, 2007). Even if there is not a well-defined threshold in the number of interviewees in a sample, literature identifies a range from 15 to 30 participants (Morse, 2000; Dworkin, 2012) as the appropriate sample size to attain saturation studies that adopt the technique of interviews. This number can ensure a proper investigation of research questions, by permitting to grasp the differences between the variables and enhancing the possibility that data can clarify the relationships between the constructs (Charmaz, 2006).

The final sample is composed of 15 interviewees, operating in three different kinds of accommodation services, including hotels, B&Bs and guesthouses (the first column in the Table). Businesses have been selected by identifying and randomly contacting the accommodation structures of Salerno through Internet, social media and OTAs (such as Booking). Out of the 25 firms contacted, 15 agreed to participate in this research project.

The researchers decided to adopt stratified sampling (Neyman, 1992) to distribute equally the presence of the different kinds of accommodation services in the sample (Ingram, 1996). To improve the representativeness of the sample, cases have been selected strategically (Flyvbjerg, 2006) to ensure a good amount of variation.

According to literature and international classifications, the three most common kinds of accommodations in hospitality industry are hotels, B&Bs and guesthouses (Ingram, 1996; Wu and Lu, 2012; Wang, 2012). Hotels provide services of lodging, rest and leisure, with service provision in rooms and can have at least 7 rooms. Bed and breakfasts can make use of three rooms, while guesthouses offer an entire house for guests. B&Bs and guesthouse are usually located in residential house. B&B offers breakfast service whereas guesthouses do not provide food service (Lubetkin, 1999). They typically are both family-run businesses rooted into local life, natural landscape, environmental or agricultural resources and can offer special services associated with the typical products of a destination. For this reason, the three categories of hospitality have been included to enhance the representativeness of the sample by involving three different kinds of services, which differ in size and core services size and different core services. It can be hypothesized that different kinds of accommodation can implement different data-driven strategies and practices and it can be useful to observe if the difference in size and in the economic and financial resources can produce different applications of DDBMs.

In line with the methodological practice followed in qualitative approach, the researchers stopped the process once theoretical saturation (Glaser and Strauss, 1967) has been reached by comparing incrementally all the added data collected until exhaustive information on the variables and of the relations among them is obtained (Charmaz, 2006). Then, according to the concept of information power (Malterud *et al.*, 2016) the more relevant information the sample holds, the lower number of participants is needed. For this reason, the researchers decided to stop data collection when they reached 5 cases for each category because the interviewees had fulfilled the expectations with respect to the answers to the research questions.

The description of the interviewees, of their entrepreneurial activities and of their sociodemographic characteristics is provided in Table 1. The individuals included in the sample are the entrepreneurs, the owners of the firms and at the same time key member of the top management.

As Table 1 shows, each accommodation category in the sample is composed by 5 units. The SMEs investigated in each category have different sizes, offer different services and are characterized by a different composition of management staff.

Hotel 1 and Hotel 2 are the biggest in size (47 and 42 rooms respectively) and both offer different collateral services such as pool, gym, internal restaurant, hall for conferences and ceremonies. The two 4-stars hotels were both founded in the first decade of the 2000s. Hotel 3 is a 4-stars and it is the oldest in the sample, having been founded in the first decade of the 1990s. Hotel 4 is a three-star hotel with a young management staff which has been recently

Accommodation	Number	Key characteristics	Owner's gender	Owner's age	Number of rooms	Number of employees
Hotel	1	4-stars Collateral services	Male	39	47	30
	2	4-stars Founded in 1914	Male	50	42	25
	3	4-stars Collateral services	Female	52	30	20
	4	3-stars Art hotel	Male	42	15	10
	5	3-stars Family-run business	Male	48	12	8
Bed and breakfast	1	Family-run business	Female	35	3	6
	2	Family-run business	Male	38	3	10
	3	Historical palace	Male	56	3	8
	4	Connection with local typical products	Female	40	4	10
	5	Luxury accommodation	Female	45	4	15
Guesthouse	1	Young entrepreneur with a 10-year experience	Female	36	2	5
	2	Family-run business with management staff at the first experience	Male	32	3	6
	3	Young entrepreneur with a 5-year experience (social media expert)	Male	34	2	6
	4	Entrepreneur at her first experience	Female	42	4	8
	5	Entrepreneur with a 10-year experience in hotels	Male	45	3	9

Source(s): Authors' own creation

Table 1.
Description of the sample of interviewees

built. It is defined a "art hotel", because its walls are decorated with modern works of art. The general manager is an architect, an expert of design involved also in wellness industry. Hotel 5 is a three-star hotel founded in the 1990s and it's a family-run business with a management staff with 20 years' experience.

B&Bs 1 and 2 are family-run businesses recently launched and situated in the historical center of the city with three rooms and with a young management staff. B&B 3 is located in an ancient building from the early 1900s and is managed by an entrepreneur with 20 years of experience in the sector. B&B 4 is managed by a young entrepreneur, who also owns an external restaurant and created a strong link between the hospitality business and the enjoyment of typical local products. B&B 5 is a luxury accommodation with three rooms and a penthouse with sea view that offers collateral services such as guided tour and cooking classes to provide guests with a total experience.

Guesthouse 1 is owned by a young female entrepreneur with almost a decade of experience in the sector of hospitality and who first owned a B&B, then abandoned in favor of a more flexible accommodation service such as the Guesthouse. Guesthouse 2 is a family-run business launched two years ago by two young entrepreneurs at their first experience in the sector. Guesthouse 3 is a small enterprise funded five years ago by a young manager who is

very who at the same time is a social media manager and therefore makes the best use of ICTs to improve the business. Guesthouse 4 was founded two years ago by a manager at her first experience who cultivates a passion for wine and who has a cellar available to guests. Guesthouse 5 is owned by a male entrepreneur with a 10-year experience in a hotel, where he was part of the staff. He decided to launch his own entrepreneurial activity by choosing a flexible kind of accommodation such as guesthouse.

4.2 Data collection

The goal of the interviews is to analyze hotels', B&Bs owners' and guesthouse's data-driven strategies and practices and the outcomes generated through value proposition, creation and capture to develop innovation. Moreover, the research seeks to assess the actors of the smart hospitality ecosystem of Salerno (based on the companies in the sample), the technology employed, the processes of value proposition/creation/capture and the adoption of data-driven orientation (RQ1). In the second place, researchers evaluated if the interaction of these elements enables value co-creation and innovation (RQ2).

The technique of semi-structured interviews (Schmidt, 2004; Harrell and Bradley, 2009) performed through hermeneutic approach (Addeo and Montesperelli, 2007) has been selected since it allows at detecting situations, behaviors, attitudes, opinions without producing any type of evaluation but trying to grasp in depth the dynamics of activation of a phenomenon in its context. A semi-structured tool to collect data permits to have a low level of detail and articulation of the outline on which the interview is based. In fact, a high level of structuring of the track leads to a high rigidity of the interview, because the interviewer and the interviewee cannot detach from the pre-established sketch (Bichi, 2002).

Starting from the research questions and from the key dimensions identified in the framework, the interview sketch (Table 2) has been elaborated. The researchers used a list of themes rather than structured questions to make the interviewees free to introduce new topics or unexpected elements and to encourage the emergence of new issues and new questions (Addeo and Montesperelli, 2007).

The interview sketch (see Table 2) has been elaborated through a systematization of the categorization offered in extant research on service ecosystems. Starting from the identification of the main dimensions of STE (Actors, technology, resource/information sharing), of data-driven orientation (culture, technological infrastructure, analysis skills, process management, continuous improvement) and of the three processes of business models (value proposition, creation and capture), some sub-topics have been derived for each macro-variable introduced in the study (business models, service ecosystems and data-driven orientation).

The final sketch administered to interviewees was composed of four parts: (1) implementation of the key enabling dimensions of ecosystems, (2) use of data as a strategic asset for value proposition, creation and capture, (3) adoption of a data-driven orientation and accomplishment of the key phases of data-driven management, and(4) development of potential innovative outcomes through a new proactive attitude and a data-driven managerial orientation.

Three researchers administered the face-to-face interviews, that lasted about between 20 min and 45 min, in an informal setting over a period of four months (from to March 2022 to July 2022). The researchers employed the sketch as a guide to orient the discourse without altering it, by making the topics emerge spontaneously in the interviewee's words. During the interactions, researchers paid attention to all communication aspects (verbal and non-verbal).

4.3 Data analysis

The interviews have been recorded and transcribed by the same researcher (one researcher for each of the accommodation service) and then shared with the others to perform a common

Smart tourism ecosystems	
Actors	Which are the key stakeholders with which does your company establish collaboration?
Technology	Which are the key technologies and tools employed to enhance pre-delivery, service delivery and post-delivery?
Shared information/ resources	Which is the content of the information shared with guests?
Business models	
Value proposition	Do you collect insights deriving from data analysis to renew your value proposition and core values of the offering?
Value creation	Do you extract insights for innovation from data analysis?
Value capture	Do you store data to analyze it even in the long-run?
Data-driven orientation	
Data-driven culture	Is there a strategic planning for data collection, for the selection of sources and for the extraction and interpretation of results in your company?
Technological infrastructure	What are the technological tools and/or analytics used to collect and analyze data? How are these used to meet the main strategic objectives of your company (e.g. users and/or buyer personas profiling strategies)?
Data analysis skills	What are the most appropriate skills to manage the collection and analysis of data? How can the human component enhance or hinder effective data analysis and interpretation? Is there an integrated strategy of actions for the continuous training of employees and/or for the enhancement of skills?
Process management	Have you ever had to revise your decisions in progress based on the results of data interpretation? And after the dialog with other employees inside and outside your company? Which of the two phenomena occurred most frequently?
Continuous improvement	Are the data collected and the results of data interpretation shared within the organization, and "stored"? Which is the role of innovation for the survival of your company?
Innovation	
	Do you think that data analysis can contribute to the development of the new service or of a new way of doing business in the area? If so, how? How does your company search for innovation opportunities and try to forecast market's requirement through data analysis?

Source(s): Author's own creation

Table 2.
The interview sketch

interpretation of the main findings. To complement the data obtained from the interviews, additional information about the companies and their activities was collected through strategic documents provided by the interviewees and through secondary data available on the internet.

Through a process of coding, the key elements of the framework have been detected in the transcripts of the interviews, re-elaborated and discussed semantically through the subjective interpretation of researchers.

The empirical data obtained have been transformed into key concepts through substruction (Dulock and Holzemer, 1991) that have been used as macro-categories of analysis to detect regularities in the attitude of the interviews, by allowing to revise, delete and enrich the variables included in the sketch. Each researcher coded independently the concepts emerged from the analysis. Then, consistency checks and comparison between the different coding schemes have been carried out to identify discrepancies in the evaluation of researchers and attain a unique coding scheme.

The degree of agreement between the different interpretations of the three researchers is estimated through the evaluation of reliability by means of Krippendorff's inter-coder

reliability testing (Krippendorff's Alpha coefficient, Krippendorff, 1980, 2008; De Swert, 2012). As a result, the theoretical dimensions that guided the elaboration of the interview sketch and data collection were edited and broadened to include the novelties emerged from the empirical data. The findings of the coding are employed to establish a final score for the presence or the absence of the different macro-areas and sub-dimensions of the analysis in each company in the sample and to guide the identification of categories introduced in the final framework.

5. Findings

5.1 The key dimensions of data-driven business models in hospitality ecosystems

The transcripts of interviews have been analyzed to detect the key ecosystem's dimensions and the data-driven practices activated in the hospitality companies in the sample throughout the three processes of value proposition, creation and capture. In the next paragraphs, the findings for each dimension of the framework obtained from the three groups of entrepreneurs (of hotels, B&Bs and guesthouses) are presented.

5.1.1 Hotels. The main actors involved in the hotel ecosystem are businesses that provide information technology (IT) services such as (1) OTA to manage reservation system; (2) IT businesses that offer consultancy services for data analysis and that sells platforms and tools for the internal system; (3) IT businesses that deliver third-party software (Such as X-Byte or Dexi) to extract data from OTA and from reviews on ranking sites such as TripAdvisor.

As for the technological infrastructure, the bigger hotels in the sample (hotels 1 and 2) redesigned their information systems to create a data center. The owner of hotel 1 affirms: "before we had to extract data manually, now we have a platform that centralizes data from all the sources, from the central reservation systems, to Opera, our cloud system, that makes the information available for everyone, everywhere and in every moment, to TravelClick, a business intelligence tool, which aggregates travel agency bookings across all agencies" (respondent 1, hotel manager, male, 39 years old). Hotels 2 and 3 collect booking trends data to "devise strategies to increase bookings and survive competition" (respondent 3, hotel manager, female, 52 years old).

However, the smaller hotels in the sample (hotels 3, 4 and 5) employ Facebook and Google analytics and the traditional Search engine optimization strategies to extract data on user's behavior. These tools are chosen due to their low costs; in fact, the owner of hotel 5 declares "not to have time or the right competencies to use advanced software" (respondent 5, hotel owner, male, 48 years old).

All the companies in the sample collect data starting from reservation: some of them (hotels 1, 2 and 3) use software and analytics to extract data through booking system, whereas the others (hotel 4 and 5) use only the analytics offered by Google and the OTA (Booking, Airbnb, Trivago and Expedia).

The three hotels that analyze data through additional tools gather them from two sources: (1) internal channels: hotel website and apps (if present); (2) external channels: OTAs such as Booking, Airbnb, Trivago and Expedia. The results of data analysis permit to collect information on the kind of rooms booked depending on the kinds of users and on their habits (payment method, times of arrival and departure, period of the year chosen for travel) "to target costumers and personalize services" (respondent 2, hotel manager, male, 50 years old).

After the reservation, the system can contribute to enhance the management of check-in and check-out: "our property management system ensures the creation of a guest portfolio that matches the data of the system with the data collected from the central reservation system (CRS)[. . .] we can provide virtual check-in, too and we can obtain an heat map of guests' behavior to analyse their satisfaction" (respondent 4, hotel manager, male, 42 years old).

In the post-delivery phase, one hotel in the sample has a collaboration with Medallia, a company that provides consulting services to improve customer experience through IT solutions. As the owner affirms: "Medallia offers a 360-degree overview of the guest's journey, from the first visit to the website to their last stay, during the journey we seek to engage customers with messages through instant messaging application to optimize their experience during their stay" (respondent 1, hotel manager, male, 39 years old).

Concerning the information sharing, during the service delivery, an integrated system of cloud and mobility technology can provide "real time data on a personalized dashboard that transmits data to every kind of business units (front-office at desk, waiters, staff for cleaning service) regarding users' choice in the hotel restaurant, of complementary services in the room, in the other services (pool, gym, wellness centre)", as declared by the manager of Hotel 1 (respondent 1, hotel manager, male, 39 years old). Through mobile devices the shared data become portable information that can be used to predict users' choice (through Application Programming Interface for extracting guests' choices) and to provide personalized experience.

In Hotel 1 the central reservation system (CRS) is updated daily, whereas property management system (PMS) is updated throughout the day to simplify the activities of the staff (and signal occupied rooms, vacant rooms, dirty or clean rooms, etc.).

If information sharing accelerates communication between hotel units and accelerates the delivery of service in daily operations, the resources integration with guests remains at a basic level. Also the hotels that make an intensive use of data analytics aim at providing customers with personalized service experience but do not mention the research of personalized interactions with the single guest during the stay. There is a lack of attention to people and customer retention, as emerged from the affirmation of the manager of hotel 1 that clarify the goals of data analysis: "analyzing data can help us raise our competitiveness in a period of instability and uncertainty of demand and increase performance during the journey" (respondent 1, hotel manager, male, 39 years old).

Therefore, even if the value proposition of the hotels in the sample is based on the research for the continuous improvement of the service, data analysis seems to be conceived as a lever for the enhancement of service and the improvement of performance and not as a strategic asset that can provide insights for the constant redefinition of strategies and core values.

Concerning the adoption of data-driven culture, the hotels in the sample recognize the enormous potential of data analytics. The manager of Hotel 3 declares: "before we used only pen and paper tools or an excel document or later PMS (property management system), now data is always available, and we use it to improve services in real time" (respondent 3, hotel manager, female, 52 years old). The manager of Hotel 4 states that data is not at the heart of the strategy: "big data is everywhere but only those who make a good use of them can successfully exploit this big opportunity, that's why I prefer using data analytics at a basic level, since I believe that in this moment my company does not possess the right skills to make a wise use of these tools" (respondent 4, hotel manager, male, 42 years old).

The hotels in the sample do not show an orientation toward learning and the enrichment of data analysis skills. The manager of hotel 2 affirms: "we collaborate with consulting IT businesses that analyze data for us, since we believe that externalizing the service has lower costs than internalizing it and training employees" (respondent 2, hotel manager, male, 50 years old). Only Hotel 1 has an internal IT team that two or three times in a year exchange opinion with specialized Big data analysts. The manager of hotel 4 declares that: "developing an IT team would mean to revolutionize our competencies and, in this moment, according to us a similar choice can provide more costs that benefits" (respondent 4, hotel manager, male, 42 years old).

The value created consists mainly in the increase of economic value, in the enhancement of process, in the simplification of information flows between business units and in the boost of service delivery during the stay in the hotels.

Process management is strengthened by the speed of data collection that, combined with the administration of survey during the journey, permits to implement real-time adjustment of service. Two out of the five hotels in the sample integrate the data collected through PMS with management company system and enterprise data warehouses. Data storage is performed but the interpretation of data as a starting point for future innovation is not mentioned by any of the interviewees in the sample.

As for value capture, data is stored but the real advantage is to extract information before and during the experience, "to implement timely corrective actions to enhance service delivery in real time we administer survey after the guests enter their rooms" (respondent 1, hotel manager, male, 39 years old). However, the events occurring during the journey tend to be solved in a given moment and the experience do not turn into expertise for employees: "our aim is to address the problem as soon as possible, but "each new problem that arises is a story in itself and we cannot predict corrective actions for the future" (respondent 3, hotel manager, female, 52 years old).

5.1.2 Bed and breakfasts. The key actors included in the B&B's ecosystem are: (1) other hospitality companies in the city and in the neighboring cities (especially other B&Bs); (2) service providers of activities in the local market (restaurants, bars, local shops, etc.); (3) local administration (i.e. municipality and local tourism authority) and (4) cultural associations.

In most cases, the entrepreneurs in the sample (3 out of 5) establish informal relationships with these actors based on the exchange of information on guest's behaviors. B&B 2 and B&B 4 have economic agreements with restaurants, bars and local cultural institutions such as museums. In fact, the owner of b&b 1 declares that "periodically there is the possibility of closing agreements with museums and associations to offer our guests tickets discount for events and exhibition. For example, I was recently contacted by a local institution for providing my guests a discount for an exhibition of contemporary art" (respondent 1, B&B owner, female, 35 years old).

As for the technological infrastructure, the most common platforms adopted to enhance pre-delivery services are both OTAs for reservations (Booking, Expedia, Airbnb and Beb.it) and metasearch platforms such as Google Hotel Ads, Trivago, Tripadvisor and Skyscanner. Less-employed OTAs are Windu, Mrb&b, Hostel.com, Hostelword, etc. Two out of the three B&B's owners in the sample (B&B1 and B&B4) use other tools to allow e-booking but also to communicate with guests before they arrive: "from our official B&B sites, to instant messaging applications such as WhatsApp and Telegram, to social networks such as Facebook and Instagram: the experience starts immediately after the reservation and continues even when guests leave our bed and breakfast" (respondent 1, B&B owner, female, 35 years old).

During the journey, 4 out of the 5 owners in the sample declare they use instant messaging services to communicate with guests "for any kind of problem in the room, for any information need related to the search for restaurants, bars, shops, pharmacies" (respondent 2, b&b owner, male, 38 years old). After the journey, social networks, OTAs and metasearch platforms permit to collect feedback from guests and to contact them in the post-experience, too.

The tools employed to analyze data are mainly the analytics, ranking and metrics offered by social network sites and OTA that can help "personalize experience, identify and reach targets" (respondent 2, b&b owner, male, 38 years old).

However, the owner of b&b 1 affirms that "Our key source of information are our guests, of course we observe the data deriving from the analytics and we employ web scraping such as ParseHub to make the data understandable, but after predicting guests' behavior we need to gain more meaningful data on their needs by observing them during the journey" (respondent 1, B&B owner, female, 35 years old).

Shared information during the journey consists of suggestions on transports, events, restaurants. The exchange of advice on the activities to conduct during the journey creates a familiar climate and permits to catch some insights on the new trend for tourism. As revealed by the owner of b&b 5: "our guests want to live the city, today culinary tourism is taking over, they want to experience the culture of the city, to take picture of food, of the panorama" (respondent 5, b&b owner, female, 45 years old). Moreover, the most common request, according to the owner of b&b 4, is to discover cultural sites of the region and of the municipality.

The continuous collection of information on guest's preferences, performed through the combination of big data and small data, contributes to the "natural" remodeling of services. Consequently, value proposition is mainly grounded on the data collected. As emphasized by the owner of b&b 2 the information collected during the journey and throughout the interactions with guests is actively exploited to settle value proposition: "Every time a guest leaves our bed and breakfast we have new experience to share and new knowledge on contemporary tourist that we can use to adjust the service" (respondent 2, b&b owner, male, 38 years old).

At the same time, the one-to-one relationship established between hosts and guests permit also tourists to share comments and express their evaluation on the service in real time. The owner of b&b 1 affirms: "the exchange of personal experience, especially during the breakfast, is a precious lever to obtain relevant information from the consumer without any effort of time and cost. We discover our limitations and we can improve the service immediately" (respondent 1, b&b owner, female, 35 years old). In this way, not only value proposition is modified according to the insights gathered but also value creation is constantly improved by engaging actively guests and giving birth to value co-creation.

The value created from the information exchanged through smart technology and data analytics is not only economic value for the single businesses in the sample but also economic well-being for the other local service providers (restaurants, bars, gift and souvenir shops and typical products shops) and the entire territory. Moreover, a relational and social capital is created. Culture of the place is promoted and shared with guests.

The owner of B&B1 affirms: "we don't need surveys to know well our customers, we live their journey together, so we can experience their emotions and we can catch their preferences by reading weak signals and looking them in the eyes" (respondent 1, b&b owner, female, 35 years old).

Hence, the B&Bs in the sample show that they build their strategies in a targeted manner based on constantly collected data, both small and big data, and on constantly analyzed data, through analytics or through human interpretation. It can be affirmed that the B&Bs in the sample adopt a data-driven culture and not necessarily a "big" data-driven culture. The owner of b&b 2 shows that data guide business strategies by affirming: "we trust data but not necessarily it should be big and we don't use data before planning the offering but we let business needs and objectives guide how and when collecting and sharing information, knowledge, experience with guests; for us, the real lever for success is to be proactive and align the investments in data analysis with our needs and not to simply adopt tools that in the long time can become useless" (respondent 2, b&b owner, male, 38 years old). The owner of b&b 1 reveals the need to introduce new technologies for data analysis by declaring: "we would like to extend our technological capital by searching for tools that meet our needs and strategic goals, rather than simply using money or software to solve a problem, we look for solutions (analytics and software) that can support (and not replace) the real source of data of our business: the data gathered from guests during the journey" (respondent 1, b&b owner, female, 35 years old).

As for digital skills, the entrepreneurs in the sample in the most cases claim to seek informal help from friends to interpret the report of analytics and rarely from IT

consultancy services. The owner of b&b 1 states: "according to me he key skills for a good data analysis are creativity, intuition and knowing how to grasp weak signals rather than statistical skills, given that the data related to the tourist experience mostly have to do with paraverbal signs and emotions" (respondent 1, b&b owner, female, 35 years old). According to the owner of b&b 4 "data analysis tools are a winning ally but only hosts can touch customers with our hands and read their needs closely and participate in their experiences" (respondent 4, B&B owner, female, 40 years old).

Lastly, it can be noticed that face-to-face interactions help address the emergence of problems during the delivery. Thus, the sharing of experience with customers supports process management. As asserted by the owner of B&B3: "if a problem is clarified immediately, even after a direct comparison with the owners, consumers tend to leave a positive review [. . .] we prefer live feedbacks with consumers rather than simply reading online reviews" (respondent 3, b&b owner, male, 56 years old).

As for value capture, information sharing and value co-creation continue also during the post-delivery. Two out of the five entrepreneurs in the sample seek to make their guests loyal by keeping in touch with them through social networks. In particular, one of the b&b owners share pictures of the journey even after several months to recall experience and encourage the revisiting intention. The owner of b&b 1 states: "I have a ritual with guests consisting in taking picture with visitors before leaving b&bs that often are shared on social networks and reshared after even after months on the occasion of holidays or possible moments of vacation" (respondent 1, b&b owner, female, 35 years old).

5.1.3 Guesthouses. The main actors involved in the ecosystem of the guesthouses are: (1) other guesthouses and B&Bs in the city and (2) providers of local commercial activities (restaurants, bars, local shops, etc.).

As for the technological infrastructure implemented, the key technologies employed to enhance pre-delivery are OTA and metasearch platforms "to simplify guests' selection of competing structures and their behavior's choices" (respondent 1, guesthouse owner, female, 36 years old). Then, during the journey, the most employed platforms are instant messaging applications. As the owner of guesthouse 3 declares "Whatsapp or private messages on social network permit to address problems in real time, even although I must admit that not all customers are willing to have problems solved on their mobile phones, as sometimes customers consider us available 24 h a day and this is not appropriate for us" (respondent 3, guesthouse owner, male, 34 years old). For the post-delivery service, some guesthouses in the sample have PMS that use "to get a history of visits, collect feedback and understand how to improve the service" (respondent 2, guesthouse owner, male, 32 years old).

The tools employed to extract data consist in metrics and analytics offered by OTAs and metasearch sites and provided by third-party service providers, such as Kinsta and ParityRate. According to three out of the 5 owners in the sample, the key goal of data analysis is competitor analysis. As declared by the owner of guesthouse 2 "unlike hotels and bed and breakfasts, guesthouses are a hybrid kind of accommodation and it is difficult to analyze competitors, that's why we use external services to collect data, also to have a clearer image of the competition" (respondent 2, guesthouse owner, male, 32 years old). But also the data collected through social media analytics are useful for competitor analysis. The owner of guesthouse 4 affirms that "analytics make the opinions of guests public and therefore accessible to anyone at low costs; as we can see the perception of our guests, we can understand what travellers think of our business and of competitors and that information can help capitalize on our competitors' shortcomings or understand what to implement our service" (respondent 4, guesthouse owner, female, 42 years old).

Technology allows at sharing information rapidly than in the past, as emphasized by the owner of guesthouse 3: "even providing some technical and basic information, such as prices,

check-in and check-out information, collateral services information and events to participate, is simplified using instant messaging and sometimes users are already prepared on the activities available in the city they sometimes, they 'train' themselves on the internet and they are well-informed on food and on the restaurants" (respondent 3, guesthouse owner, male, 34 years old).

Hosts exchange with guests not only basic information but also experience and can get information about guests' motivations and cultural beliefs. The owner of guesthouse 3 affirms: "actors share information about their habits, lifestyle and culture and at the same time I show them the tradition of the city" (respondent 3, guesthouse owner, male, 34 years old).

In the sample of guesthouse's owners, value proposition is modified and adjusted through user's feedback but especially through competitor analysis. Hence, both information collected through analytics and through face-to-face interactions are employed to change the core values of the offering.

Despite the use of data analytics and of smart technologies, the guesthouses in the sample show a poorer adoption of data-driven culture, by revealing a skepticism linked to the use of big data in hospitality. As the owner of guesthouse 5 affirms: "the fact that data is vital to a company is nothing new: we believe in data analysis but according to us not always data should be big to produce value for a company, they should make sense and be reused to improve service".

The owner of guesthouse 3 believes that big data is "a business imperative for the hospitality industry, but not all big data is valuable and not every business has the possibility to collect large amount of data, I believe in big data for companies that have the economic capital and the knowledge base to analyze it" (respondent 3, guesthouse owner, male, 34 years old).

According to the owner of guesthouse 5, Big data is not useless but should be integrated with human component: "after the advent of Covid-19 data is still precious, but today, due to the discontinuous demand of the last two years and to the uncertain and fluctuating situation, we cannot place a blind faith in a system that does not read these changes. It can be risky. Human intervention is more necessary than ever" (respondent 5, guesthouse owner, male, 45 years old).

Based on the skepticism toward big data, interviews seem not to invest strategically in the acquisition of digital skills. The owner of guesthouse 3 asserts: "maybe it is a cultural issue, the fact that in South Italy we do not have a digital culture, but I think that in hospitality not always big data is the solution, maybe it depends on the fact that the core element of hospitality service is in the face-to-face interaction with guests" (respondent 3, guesthouse owner, male, 34 years old).

Value capture through data analysis is strictly related to the exchange of experience in real time with guests and to the establishment of informal relationships for the collection of insights. The owner of guesthouse 2 reports: "once e guest sent me a picture of the view from my window and suggested me to use it as a picture to be posted on Instagram or on Airbnb" (respondent 2, guesthouse owner, male, 32 years old).

The analysis of users' feedback through analytics can help manage service provision and continuously improve the service by understanding how to challenge competitors. As explained by the owner of guesthouse 1: "for instance, if competitors are criticized continually by customers for the low flexibility of check-in times or for the lack of availability of the staff, we know that we can improve the presence of the staff and try to enhance the options for late arrival and departure [..], but we can also understand what are trends of the moment and what travellers are looking for in a given period in order to adapt our offering" (respondent 1, guesthouse owner, female, 36 years old).

Table 3 shows the key results for RQ1.

Variables	Dimensions	Hotels	Bed and breakfasts	Guesthouse
STE	Actors	• OTAs • IT consulting service businesses • IT service providers	• OTAs • Other local tourism providers • Local providers of other service (food, shops) • Local administration • Cultural associations	• OTAs • Other local tourism providers • Local providers of other service (food, shops)
	Technology for data sharing, analysis and collection	Data center based on • Central reservation system • Cloud system (Opera) • Business intelligence tool (TravelClick) • Api and scraping tools • Personalized dashboard on mobile devices • "Medallia" for experience analysis	• OTAs metrics and analytics (Booking, Airbnb, Expedia, etc.) • Metasearch platforms and their analytics (Trivago, Google Hotel Ads, Tripadvisor, etc.) • Social network sites and analytics • Web scraping (ParseHub)	• OTAs metrics and analytics • Metasearch platforms and their analytics • Analytics provided by third-party service providers (Kinsta, ParityRate)
	Information/ resource sharing	Basic information on service	Creation of social and relational capital	Exchange of cultural background, beliefs and motivations
Data-driven orientation	Data-driven culture	Short-term orientation on data analysis Focus on performance and demand improvement	Strategic involvement of small and big data analysis in service design	Focus on data for competitor analysis Scepticism toward Big data due to risks and costs
	Data analysis skills	External acquisition of competencies	Creativity, intuition, empathy, human interpretation, verbal and paraverbal communication	Technology anxiety and lack of investment in digital competencies Human interpretation of data
	Process management	Real-time adjustment of service	Adaptation of service during interactions	Adaptation of service during interactions
	Continuous improvement	Improved service based on corrective actions	Constant remodeling of services based on the exchange of experience with users	Change of services based on competitors' back draws

Table 3.
A synthesis of the main findings for RQ1

(*continued*)

Variables	Dimensions	Hotels	Bed and breakfasts	Guesthouse
Business models	Value proposition	Poorly focused on data	Focused strategically on data Business needs guide small and big data collection	Focused on data deriving from competitor analysis
	Value creation	Focused on data	Focused on data and experience	Focused on data and experience
		Economic value	Economic well-being of territory	Exchange of culture and personal knowledge
		Improvement of process and performance Simplification of information	Social and relational capital	
	Value capture	Poorly focused on data reuse	Focused on data Experience recalling through social networks for loyalty	Focused on data Collection of insights through users' feedback

Source(s): Author's own creation

Table 3.

5.2 The key dimensions of data-driven innovation in smart hospitality ecosystems

The different use of big data and the degree of adoption of data-driven orientation highlighted in Table 2 imply the development of diverse kinds of innovation in the three kinds of hospitality services investigated in the sample.

The hotel's owners employ an integrated architecture to analyze data essentially to improve revenue management, to decrease energy costs and to monitor consumption. Despite the high availability of costs and the possibility to buy more sophisticated tools and software (balanced scorecard, platform for smart housing and energy management) the goal of data-driven strategies is the enhancement of performance and is not strictly the analysis of user's behavior to retain customers. In the hotels with data center there can be a high dispersion of data, since the higher number of employees, that potentially means higher possibilities of using data properly, can decrease the diffusion and internalization of data. Even if a lot of data is collected, with advanced technologies, software and tools the results and the interpretation of data is not shared with front-office employees, back-office employees and remains limited to top management knowledge. It follows that the high formalization of organization's structure in the hotel can present the risk of estranging the top management from customers and of preventing the involvement of those who interact directly with customers in the analysis and above all interpretation of the data.

Thus, from the analysis of experts emerges that the new values co-created in the hotels are service and performance improvement and process improvement, by revealing the development of service and process innovation (see Table 3). As declared by the owner of hotel 1: "the real revolution of our big data centre is the optimization of room rates and the maximization of revenue and profits and in the enhancement of process, that can become more controllable, flexible and can enhance employees' productivity". The process innovation is accompanied by service innovation, as declared by the owner of hotel 3: "being equipped with a good RMS means not only streamline information flows and make communications easier but also having a powerful analysis tool to adjust services based on the real time data to introduce novelties in the bundle of offering, in the menu of the restaurant, in

collateral services". The optimization of processes and of information flows between business units do not ensure the transparency of the data collected, that are used essentially by top management.

In the B&Bs in the sample, the lower formalization of organizational structure can permit the emergence of creativity and can ensure a higher control on users' behaviors, preferences and tastes through the establishment of personalized experience.

The value added of the data-driven strategies developed by the B&Bs in the sample is the combination of small data and big data that can give birth to the constant reshaping of value proposition, creation and capture. Value proposition is the constant outcome of the co-creation of experience and knowledge, of social and relational value with guests. The owner of b&b 3 confirms the: "the insights collected from users' experiences guide our business strategies, that are significantly re-adjust when each guest leaves the bed and breakfast, to respond promptly to market and users' behavior changes". The use of data to redesign value proposition, the exchange of experience with guests during the interactions that gives birth to value co-creation, the capture of the co-created value to improve the service generate innovation outcomes across the different processes of business model, by developing business model innovation (see Table 2).

The owner of B&Bs in the sample highlight the relevance of "small data", those collected face to face by the front through resources integration and experience exchange. Even if weak signals interpreted through human creative skills are the real source of innovation, small data should be integrated with big data (extracted from analytics) to connect the data processed with software with the feedback released by tourists in the experience of journey. According to the owner of b&b 1: "the integrated mix of data collected from users with the analytics and of data collected through face-to-face interactions and observation permits to adjust in real time the offering based on the taste and attitude of the single guest/group of guests".

The alignment of business strategies with data analysis strategies can help B&Bs develop a proactive behavior, by giving birth to strategic innovation (see Table 2). The owner of b&b 4 confirms: "collecting data offers the possibility to detect new market opportunities and to predict trends and changes in users' behavior, but strategy comes first and our strategic needs drive the kinds of data collected and analyzed".

The guesthouses in the sample implement in some cases a more sophisticated technological infrastructure than the one implemented in B&Bs, but these companies tend to collect small data (through experience exchange) and big data (through analytics) only to understand competitors' weaknesses. The analysis of users' feedback through analytics can help manage service provision and continuously improve the service by understanding how to challenge competitors. As explained by the owner of guesthouse 1: "learning to overcome competitors can help us be proactive and to develop a continuous tension to innovation". Hence, continuous learning and the ability to constantly readjust their position in the market can contribute to project companies into a state of adaptation and resilience to change.

Therefore, as highlighted in the synthesis of results proposed in Table 4, the adoption of data-driven strategies (based on the integration of small data and big data) can lead hospitality companies not only to introduce new products/services (service innovation) but also to optimize, simplify and boost business process (process innovation), redesign business models (business model innovation), elaborate proactive strategies (strategic innovation), improve distinctiveness over competitors (competitive innovation) and, finally, encourage systematic innovation.

6. Discussion

The findings of the empirical research presented above reveal that data-driven hospitality companies can create a service ecosystem (RQ1) that can give birth to different kinds of

Variable	Hotels	Bed and breakfasts	Guesthouses
Innovation	*Service innovation* • New service development • New offering based on corrective actions during delivery • Quality improvement	*Business model innovation* • Renewal of value proposition/creation and capture based on small data collected through users' experience • Renewal of strategies, resources exchanges, value creation and technology employed based on users' experience	*Competitive innovation* • Improvement of service based on the analysis of competitor's weaknesses (deriving from big data and small data collected during interactions) • Adaptation of offering based on competitor's moves
	Process innovation • Optimization of activities and process • Simplification of information flows • Improvement of performance	*Strategic innovation* • Proactive alignment of business needs with (Big and Small) data collection • New market opportunities deriving from the interpretation of users' behavior and needs during their travel experience	

Source(s): Authors' own creation

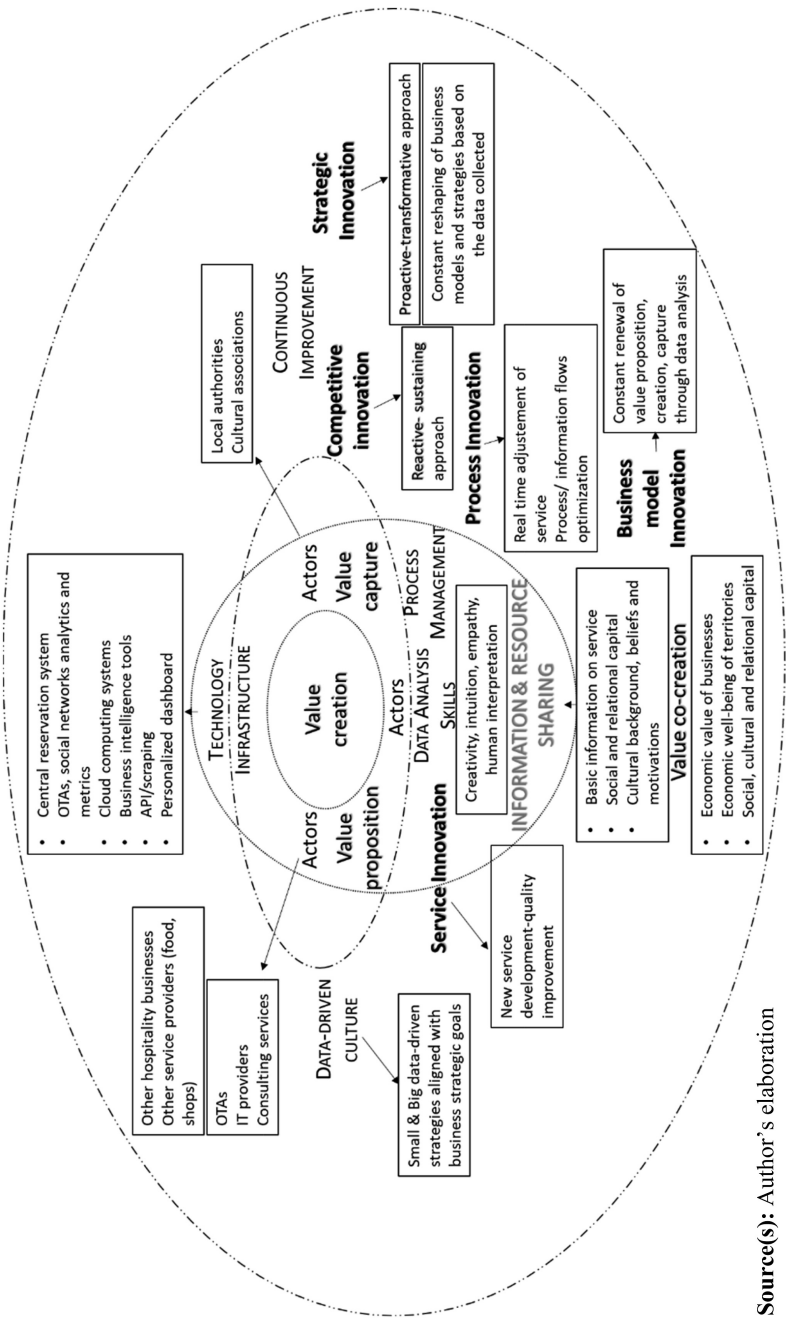
Table 4.
A synthesis of the main findings for RQ2

innovation (RQ2) based on the different kinds of data analysis strategies, technology and resources implemented. The analysis of interviews confirms that to attain a data-driven innovation (which rereads strategies and business model), SMEs operating in the hospitality industry should necessarily integrate technological dimension (the use of analytics and the investment in technologies and hard skills) with human dimension (soft skills, intuition, empathy) and managerial dimension (proactive entrepreneurial orientation) (Kartajaya *et al.*, 2021; Visvizi *et al.*, 2021).

The results allow at re-elaborating the framework for smart hospitality ecosystems introduced in paragraph 3 and obtained from a critical reinterpretation of literature on STE, business model and data-driven orientation (see Figure 2).

As highlighted in the synthesis of results, it can be noticed that the hospitality companies included in the sample creates and ecosystem of relationships by establishing different kinds of collaboration (economic, informal and social) with different kinds of stakeholders, from businesses that provide consulting services or that sell software and analytics (economic system) to other hospitality businesses, local authorities and cultural associations (social system and local community). Small accommodation structures (B&Bs) tend to collaborate with other local service providers (restaurants, bars and museums), whereas hotels are more isolated since they seek to offer collateral services from the inside. Therefore, smaller structures activate a broader network of connections by improving the exchange of data and information on guests within the local ecosystem.

The most sophisticated technological infrastructure is implemented by hotels, which create an integrated datacenter based on the connection between CRS, cloud systems, business intelligence tools and enterprise database system. This centralized system is also used by employees at each level (management, front-office, cleaning staff, restaurant staff) through portable devices with a personalized dashboard to address problems in real time during service delivery. The technologies employed by B&Bs and guesthouses to collect data consist of the analytics available on OTA, social networks and metasearch platforms and of analytics that are provided by third-party companies.



Source(s): Author's elaboration

Figure 2.
The re-elaboration of the framework for smart hospitality ecosystems

Only the biggest hotels in the sample (three out of five) have internal data analytics tools (data centers) to harmonize the work of the various departments. Despite the high availability of infrastructure, hotels do not transform data into valuable knowledge in the long-term. Smaller hotels limit the use of analytics to the ones deriving from social media and OTA due to the high costs. The use of OTAs is more intensive in B&Bs and guesthouses and less intensive in hotels.

On average, all the interviewees declare that data analytics and technology are to improve pre-delivery, experience journey/service delivery and post-delivery. Hence, in the hotels, B&Bs and guesthouses in the sample technology all-encompasses all the phases of customer journey and of service delivery. However, since hotels essentially aim at collecting data to improve performance in the short term, the information/resource exchanged with users is essentially basic and functional to service delivery, whereas B&B create new social and relational capital based on the experience with users and guesthouses share mainly cultural background with them.

Regarding data-driven orientation, hotels focus on the collection and analysis of big data that aim essentially at enhancing services in progress during the delivery and at raising performance, revenue and demand. Data reuse and storage are performed to slightly modify services and not to advance insights for future improvements of culture and strategies. In the B&Bs in the sample, big data are complemented with small data that are considered essential for a proper exploitation of the data collected. Without the exchange of experience with guests and the interpretation of weak signals, emotions and paralinguistic communication through managers' intuition and creativity the insights obtained from data cannot produce innovation. Therefore, B&Bs align the strategies of big data and small data collection with the definition of strategic objectives by revealing a data-driven orientation. Guesthouses adopt data-driven strategies based on the collection of big data (through analytics for competitor analysis) and of small data (exchange of experience with users) essentially for challenging competitors. In fact, the owners of guesthouses in the sample reveal skepticism toward the use of big data that can be useless if not interpreted through human skills, too expensive and risky. Moreover, guesthouse's owners reveal the lack of digital culture in South Italy companies and the unwillingness to invest in training to enhance data analysis skills.

The high or low pervasiveness of data-driven orientation into business strategies can influence the pervasiveness of data use into value proposition, creation and capture (the three processes of business models). In fact, hotels seem to involve data-driven strategies mainly in value creation during the delivery of service to implement corrective actions, whereas B&Bs embed value proposition, creation and capture with the willingness to strategically detect new opportunities from the market and from users' behavior. Lastly, guesthouses adopt data-driven strategies in value proposition, creation and capture but to attain the more "limited" goal of overcoming competitors.

As for RQ2, the different data-driven strategies adopted in the different hospitality ecosystems analyzed above can encourage the emergence of different kinds of innovation. Hotels and guesthouses create sustaining innovation, whereas B&Bs achieve transformational innovation (Christensen *et al.*, 2003). In fact, the new value co-created in the ecosystem allows hotels, guesthouses and B&Bs at constantly improving the services offered (service innovation). Moreover, the incremental improvement of supply chain management and the simplification of activities and information flows between business units can give birth to a process innovation.

The ability to establish in the company a continuous tension towards the renewal of the value proposition based on the new knowledge co-created and exchanged (value creation) and on the insights emerging from the data (value capture) can give life to business models innovation. This kind of innovation is generated mainly in the B&Bs in the sample. At the

same time, by focusing on catching the levers that can help outperform the competition, guesthouses tend to act as followers and to pursue a reactive approach to innovation (Boldrin and Levine, 2008), that can give birth to the development of competitive innovation. On the contrary, the strategic redesign of goals and business models through (big and small) data-driven strategies implemented by B&Bs to discover new opportunities for innovation reveal a proactive approach to a strategic kind of innovation (Markides, 1998; Afuah, 2009) that can include the other forms of innovation (Chaarani *et al.*, 2021).

7. Theoretical and managerial implications

The results highlight the key levers and strategies to exploit the opportunities offered from the big data and from the redefinition of business models according to a data-driven approach in hospitality ecosystems.

In this way, the paper seeks to address the gaps identified in extant research related to the absence of studies that analyzes how the traditional elements of business models can be reframed in hospitality enterprises to comply with the demands of digital transformation (Ammirato *et al.*, 2015).

The findings show that a proper implementation of DDBM can lead SMEs in the hospitality ecosystem to overcome their potential limitations (in size and in the availability of economic and financial resources) by using technologies in a strategic way that supports the creation and the retention of new knowledge, deriving from the ability to exploit data and information collected from internal and external sources.

Despite their size, the smallest firms in the sample, which implement even a less sophisticated technological infrastructure are able to establish a complex network of relationships with local stakeholders, by contributing to enhance the competitiveness of local firms and institutions and to raise social and economic well-being. The capability to integrate data analysis with small data, managerial skills and a proactive orientation leads the small firms in the sample to retain the data acquired and to renew value proposition over time.

The empirical research reveals the key levers for a data-driven transformation of business models in small and medium enterprises (SMEs) by demonstrating how the peculiarities of hospitality (rootedness in the territory, relational capital, face-to-face relationships) can be adapted to comply with the challenges of digitalization while keeping the human dimension relevant.

Thus, from a theoretical standpoint, the conceptual framework proposed can offer an ecosystem rereading of value creation process (the core element of business models) in hospitality ecosystems in the light of the advent of Big data and of data-driven approach, whereas extant research mainly focuses almost exclusively on tourism sector in general (Andersen *et al.*, 2022). The analysis of the data-driven strategies implemented in the hospitality business can help observe the complex process of transformation of data into information and knowledge as a continuous flow that can constantly create new value.

Moreover, the study advances the first steps to conceptualize data-driven innovation as a multi-level construct that can include technological, human and managerial dimensions and can generate economic, social, cultural and relational value. This article enriches the debate on data-driven orientation and innovation by revealing that not only big data but also small data can contribute to develop innovative insights starting from data analysis. In addition, the findings show that technological and economic capital (investments in data analysis) can be considered a necessary but not sufficient conditions for exploiting the opportunities offered from data and for encouraging innovation. Human component and proactive managerial attitude should necessarily read the interpretation of data results in line with strategic objectives and corporate culture.

According to a managerial standpoint, the classification of the different possible technological tools and analytics that can help perform a successful data analysis across the different phases of service delivery and customer journey can be a useful tool for hospitality managers that aim at implementing data-driven orientation. The clarification of the relationship between data-driven strategies and the emergence of different types of innovation can show managers which are the different kinds of information, resources, skills and capabilities that can be combined to generate different innovative outcomes.

The identification of diverse kinds of data management strategies can help understand how to explore the diverse possibilities offered from different data analysis tools and analytics and the diverse value co-creation practices that can derive. Assessing the key technologies that can reshape experience across service delivery can show management how to transform data into relevant information and value through the active involvement of users that can become more loyal and committed.

The empirical research provides managers and practitioners with useful insights on how the strategic combination of human and technological dimensions can help businesses not only improve process and service but also establish constant process of adaptation and reconfiguration of business models and strategies to pursue continuous improvement. In addition, the findings of the study show how different degree of pervasiveness of data analysis in strategies, business models and service delivery processes can modulate business' abilities to address the different demands of users. Revealing some strategies that can help management renew the value produced over time can help better understand how to attain a proactive attitude toward innovation to manage contemporary unpredictable environment. The ecosystem perspective introduced can permit to reframe innovation as the result of a systems process (Troise *et al.*, 2021) based on human, technological and social dimensions and of a systematic process that can spread a drive toward innovation and a transformative attitude in data-driven companies.

8. Conclusion

The analysis can contribute to identify the main data-driven strategies that contemporary hospitality ecosystems can apply to reformulate their business models and value creation practices and to exploit the possibilities offered by big data analysis for the development of innovation.

The conceptual framework obtained from literature review and from the analysis of results can propose a useful tool for SMEs managers that aim at combining a given data-driven orientation and given strategies of resources integration and sharing to boost the emergence of innovation. The recognition of the strategic levers for the digital redefinition of business models in hospitality can be useful for researchers and managers that should face the acceleration of digitalization processes caused by the coronavirus disease 2019 (COVID-19) (Chemli *et al.*, 2022).

The use of technology for data analysis and of analytics can potentially redefine service provision, pre-delivery, co-delivery and post-delivery and value proposition, creation and capture, by generating from the initial input in terms of shared information an enriched outcome deriving from the exchange of resources such as user's experience and culture.

One of the most interesting results of the empirical research is that the implementation of a sophisticated technological infrastructure and huge investments in big data analytics are not enough to guarantee value creation throughout the business process. Indeed, the study reveals that an integration between technological component and human component and between big data and small data is required. Moreover, a real data-driven culture can be implemented also in small B&Bs or guesthouses that have a less-advanced technological infrastructure. This implies that the sophistication of IT architecture does not involve

necessarily an effective and strategic adoption of data-driven orientation. The key role of relational, social and cultural capital in the development of innovation shows that technological and economic capital cannot ensure automatically the innovativeness of a company.

The conceptual framework proposed categorizes the key dimensions of smart hospitality ecosystems that can support the adoption of data-driven orientation across the three processes of business models (proposition, creation and capture). Then, the impact of the data-driven redefinition of business models on different kinds of innovation is assessed through the experience reported by the 15 entrepreneurs in the sample (that permitted to categorize services, process, business models, competitive and strategic innovation).

The potential limitations of the study can derive from the narrowness of the sample which is geographically circumscribed to one region. For this reason, to assess the validity of the conceptual dimensions identified in the framework, comparative case studies can be performed to extend the findings obtained to other contexts. Further studies can start from the results herein obtained to apply the framework for data-driven STE to other service industries (e.g. healthcare, food, education) or to other kinds of network (territory, clusters). The validity of the dimensions conceptualized in this research can be investigated through additional qualitative (observation, focus groups, content analysis) and quantitative research (development of a measurement scale for data-driven innovation).

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