Digital transformation and tourist experience co-design: *Big social data for planning cultural tourism*

Maria Teresa Cuomo, University of Salerno, mcuomo@unisa.it - corresponding author

Debora Tortora, University of Milano-Bicocca, debora.tortora@unimib.it

Pantea Foroudi, Middlesex University of London, P.Foroudi@mdx.ac.uk

Alex Giordano, University of Naples "Federico II", alex@etnografiadigitale.it

Giuseppe Festa, University of Salerno, gfesta@unisa.it

Gerardino Metallo, University of Salerno, gemetall@unisa.it

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Abstract

Digital transformation has completely changed the demand/offering interaction in the travel industry, as well as largely affecting the customer journey. In this direction, "big social data" and user-generated content have become key sources of well-timed and rich knowledge supporting data driven decision approaches addressed the managing of complex relationships. Based on this theoretical framework, the paper suggests how to apply "big social data" in the tourist experience co-design, providing an increased value for the visitors and a better decision making approach for managers. In this respect, the field analysis concentrated specifically on user-generated content regarding the Pompeii Archaeological Site (P.A.S.), to trace valuable insights for the tourist experience. Based on double stage of research – netnographic analysis and a supplementary online survey – the study aimed to detect: (a) tourist perception on the P.A.S.; (b) random chat on the part of internet users (tourists and other browsers, not necessarily visitors) on the topic of the P.A.S.; (c) the main characteristics of the P.A.S. that attract internet user attention; (d) the main topics debated by influencers/opinion leaders managing online discussions on the P.A.S. managerial and theoretical implications were investigated highlighting the main limitations of the study as well.

Introduction

Cultural tourism in Italy has continually increased over the last 15 years. In 2018, Italy generated 21 billion euros in economic value, 66% of the total amount from international tourism and nearly 60% of Italian holiday revenues (Manente, 2019). Based on their greater appeal, cultural goods represent one of the main resources to differentiate the national tourism offering and counteract seasonality (Vergori and Arima, 2020) by means of experiencing the local culture, tradition and lifestyle, participating in arts-related activities, visiting museums, monuments and heritage sites. Despite this huge, varying and up-to-date potential proposal, a commonly accepted stereotype still nowadays associates cultural tourism with ageing travelers (Falk and Katz-Gerro, 2016), which may have an effect on the arrangement of the selling proposition and the marketing and communication activities of cultural sites.

How can Big Social Data be applied effectively to improve tourism experience co-design? What are the effects on travelers and public/private actors? A large body of study, in areas ranging from value configuration (e.g., Olshannikova et al., 2017), value creation (e.g., Svensson and Grönroos, 2008; Vargo and Lush, 2008), to value capture (e.g., Bowman and

Ambrosini, 2000) has tried to acknowledge and define how businesses or brands could be co-designed/created (Fournier, 1998; Harmeling et al., 2017; Merz et al., 2018). However, co-design in tourism platforms is likely to remain undefined for marketing and tourism researchers without a better understanding of when and how to create value and how the value can be assessed through the platforms. By employing a decision making approach and the theory of service-dominant logic to cultural tourism, the paper analyses how Big Social Data can be used to organize tourists' value propositions and to engage them in co-designing valuable cultural tours (thanks to the support of tourists' own content). Indeed, the active participation of the traveler – regardless of his/her awareness – engenders a process of co-design in terms of construction of tourists' value propositions for precious experiences (Del Vecchio et al., 2018 He et al., 2017; Moscardo, 2017; Wang and Alasuutari, 2017). By employing netnographic research, tourists' perceptions on archeological sites and in particular on the Pompeii Archeological Site (P.A.S.) were surveyed, in terms of: (a) the main characteristics of the site that attract internet user attention; (b) the main tourist profiles in terms of experience; (c) the main profiles of influencers managing online discussions on cultural tourism. To strengthen the analysis, a second step of research was provided by means of an online survey. Subsequently, the results of the Big Social Data analysis provided by social media and the online survey are presented and discussed, evaluating the surfacing of two predominant cultural identities of tourists. In addition, on the bases of the user-generated content and on the use of social networks, four categories of influencers are identified, as new types of independent third-party endorsers (Magno and Cassia, 2018), able to have an effect on the expected tourist experience. In the conclusion of the paper, theoretical and managerial implications and limitations are set out, together with some limitations. Therefore, taking into consideration a data-driven approach, the paper offers a fresh perspective regarding the role of Big Social Data in supporting more effective cultural tours.

Our study contributes to the growing research on tourism experience by proffering the notion of co-design as the main meaningful and committed association that managers are seeking to develop with the tourists. Furthermore, based on the theory of service dominant logic (e.g., Svensson and Grönroos, 2008; Vargo and Lush, 2008), our study provides a comprehensive understanding of how Big Social Data can be used as a key resource for the value configuration of the tourist experience. In addition, based on the importance of Big Social Data, it is essential to understand how it can strengthen the digital collaboration to co-design the tourist experience, which impacts on the process of value creation by the definition of a more adequate value proposition. Also, the result of this research helps tourism managers to comprehend the benefit

of Big Social Data which can increase the value generated for tourists so the former are able to better apply their economic/time resources. It also helps public/private operators to grow their revenues.

In recent years the digital transformation of the cultural tourism sector has completely changed the demand–offering interaction in the travel industry (Шейх and Суюнчалиева, 2019), as well as largely affecting the customer journey, announcing the end of well-established patterns. On this strand, 'Big Social Data' and user-generated content are becoming key sources of well-timed and rich knowledge (Bello-Orgaz et al., 2016; Nguyen and Jung, 2017), supporting data-driven decision approaches addressing the managing of complex relationships (Tortora et al., 2019) through the use of emerging and comforting technology. Our study adds knowledge to previous research and suggests how to apply Big Social Data in tourist experience co-design (Moscardo, 2017; Wang and Alasuutari, 2017), providing an increased value for visitors and a better decision-making approach on the part of managing institutions, site managers and enterprises (Ardito et al., 2019; Zhang, 2018)

Therefore, in order to better underpin and enhance these considerations, the paper is structured as follows. We draw on existing study in Big Social Data and its impacts on tourism experience co-design. Our articulated tourism level conceptual framework offers hypotheses. It describes the research design used for the empirical analysis, the research hypothesis and data collection. The paper concludes with a discussion of the managerial and theoretical implications and limitations.

2. The effects of digital transformation on tourist decision-making

Digital transformation has affirmed and strengthened its relevance in all the areas of life (Baldini et al., 2019; Demir, 2019; Guryanova, 2020). Based on the integration of smart features, interoperability and interconnection of businesses and tourists exchanging data through dynamic platforms, smart technologies automate and simplify daily business and customers' activities (Leung, 2019).

In the tourism industry, technological progress has long gone hand-in-hand with sector changes. Many studies over time have underlined the unavoidable impact of the development of ICT on the growing attractiveness of destinations and cultural sites, increasingly characterized by intensive information sharing and value co-creation (Akehurst, 2009; Da Costa Liberato et al., 2018; Porter and Heppelmann, 2014). Hence, the culture of sharing and

its participatory implications are becoming more and more part of the travel experience for experts and scholars in the sector. Both recognize that the storytelling of a place, or a cultural site, can no longer be delegated only to institutional representatives. On the contrary, the voice of the tourist who approaches it for the first time can become the most honest statement to put across the whole landscape, together with its cultural and social wealth (Frias et al, 2019; Zhong et al., 2017). When apprising themselves about future destinations, visitors search for content able to involve them by anticipating the travel experience, allowing it to go on during the journey/tour, and making them feel part of a community of travelers – more than mere tourists. Hence, the collaborative dimension, which exploits the natural competences (communicative, territorial, social, etc.) and reliability of those who have experienced the destination/cultural site first-hand, becomes a wide source of value, encouraging people to resonate with the major characteristics of the place (Bassano et al., 2018; Hagen, 2008; Li and Liu, 2020; Liu et al, 2019).

On this strand, the digital flywheel on the consumption dynamics acquired relevance such as artificial intelligence and block chain technology (Porras et al., 2019) as well as other disruptive technologies (Buhalis et al., 2019) that allow selecting and offering targeted content, changing the tourist decision-making process, more and more open to be influenced by these suggestions, instead of following professional advice. In particular, block chain technology has been defined by economists as a trust machine which can be used as a distributed architecture where all the actors can verify and check the different phases of the process. Also, it is a tool to able to fight against corruption and start the process to fight against poverty and equality (economist.com, 2015). The connection of physical infrastructure and natural and cultural resources with social amenities/facilities and business activities makes tourists – and public/private operators – able to leverage the collective intelligence of an area to generate advantages (Allam and Newman, 2018; Harrison et al. 2010).

From a strategic point of view, it is possible to handle data and tourism resources as their discovery, collection, process, integration, and management for enhancing tourism value. This makes it possible to better steer infrastructure and services for enriching the tourism experience, to support the co-creation activities of businesses and tourists for tourism innovation, also enriching, sharing and measuring the economic value derived from tourism activities to different actors (Lim et al., 2018). In a nutshell, in order to square up to wide challenges and possibilities provided by digital transformation, which need to be carefully considered, technological solutions are able to support evidence-based decision-making, built on measures and anticipation of future scenarios, essential for the development of cultural

tourism, with positive effects on tourists themselves and in society at large (Femenia-Serra and Ivars-Baidal, 2018). Geo-referenced data, Big Data, the Internet of Things (IoT), end-user services and cloud computing combined with mobile technology and artificial intelligence represent fundamental elements to deliver more personalized tourist experiences and accomplish the transition towards more intelligent and competitive tourist systems (Femenia-Serra, 2018; Wang et al., 2016). Among these elements, Big Data – extremely large or complex data sets deriving from a variety of sources such as smartphones, satellite imagery, online social media platforms, public monitoring devices, and so on – clearly brought benefits for tourism research (Li et al., 2018; Volo, 2019), closely related to emerging technologies, new abilities in data processing and new applications (Table 1).

Table 1: Big Data related tourism geographic research (Big Data and tourism geographies – an emerging paradigm for future study)

Type of research	Role of Big Data	Result of Big Data in research	Big Data categories
Big Data aided research	Data of traditional tourism conceptual models of analysis: Big Data with volume, variety, velocity, value, vertigo and volunteer	Expansion of traditional tourism research with more volume and variety of data	
Big Data aimed research	Special method for/of Big Data, Big Data itself as object, more sophisticated data system, post Big Data tech, A.I.	New methods, data mining and capturing, data filter, paradigm shift, system robustness	Data capturing and mining, filtering, storage, data cloud, analysis, search, sharing, transfer, visualization, querying, updating, social emotion, system robustness, information security, privacy and data source, Big Data platform for business operation
Big Data aroused phenomena research	New tourism phenomenon aroused/driven by Big Data, e.g., new consumer behavior, new model of tourist decision making	To understand and predict new phenomena aroused by Big Data, etc	
Big Data application research	New model of tourism operation, new tourism spatial model of organization economic value creation	New services and operation of tourism, Long tail market, B2C trade platform, etc	

Source: Developed based on study by Zhang (2018)

Big Data constitute the main driver for value creation in cultural tourism, contributing to defining experiences pending among innovative technology, strengthened tourist and business involvement, and increased personalization of the offering. In this light, a component of Big Data is that of Big Social Data, deriving from user-generated content through popular social

online services, such as Facebook, Twitter, YouTube, Instagram or forums and blogs. However, the literature on the topic shows different interpretations and terms to refer to the 'social' aspect in Big Data in response to various purposes of analysis.

For instance, some scholars (Burgess and Bruns, 2012) focused on the shift of Big Data towards media, communication, cultural and computational social science and analyse the role of social media in the context of the contemporary media ecology, identifying ethical concerns as well as data accessibility, authenticity and reliability challenges. Other studies (Ishikawa, 2015) analysed interconnections between physical world data and social data for the audience benefit. Some research studies (Guellil and Boukhalfa, 2015), instead, concentrated on the set of links produced by the relationships between users and on their non-structural nature, due to the length of messages required by some microblogging sites, the presence of spelling mistakes or other errors, and the lack of completeness. Also compelling is the research on the processes and methods designed to provide sensitive and relevant knowledge to any user or company from social media data sources differing for formats and contents, dimension and online or streamed generation of information (Bello-Orgaz et al., 2016). In any case, Big Social Data are utilised to extract insights from social media data and online social interactions of people for descriptive or predictive purposes to influence human decision-making (Olshannikova et al., 2017). Table 2 summarises the main Big Social Data related concepts, data sources, challenges and goals.

In any case, the voluntary character of these data represents their main characteristic, which is the core of their value, as tourists want pictures and comments to be accessible to others and yearn to share them with closed/open communities (Brandt et al., 2017). Sure enough, pictures, tweets, videos, comments testify to the level of engagement of tourists with the cultural offering. They reveal what is really valuable for visitors.

Table 2: Summary of BSD-related concepts, types of data they cover as well as challenges and research goals related to the area

Authors	Proposed conceptualization	Data sources	Data challenges/ characteristics	Research goals
Big Social Data as science				
Ishikawa (2015)	SBD – science about relationships between physical world data and social media data	Social media data (explicit semantics); physical real-world data	Volume; variety; velocity; vague	To clarify fundamental conceptualization of SBD and its applications

| Authors	Proposed conceptualization	Data sources	Data challenges/ characteristics	Research goals
		(implicit semantics)		
Pentland (2014)	Social physics – quantitative social science about connections between idea/information flow and human behavior	Physical world and social media data that reveal human behavior	Large size; data is ubiquitous and real-time	To conceptualize social physics; To reveal applications of social physics in real-world settings
Data-driven approaches to Big Social Data				
Guelil and Boukhalfa (2015)	SBD is a part of social computing	Social media data	Lack of completeness; large size; dynamic and unstructured	To review research on SBD and classify related literature; to study analytical approaches to SBD
Coté (2014)	Concept of data motility under the age of BSD	Data from mediated humans' practices	Volume; symbolic nature of data; distributed infrastructure; lack of regulations	To conceptualize the data motility; to bring conceptual boundaries of BSD
Big Social Data for society				
Burges and Bruns (2015)	BSD is social media data	Social media data	Data authenticity, reliability and accessibility issues	To assess feasibility of research in BSD; to reveal potential issues while working with BSD in academia context
Housley et al. (2014)	'Big and broad' social data	Social media data	Volume; variety; velocity; real-time; dynamic	To conduct observatory research of 'big and broad' social data opportunities and challenges
Big Social Data as method				
Bello-Orgaz et al. (2016)	BSD —processes and methods to extract knowledge from social media to users or companies	Social media data	Volume; velocity; variety; value; veracity	To review technologies and applications for processing Big Data from social media

Source: Developed based on study by Olshannikova et al. (2017).

Indeed, these unstructured/semi-structured data are semantically richer than other Big Data and so, in conjunction with these, they represent a well-stocked source for suggesting the key elements to generate contextualized offers, or to co-create personalized products/services with tourists, promoting networking, collaboration and innovation (Del Vecchio et al., 2018), thus providing them with better value even in real time (Olshannikova, 2017).

From tourists' point of view and the theory of service-dominant logic, active participation through online reviews and interaction with their friends or unknown people by means of social media activate a process of tourism experience co-design. Even though not always (or not completely) aware, this involvement increases value for consumers, encouraging more respectful behaviors, due to an increased personal exposure (self-surveillance) and social pressing (social surveillance), but also thanks to more customized situations and so with potentially higher satisfaction. In other words, the Big Social Data approach narrows the gap among: expected tourist experience (expected quality); designer perceptions of tourist expectations (management perceptions); planned tourist experience (customer-driven service design and standard); delivered tourist experience (service delivery); external communications and perceived tourist experience. Figure 1 illustrates the tourist value system creation.

**Figure 1: The tourist value system creation**
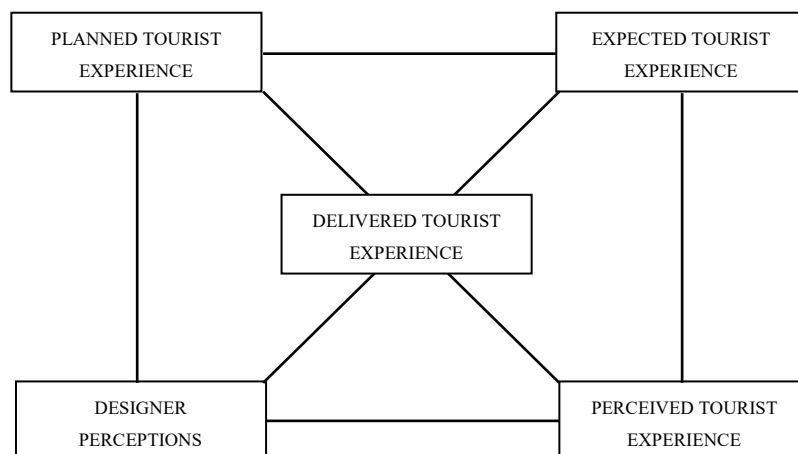
Source: Designed based on study by Wang and Alasuutari (2017)

In sum, Big Social Data may be useful to equalize the planned and perceived value of the experience (internal vision), with the expected value and the communicated one (external vision), removing the internal/external boundaries, thanks to the contribution of an authentic user-generated content. Big Social Data management underpins a value co-creation approach on tourism experience design, providing predictive modeling analysis to contribute to the concept of co-design (interchangeable use as co-creation or co-invention) in the tourism market (Campos et al., 2018) and service-dominant logic in tourism. According to Vargo and Lush (2008), a service-dominant logic approach suggests that customers (businesses) are co-creators of value and are involved in the process of value co-design where tourists' and businesses'

roles are not clearly specified (Svensson and Grönroos, 2008). The service-dominant logic "is firm-centric and managerially oriented" (Vargo and Lush, 2008, p. 2) and has its origin in the foundational propositions that create value among businesses and tourists "in every aspect of the value chain and that it is the beneficiary who always uniquely and phenomenologically determines this value through value-in-use perceptions" (Merz et al., 2018, p. 79). So, a *Big Social Data approach to tourism experience co-design increases the overall value for both decision makers and tourists.* Figure 2 illustrates the research conceptual model.

Figure 2: The research conceptual model
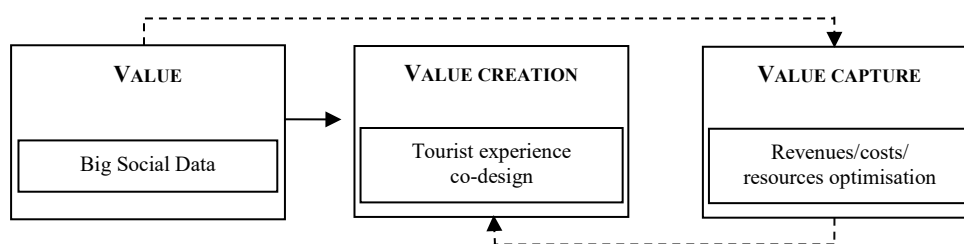
Source: Designed by the researchers

3. Material and methods

This study deals with the support of Big Social Data for the concept of tourism experience co-design, with a focus on cultural offering. Taking into consideration the transformations in the way of experiencing travel, digital tourism in Italy is an ever-growing trend, with an estimated worth of 14.2 billion euros, a quarter of the overall national tourism value (Polytechnic of Milan, 2019). In addition, cultural heritage in Italy has a strong appeal: in 2018, about 55 million visitors visited national monuments, museums, archaeological parks, and so on, bringing in a total amount of 229 million euros in revenues. The interest for this offering grew by 44% in five years, compared to 38 million in 2013 and + 81% in revenue in the same period, with archaeological sites attracting almost half of the visitors (MiBACT, 2020).

Starting from this point, the field analysis concentrated on user-generated content regarding the Pompeii Archaeological Site (P.A.S.), to trace valuable insights for the tourist experience. A Unesco World Heritage Site, the Pompeii Archaeological Site was in 2019 the third most popular tourist attraction in Italy, with 3,805,094 visitors and an increase of 4.26% on 2018 (pompeiisites.org, 2020; MiBACT, 2020).

To conduct the empirical study, two distinct stages of research were required. The first step was carried out by means of a netnographic analysis (Kozinets 2002, 2012, 2015; Tavakoli and Wijesinghe, 2019; Whalen, 2018; Molz, 2018), a methodology that offers an empathic approach to qualitatively analyzing publicly accessible data by users' conversations on the P.A.S., extracted from social media to derive community insights. The study aimed to detect the tourist perception on the P.A.S. in terms of characteristics that attract internet user attention, together with an emphasis on the main topics debated by influencers/opinion leaders managing online discussions on the P.A.S. Data were collected during the period January/June 2018, extracting a dataset of 8,856 postings on TripAdvisor, 328,110 pictures on Instagram (the most recent with respect to the deadline for collecting data) and 2,004 tweets. By means of a qualitative content analysis (Hsieh and Shannon, 2005; Mayring, 2000), in conjunction with a discourse analysis (Johnstone, 2008; Jones and Dye, 2018) and a sentiment analysis (Höpken et al., 2017), the narratives on the part of the internet users relative to the P.A.S. were reconstructed. Hence, Table 3 shows the number of individual reviews/photos/tweets collected by means of crawler software (downloaded data), and analysed data – net of any off-topic data – together with the purpose in terms of information searched for each social network.

Table 3: Summary of BSD-related concepts, types of data they cover

| Source	Downloaded data	Analysed data	Information
TripAdvisor	8856	375 – in topic	Ex post perceptions
Instagram	328110	328110	Real time perceptions
Twitter	2004	1054 – in topic	Comments on the P.A.S

For the second step, the research hypothesis was further investigated using data from an online survey, broadcast by Tourism Provincial Organizations based in the Campania Region in the south of Italy. The online data collection, instead, took place during the period November 2018/January 2019, involving 1,550 respondents interested in cultural and historical tourism. Data were qualitatively treated to verify the main tourists' profiles in terms of experience, as inferred from the previous analysis, as well as the main profiles of influencers managing online discussions on tourism.

4. Findings

4.1 Results of the netnographic analysis

According to what previously defined, the empirical study examined the perceptions, ex post and real time, trackable on the web around the P.A.S., together with online users' comments. As summarized in Table 3, data were collected by means of three social networks, each of them directed to catch focused information more efficaciously than the others. TripAdvisor can be considered the most prominent travel review site (Yoo et al., 2016) and the largest travel platform in the world (Jumpshot for Tripadvisor, worldwide data, April 2019, www.tripadvisor.com); the platform has been used in literature as a source of data for sentiment analysis tasks (Valdivia et al., 2017). Instagram, instead, is a multimodal social networking platform that combines online mobile photo-sharing and video-sharing, providing users with an instantaneous way to capture and share their life moments with friends through a series of (filter manipulated) pictures and videos (Hu et al., 2014; Lazaridou et al., 2017). Hence it seems to be more suitable to grasp real time perceptions of the users (obviously with reference to the past moment of the experience). Lastly, Twitter is a microblogging platform that allows users to record their thoughts and personal updates in 140 characters or less. Thanks to this concise format, users update their 'blogs' multiple times per day. Therefore, by applying netnographic methods, it is possible to catch people's feedback about destinations, cultural sites and so on (McCormick et al., 2017; Ramanathan and Meyyappan, 2019; Siregar et al., 2020). Comments coming from **TripAdvisor** showed that appreciation of the P.A.S. derived for the most part from its beauty and artistic, historical and cultural value, as 62% of positive remarks indicated (five stars), focused on the intrinsic meaning of the archaeological site, against 5% of negative opinions (one star) toward organization and management (Figure 3).

Figure 3: Comments on the P.A.S.
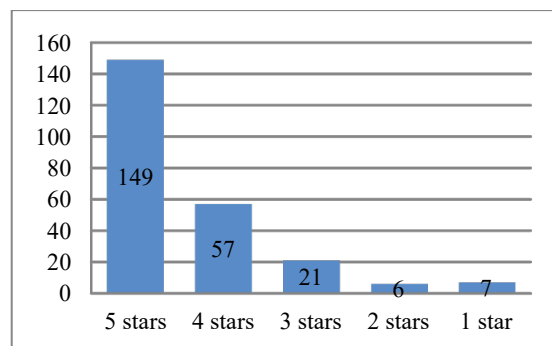
The sentiment analysis, instead, showed a situation better fitting reality, where positive elements (43%) and critical issues (48%) were balanced, with a difference of 9% in favour of the latter. Rather than considering practical issues, positive perceptions were related to the intangible sphere of the visit on the site, evaluating the overall immersive experience, linked to the impression of re-enactment thanks to the uniqueness of the site. On the contrary, the main critical comments emerging from the analysis were appointed to the organizational dimension, as the lack of communication in the P.A.S. (in terms of not having thorough signage, out of date audio-guides, and so on), the work in progress that made visitors unable to reach all the areas, and the verification of some empty Roman house, due to the transfer of content to the archaeological museum of Naples. Another negative trait concerned inappropriate behaviour by tourists, due to the possibility of visiting the P.A.S without paying in some periods of the year, which attracts people not completely interested or conscious of the site's special status. The situation amplified a feeling of scarce security of the P.A.S. In short, the P.A.S. did not enjoy favourable web positioning.

On the contrary, data retrieved by **Twitter** were characterized by a lower level of narration, with a small amount of qualitative evidence in terms of content. The prevalent discourses were orientated to provide added information (71%) or commercial indications (7%), without personal involvement and generating a neutral sphere of narration, since only 22% of the tweets contained personal opinions of the users. Also, that the sentiment on the P.A.S. was neutral for the most part (82%) confirmed a passive and disengaged sharing of information on the social network (negative 7% and positive 11%).

In other words, Twitter appeared to be a worse source for the purpose of the analysis, but it represented a useful tool for promotion, as testified to by the high level of sharing toward practical news on the cultural and historical events planned or implemented on site. To extract data from **Instagram**, the two hashtags #Pompei and #Pompeii were used. The pictures considered in the topic were analysed according to their 'modus narrandi', that is the visual ways typically used by tourists to represent themselves. Three categories were defined, namely, selfie (when the portrait had a focus on oneself for a self-presentation); panorama (when the picture pinpointed the evocativeness of the site); details (when the photo focused on an aesthetic representation, even though using an original semantics to narrate something of oneself).

According to these issues, on Instagram an emotional narration prevailed over an educational or historical one. Most of the in-topic pictures concentrated on the artistic side (the category named 'details') and on self-presentation (selfie). Evidently, the visual narration of the

experience was clearly focused on the main dimensions of emotion, suggestion and evocation. In order to incorporate these results within the tourist experience co-design process, the authors attempted to define two categories of ideal representation to take into consideration. As shown by these findings, on the bases of their passion for cultural goods and either a core or a marginal awareness, visitors to the P.A.S. were classified within two main cultural 'ideal types': accidental or passionate tourists. Such identities correspond to exemplars, but also effective, touristic targets, the analysis of which may reveal valuable insights into co-design of the tourist experience.

So the accidental tourist demonstrates a marginal awareness towards cultural goods. In general terms, driven by simple enthusiasm, he/she does not previously plan a cultural tour in detail, preferring to get involved in the situation, taking news directly from the site. By nature, he/she tends to choose the tour on the basis of its fame. Consequently, he/she manages the time of the visit in an extemporary manner. Due to his/her scarce attentiveness, he/she may adopt (even unconsciously) damaging behaviours, without taking into consideration other visitors' needs. During the tour, the accidental tourist focuses his/her interest on practical provisions, as the site maintenance, services of pre-visit assistance and the assistance during the visit, and so on. The emotional dimension of his/her narration, instead, is linked to the overall atmosphere of the P.A.S.

Opposite to this ideal type, the passionate tourist expresses an effective and aware interest for cultural goods. His/her travel choices are not occasional and the planning of the tour is preceded by a preventive collection of detailed study material. When on site, he/she is particularly attracted by the cultural and historical elements of the area. He/she appreciates singular and characteristic details and also manages the time in a rational manner, to maximize the visit experience. In this sense, his/her attention to practical provisions is functional to improve the tour. Due to his/her consciousness of the special status of the P.A.S., he/she tends to minimize the impact of his/her presence on site, which translates into respect for the destination and other visitors. Finally, the emotional dimension of the experience is strictly linked to the cultural and educational value of the P.A.S.

To conclude, as the first step of analysis, an influencer detection was conducted, in order to define the profiles of subjects managing online discussions on tourism. In the digital age, online influencers provide advice on the destination, suggest entertainment, give practical indications for the arrangements, affecting the kind of experience the tourists will live (Audrezet et al., 2018; Narangajavana et al., 2019; Xu and Pratt, 2018). Although not always strictly related to the travel sector, they are often inspirational for their followers, thanks to a fiduciary and

imitative mechanism. Therefore, in line with their web presence (content and social media usage), four clusters were found. Pompeii Innovators: especially active on Twitter, they shared both general information and specific events on the site, and scientific studies with the aim of increasing knowledge around the P.A.S.; Archaeology Experts: they were especially present on Twitter and share discoveries, activities and specific news with reference to artistic and cultural places; Personal Bloggers: especially active on Instagram, they posted photos of their holidays, cultural trips, visits; and Commercial Spammers/Traders: especially active on Twitter and Instagram, they used the sites' reputation to promote private activities, such as guided tours, restaurants, accommodation, and publishing activities. All clusters represented actors vigorously engaged in tourist experience co-design, supporting the process of value configuration, value creation and value capture. In sum, the results of the first step of the analysis seem to positively answer the research question.

4.2 Results of the online survey of historical and cultural tourists

The research question was further investigated using data from an online survey of 1,550 respondents interested in historical and cultural tourism. From a descriptive point of view, the respondents were tourists interested in cultural tourism, distributed as follows: females made up 54.84% and males 45.16%, with a very high level of educational qualification (high school: 44.52% and university: 43.87%). Considering their country of residence, where most of them (93.55%) were Italian, a large majority of the respondents travelled outside their country once per year (42.86%), twice per year (21.09%) or three times per year (13.61%) with the same percentage of those that travelled only in their own country. The respondent tourists used to spend five days on international visits (23.77%) while less than half of them spent more than five days on international visits (42.62%), as shown in Figure 4.

Figure 4: Trips outside the country per year
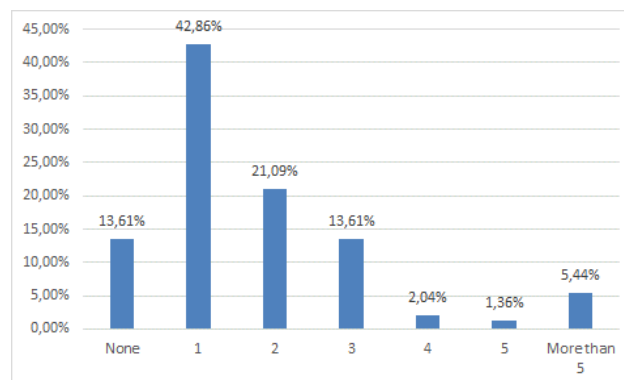
A very large majority of respondents (96.48%) was interested in visiting historical and cultural sites; conversely a very small percentage did not prefer to visit historical and cultural locations. The respondents characterized themselves in terms of tourists who are involved in the tourism experience as follows: visitors (64.18%) who prefer to plan the visit to the site, previously collecting and studying tourist material and being involved in the site details, and visitors (35.82%) who prefer to get involved in the experience taking news directly from the site, choosing it exclusively on the basis of its fame.

At this point, the online analysis was focused on user-generated content regarding the P.A.S. to identify valuable insights for the tourist experience. This archaeological site is very popular among the respondents (92.48%) and most (70.73%) of the tourists involved in the survey visited it. In addition, a great number of respondents (78.26%) visited a historical and cultural site at least once, even if one-fifth of respondents (21.74%) had never visited such a site, therefore this percentage remains very consistent. The Coliseum was also confirmed to be the most visited site among the respondents (140 out of 1,550 respondents). Furthermore, in terms of judgements, the tourists involved showed a high degree of satisfaction with the overall experience (77.12%), linked to the very high historical (77.97%), cultural (73.73%) and archaeological (68.64%) value of the P.A.S, as displayed in Table 4.

Table 4: Tourists' judgments on the P.A.S.

Factor	Very low	Low	Don't know	High	Very high	Average
Archaeological value	0.00%	0.00%	10.17%	21.19%	68.64%	4.58
Cultural value	0.00%	0.00%	9.32%	16.95%	73.73%	4.64
Historical value	0.00%	0.00%	5.93%	16.10%	77.97%	4.72
Site care	1.69%	7.63%	41.53%	38.14%	11.02%	3.51
Pre-visit assistance	3.39%	12.71%	46.61%	29.66%	7.63%	3.29
Assistance during the visit	2.54%	9.32%	38.98%	35.59%	13.56%	3.51
Overall experience	0.85%	2.54%	19.49%	49.15%	27.97%	4.02

In general terms, the managerial and organizational aspects were less relevant, without serious disruptions or evident strengths, while historical, cultural and archaeological value appear to be of great impact on tourists' judgements. The findings show the validity of the hypothesis, suggesting that a Big Social Data approach to tourism experience co-design affects the overall value for both tourists and decision makers. Thus, it seems that the respondents understand that a fair usage of social data in the wave of the social media revolution is influencing the co-design of a valuable tourism experience.

5. Discussion

Big social data is a very valid approach to balance the planned and perceived value of the experience with both the expected and the communicated value detaching the internal/external boundaries thanks to the role of an authentic user-generated content (Ardito et al., 2019). The four clusters described before were always deployed in the online second step of research whereas in connection to their personal generated content on the web, respondents define themselves as: bloggers (34.48%) able to be active – especially on Instagram – posting pictures of their cultural travel and visits; experts (15.52%) – especially on Twitter – sharing discoveries, activities and pertinent news with reference to historical and cultural sites; innovators (14.66%) – especially on Twitter – sharing both general information and specific events on the site, and scientific studies with the aim of increasing knowledge around P.A.S.; traders (6.03%) – especially on Twitter and Instagram – using the site's reputation to launch or boost their business; but what is really surprising is the fact that an important proportion of the respondents (29.31%) is not recognized in any of the four clusters. This percentage reveals a strong presence of passive users on the web who prefer to obtain information with a lower level of interaction.

The critical points emerging from Tripadvisor comments (communication, site care, pre-visit assistance and during the visit too) that belong to the first step of analysis were not completely shared by the respondents to the online survey, revealing nevertheless weak differences between the two steps of research. As regards the two ideal types of tourists, unexpectedly, the passionate tourists were less satisfied than the accidental tourists because of the managerial and organizational malfunctions (empty Roman house, work in progress, missing communication) considered as an interference of the planned experience that forced them to redesign the visit on-site. In this scenario, the ideal types detected by the findings may provide interesting insights for the tourist experience co-design, because of their origin from spontaneous witness, contributing to increase the overall cultural tour value. Based on the theory of service-dominant logic, the evidence that emerges from both the netnographic analysis and the online survey completely supports the research hypothesis. So as a Big Social Data approach to tourism experience, co-design impacts positively on overall value for decision makers and for visitors, creating new forms of knowledge/information, innovation and business (Narangajavana et al., 2019).

6. Conclusions, implications, limitations, and future research

Hyper-connection and hyper-information, testifying to the increasing complexity of society and the acceleration of social change, together with the technological advances in both the demand and supply side, create huge opportunities, as well challenges, for all the actors involved in the cultural tourism sector. Smart tourism technology has a great impact on travel decision support satisfaction, especially linked to information quality, source credibility, interactivity, and accessibility (Yoo et al., 2017).

Indeed, visitors represent themselves as experiencing actors seeking and negotiating new and stimulating meanings in the tourism experience, thanks to the support of smart devices, contextually participating, voluntarily or not, in data production (Tribe and Mkono, 2017). Meanwhile, tourism enterprises and operators – exploiting the 'new fuel' or the 'new capital' represented by tourists' data (Cuomo et al., 2019) – may better respond to visitors' needs, through focusing on tourism requests (Shafiee and Ghatari, 2016).

In this portrait, 'Big Social Data' and user-generated content appear to be key sources of well-timed and rich knowledge (Bello-Orgaz et al., 2016; Nguyen and Jung, 2017), helping data-driven decision approaches oriented by the managing of complex relationships. Thus, applying an anthropological approach to Big Social Data represents an innovative way to permit decision makers operating in the tourism industry (and not only) and tourists to build valuable tourist experiences. A data-driven approach can provide, both on the supply side (public institutions, blog, community, business) and on the demand side (the cultural identity tourists) a virtuous mechanism of information/knowledge, able to transform and renew the data flowing among the users to increase market share, revenues and profitability (Lalicic and Dickinger, 2019) and value for tourists.

New technologies have had a strong impact in recent times, contributing hugely in terms of data, information, and knowledge, first in recipient mode (Web 1.0) and then in generation mode (Web 2.0 and later). In this respect, the success of the Big Social Data approach applied to tourism experience co-design and service-dominant logic, particularly user-generated content, has been impressive. However, this research shows the growing importance of Big Social Data for tourism experience co-design based on case study, focusing on data for Pompeii, considering that this activity occurs not only for visitors but for decision makers as well. Thus, the proposed Big Social Data approach is feasible. Several implications arise from the findings of the two steps of research.

From a theoretical point of view, Big Social Data approach and service-dominant logic identify tourist cultural identities on the basis of their social behaviours and, at the same time, analyse the social influencers on the basis of the user-generated content and on the use of social networks. The application of an anthropological approach to Big Social Data certainly constitutes a novel approach that deserves further enhancement in the future in order to enable both public and private sector organizations operating in the cultural tourism industry to achieve better performances and to increase market share and profitability (Lalicic and Dickinger, 2019).

From a managerial point of view, this manuscript highlights a new avenue for tourism experience co-design based on a fruitful usage of Big Social Data both for markets and for business. On the supply side, a Big Social Data approach can support decision makers to manage customer-driven service design (service-dominant logic) and service delivery, to better plan external communication influencing expected quality and enriching management perceptions. On the demand side, new insights for tourist experience can emerge from the new profiles of the cultural tourist illustrated in the research. Furthermore, it would be interesting to know what social network has been selected by the tourist in order to calibrate the proper offer in a tourism experience co-design orientation focusing on a data-driven approach.

Social media can be leveraged to influence a tourists' 'virtual' acculturation process when travelling abroad, which refers to the acculturation that takes place in learning and acquiring culturally-related skills for sociological adaptation prior to tourists' travelling. The role of social media as an enabler may help managers to optimize their marketing efforts towards better trip experience (Li et al., 2019). Future researchers should consider adding a descriptive analysis of stakeholders in the tourism industry, which could provide more suggestions for managers. The main limitations of this study concern the reliability of the netnographic analysis of cultural tourists of P.A.S. and also the reliability of the survey online. Both analyses were methodologically sound, but they should be expanded for greater statistical representativeness. In particular, the online survey involved 1,550 tourists with a large number of Millennials (980 out of 1,550) due to their daily use of social networks. The bias of online data disregards the narrations and perceptions of people (tourists and community) who are not web users, thus, other tourists need to be involved differently.

Based on the purpose of this study, we collected a large amount of data from social networking sites from the tourism sector, and we examined netnographic analysis of cultural tourists of P.A.S. As this study identified the main variables, future research should consider the

relationships between the variables to increase the generalisability of the findings. We collected our data from the Pompeii archeological site in Italy. Cultural tourism is one of the most relevant sectors that generates and contributes to Italian GDP. Future study should focus on other archeological sites from different countries and economies and compare the results with our study. Moreover, further research can focus on Big Social Data based on tourism sustainability as it is the key variable of tourists' experience.

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