

## **Can We Use Big Data Analytics to Leverage Tourism in Rural Tourism Destinations?**

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### **Abstract**

Tourism is an increasingly important global economic activity. The proliferation of technology-based mechanisms applied to this activity, has been prompted by a growing number of more demanding consumers, well informed and receptive to new tools to access information and also by the fact that tourism is an information-intensive activity. However, in what concerns peripheral rural tourism destinations, which are to a large extent made up of micro and small enterprises, there is a lack of evidence that the maturity of data that is captured, processed and maintained, by tourism organizations, has a sufficient level of maturity to support the application of Big Data Analytics techniques.

This paper, which intends to examine peripheral and mainly rural tourism destinations, analyses the key issues about technology on tourism and proposes a matrix so that we can gauge if the data currently available, and its maturity level, are sufficient to support the use of Big Data Analytics, with all the inherent benefits that rural tourism destinations could arise from its use.

**Keywords:** Data, Big Data, Tourism, Rural Tourism Destinations, Matrix

### **Introduction**

Tourism is an increasingly important global economic activity. The proliferation of technology-based mechanisms applied to this activity, has been prompted by a growing number of more demanding consumers, well informed and receptive to new tools to access information and also by the fact that tourism is an information-intensive activity. Also, tourists are doing their part as they are themselves leaving information about their profile, opinions and desires in discussion forums, in news comments, when using applications, in reviewing and rating services enjoyed, among many other interactions where new data is produced.

Technology in tourism has dramatically changed the relationship between supply and demand (Buhalis & Zoge, 2007; Costa & Buhalis, 2014; Pou & Pera, 2005). The Internet opens new possibilities by allowing access to more information available in real time, by facilitating the acquisition of tourism products and services and by allowing the creation of a la carte itineraries and products. Technology changes the tourism value chain in the various phases of visit, namely (Pou & Pera, 2005): in planning the visit (possibility of collecting information, booking online and preparing the visit a la carte, at home), selecting and buying transportation (less bureaucracy, possibility to consult and choose different itineraries in advance, use of tools to guide the visitor to the destination through, for example, GPS technology or third-generation mobile phones), on arrival at the destination (use of interactive guide systems, security systems in passport control, reducing check-in times, virtual visits to places of interest); during the stay (promotional text messages, interactive guides, proper signaling, VoIP communications that reduce costs).

This reality has brought, to the main players in the tourism sector, uncountable opportunities. The enormous amount of data generated by all actors can be used to understand, with good precision,

tourist behaviour, deriving and anticipating their needs if we can extract, from the data, information and knowledge. Since there is considerable evidence in literature on the context of rural tourism destinations and the fact that the main players are micro and small enterprises, often lacking in their technological capacity (technology and associated human resources), (Galloway, Sanders, & Deakins, 2011; Gössling & Lane, 2014; Park, 2017; Salemink, Strijker, & Bosworth, 2017) it is legitimate, to question whether there are conditions so that the potentialities of knowledge extraction from the data, exist. Specifically, this paper aims to contribute to the understanding of the existence of sufficient and diversified data to be adequate, processed and stored so that Big Data Analytics techniques can be applied to them. It is equally important to us, in addition to assessing the quantity and diversity of existing data, to understand the degree of maturity of the existing data; that is, in our view, whether existing data will be able to feed the various dimensions of Big Data.

Given the type of organizations that typically operate in the tourism sector in rural destinations, it is reasonable to assume that these have a lower capacity for technology adoption. It is important to assess whether the state of technological maturity, in this sector, presents sufficient conditions for the application of Big Data Analytics, with all the benefits that could be achieved.

This paper proposes a matrix that intends to contribute to understand if there are, at present, conditions to apply the techniques of Big Data. However, regardless of the results that can be achieved through the matrix proposal, we are particularly interested in that through results it could be possible to delineate a framework under the form of a set of recommendations for Big Data techniques application. Also, the results would allow to establish a set of recommendations that will enable the industry to evolve in order to realize more, and more diversified and mature data, in order to apply Big Data in the future.

### **Key Issues about Technology on Tourism Activity**

Tourism is a complex activity that mobilizes and affects directly or indirectly a multitude of goods and services relating to travel, accommodation and recreation. As a social phenomenon, tourism is one of the requirements of modern society. Having already been considered previously as a luxury product, tourism tends to increasingly become a massive product, a staple product, essential to the psychological balance of the individual affected by everyday constraints (Goeldner, Ritchie, & McIntosh, 2000). For this reason, touristic flows to destinations have been increasing over the years (World Tourism Organization, 2015). According to Saraniemi e Kylänen, (2011) the tourist destination is a physical space, geographically delimited, where organizations and actors interact and where activities and transactions, which include exchange of material goods, but also immaterial aspects like meanings and symbolic values, take place. This definition integrates a set of products (supply) which constitute an attraction for tourists (demand), and the interaction between demand and supply is permitted by the existence of major elements such as infrastructure, accessibility, and tourism facilities.

A major issue in what concerns the competitiveness of destinations and, consequently management, is the importance that technology assumes in this context. Technology - mobile phones, email and, above all, the Internet - is changing consumer behavior in different ways, which has considerable effects in tourist consumption (MacKay & Vogt, 2012; Milne & Ateljevic, 2001; Pechlaner & Raich, 2002; Tjostheim, Tussyadiah, & Hoem, 2007; Werthner & Ricci, 2004). Since the early 1980s, technologies and, in particular, electronic reservations have changed tourism industry and business processes (Andriotis, 2004).

The Internet is a major contribution to the development of destinations, since it allows consumers to access electronic information and prices at the destination in the comfort of their home. Technologies increase consumer choice and promote relationships between tourist service providers in destinations. As an industry that generates millions of jobs around the world and represents a valuable contribution to the Gross Domestic Product of many countries, information technology plays a fundamental role as a means of promoting organizational efficiency and service delivery (Pou & Pera, 2005).

There are several contributions in the literature on the importance of technology, particularly the Internet, on the commercialization of tourism products, which are essentially intangible and which cannot therefore be previously tested (Aldebert, Dang, & Longhi, 2011; Buhalis & Ujma, 2006;

Buhalis & Zoge, 2007; Cooper & Hall, 2008; Hjalager, 2000, 2010; Werthner & Klein, 1999; Werthner & Ricci, 2004). In tourism, the decision to visit is increasingly influenced by the quality of the destination's website and its degree of interactivity and flexibility (Cooper & Hall, 2008). According to Cooper and Hall (2008:232) "the Internet has revolutionized destination marketing, branding and image formation" and, "at a stroke it has given small destinations with tiny budgets the same market reach as the largest destinations in the world (Cooper & Hall, 2008:232). For these authors, destination portals, for example, allow the integration of destination management systems that gather together all the elements of the destination offer.

The Internet has become the preferred source of information for visitors, especially independent travelers (Hays, Page, & Buhalis, 2012; MacKay & Vogt, 2012; Stiakakis & Georgiadis, 2011; Tjostheim et al., 2007). Also Kothari and Fesenmaier (2007) recognize the role that the Internet can play, especially for organizations responsible for destination management. Analyzing the e-business models of these organizations, the authors conclude that the Internet potential has not yet been properly used by destination marketing organizations. These authors also conclude that if these organizations can move from information providers to promoters of value they will be in advance of competing destinations. Choi et al. (2007) also conclude that these organizations have little knowledge of tourists' preferences about online information and their research behavior.

In addition to the organizations responsible for management and marketing of destinations, technology also plays a key role for small and medium-sized tourist enterprises (SMEs) in the destination. Indeed, some beneficial effects of information and communication technology (ICT) lie in the opportunity for small operators to reduce their traditional disadvantages (Mistilis, Buhalis, & Gretzel, 2014; Petti & Passiante, 2009). Buhalis and Deimezi study the development of electronic tourism in Greece, defining it "as a term describing the entire range of applications of ICT on tourism and the implications for the tourism value chain" (Buhalis & Deimezi, 2004:103). In this context they analyze in particular the level of ICT diffusion in SMEs at destination and conclude that it is mainly at the interorganizational cooperation level that ICTs can assist these enterprises in increasing their competitiveness and their global presence. "The flexibility of the Internet and the ability to address different target markets support tourism organizations to develop a marketing proposition for each target market and to create themes or routes through the destination to address the needs of each market" (Buhalis & Law, 2008:10). Accordingly Fesenmaier and Es (1999) add that the concept of electronic proximity (ICT eliminates physical space as a limiting element of exchanges between sellers and consumers) is put into practice and people will have more power with the information they can obtain. In fact, for the distribution of their products, tourism companies now do not rely exclusively on powerful intermediaries such as tour operators or global distribution systems (World Tourism Organization, 2014).

Furthermore Morrison and King (2002) support that the success of many destination marketing initiatives depends on the effective participation of a significant portion of tourism companies. Around the world, most of these businesses are small, owned by local entrepreneurs, family run, predominantly members of the host community and rural based. This all represents a significant challenge for public organizations responsible for developing destination marketing initiatives, many of which deliberately integrate e-commerce components in response to the reengineering of tourism markets and distribution chains. Only by promoting technology adoption by SMEs it will be possible to sustain a comprehensive and high-quality tourism experience and achieve sustainable competitive advantages (Morrison & King, 2002). If, on the one hand, ICTs increase consumers bargaining power, on the other hand they also increase the bargaining power of suppliers because they reduce costs, allow direct contact with consumers and increase partnerships with other distributors (Bourgouin, 2002; Buhalis & Law, 2008; Buhalis & Zoge, 2007; Cooper & Hall, 2008; World Tourism Organization, 2014).

For tourism organizations, constant product and process innovations supported by proactive and reactive strategies are some of the few sources of competitive advantage in the Internet age. Processes related to promotion and distribution may be the business functions most affected in the technological revolution (Buhalis & Zoge, 2007; Cooper & Hall, 2008). However, many organizations fail to assess the benefits of co-opetition (cooperation to promote competitiveness) and co-destiny (cooperation at the destination level) where organizations collaborate with actors they

would normally see as competitors (Buhalis & Cooper, 1998; Buhalis & Law, 2008; Hakolahti & Kokkonen, 2006; Žemļa, 2014). Cooperation among suppliers, clients and enterprises that produce complementary or related products can lead to market growth, new business relationship and even it can lead to new enterprises creation (Hakolahti & Kokkonen, 2006).

The need for cooperation at the e-business level is in fact defended by several authors (Baggio, Corigliano, & Tallinucci, 2007; Braun, 2004; Buhalis & Deimezi, 2004; Buhalis & Law, 2008; Costa & Buhalis, 2014; Hakolahti & Kokkonen, 2006; Joo, 2002; Palmer & McCole, 2000). In what concerns technology platforms (for example, websites, social networks, call centers, mobile phones), cooperation and networking is a major issue (Moreno, Hörhager, Schuster, & Werthner, 2015). Networks promote competitiveness and better performance by tourism SME (Bourgouin, 2002; Ndou & Passiante, 2005), since once connected SME can use common technological tools without the need for large investments. Connections between networked enterprises allow access to complementary assets while filling gaps in resources and skills.

In the analysis of the development of e-tourism in Greece, Buhalis and Deimezi (2004) conclude that cooperation, like competition, are characteristics of an emerging online tourism services sector. Hitt et al. (referred by Buhalis and Deimezi, (2004)) refer that the cooperation that the Internet allows is driving business networks with the aim of creating new resources or combining new forms of existing resources to develop new products and serve new consumers. In the same study, Buhalis and Deimezi (2004) conclude that companies have serious doubts about the ability of national tourism organizations to coordinate destinations and defend that business networks emerge as an alternative that can help tourism organizations to develop comprehensive value chains at the local level.

Another important aspect in what concerns technology is the contribution it can bring to peripheral destinations (Bourgouin, 2002; Buhalis, 1999; Buhalis & Main, 1998; Gössling & Lane, 2014). Information technologies can play an important role in the development and sustainable management of some of these inland mainly rural tourism destinations. ICTs strengthen networking and communications and change the nature of personal and organizational relationships in rural communities (Bourgouin, 2002; Fesenmaier & Es, 1999).

## **A Review of the Big Data Concept and its Context in Rural Tourism**

Big data is one of the most popular and most frequently used terms to describe the exponential growth and availability of data in the modern age, which is likely to be maintained or even accelerate in the foreseeable future (Hassani & Silva, 2015).

The Big Data concept does not have a single formal definition adopted by all. In a simple and pragmatic way, Big Data can be formally defined as a large volume of data, which are available with different degrees of complexity, generated at different speeds and with different degrees of ambiguity; resulting in a complexity that is beyond that supported by traditional technologies, processing methods and algorithms (Krishnan, 2013).

There are two major sources of data that can be considered under the Big Data paradigm. The first is the structured, semi-structured and unstructured data that exists within organizations such as electronic mail, documents in PDF format, spreadsheets, server logs and other data resulting from the organization's own activity. The second source of data is the set of data available outside organizations, some available freely, others paying for a subscription, or available to restricted groups of selected partners and / or customers (Sathi, 2012).

Another classification has to do with the data types associated with Big Data. According to Soares (2012), there are five types of data – web and social media, machine-to-machine, big transactions, biometrics and human generated.

Big Data data has several characteristics that together make it different from all other data types. These characteristics are known as the Vs of Big Data. Some authors refer the existence of 3Vs: Volume, Velocity and Variety (Singh & Singh, 2012). According to some others authors, there is a 4th V – Veracity (Demchenko Grosso, Laat & Membrey, 2013; Sathi, 2012). Also, a 5th V has emerged – Value, that is related to the fact that is not enough to have access to a big amount of data at any moment if this does not generate value for the business (Cui et. al., 2016; Bello-Orgaz et. al.,

2016; Ishwarappa & Anuradha, 2015; Demchenko et. al., 2013). Our position is that the 5 Vs are better to define the characteristics of the Big Data concept, so we will use the 5Vs and we will describe them in the tourism context.

**Volume** - Volume always seems to top the list of big data characteristics, and is a key contributor to the problem of why traditional relational database management systems fail to handle big data (Prajapati, 2013). The volume of tourism big data always comes from points of sales or other traditional channels of distribution (i.e., call centers, websites, premises, newsletters, customer relations, etc.). The content of tourism big data is created on a daily, or even hourly, basis, and we are interested in making sense of the information, transforming big data into smart data and then using it for tourism planning.

**Velocity** - The second key characteristic of big data is velocity, which is referred to as the speed of responsiveness. There are three important aspects of the velocity of tourism big data (Chen, Mao, Zhang, et al., 2014). The first aspect is the consistent and complete capture, storage, and analysis of the fast moving streams of big data: for example, the stream of readings taken from a sensor or the weblog history of page visits and the clicks of each visitor to a website. The second aspect is the characteristics of timeliness or latency. We should capture, store, and use big data within a certain lag time depending on the type of the information since some of the data are permanently valuable while some would no longer be meaningful after a very short period of time. The third aspect is the speed with which big data must be stored and retrieved; the architecture of capture, analysis, and deployment must support real-time turnaround (in this case, fractions of a second); and must do this consistently over thousands of new customers. In tourism, for instance, we are concerned about how to send the right offer to the right person at the right moment when he or she arrives at a destination and what you should do if someone checks in to your hotel and is disappointed with the room and decides to tweet about it rather than call the front desk. Take the airlines in the travel business as an example, the dynamic revenue management could make a timely price change according to complex algorithms based on real-time or near-real-time customer online behaviors.

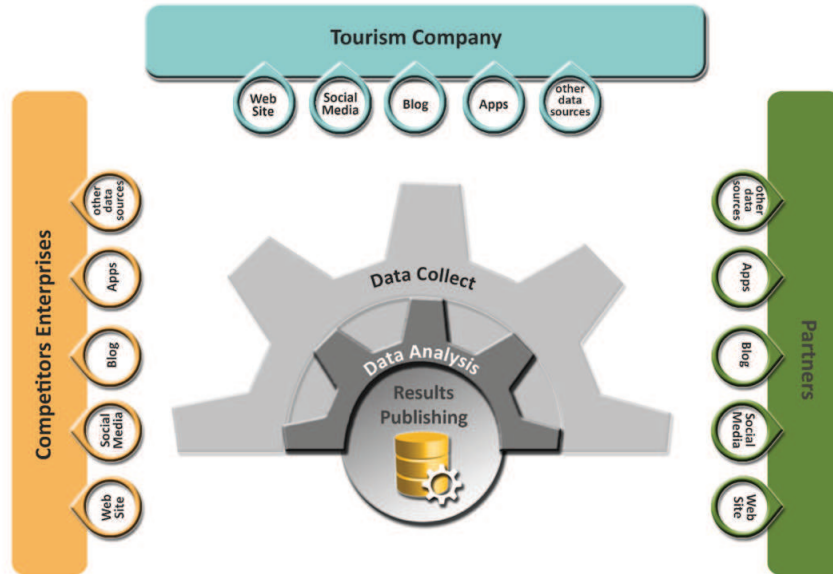
**Variety** - Another key characteristic of big data, both in terms of cost and ease of use, is the variety of data that stems from all accessible technologies. Variety describes the different formats of data that do not lend themselves to storage in structured relational database systems. The formats of big data include a long list of data such as documents, e-mails, text messages, images, graphs, videos, and the output from all types of machine-generated data from cell phones, GPS signals, sensors, machine logs, and DNA analysis devices (Li, Jiang, Yang, & Cuzzocrea, 2015). This type of data is characterized as unstructured or semistructured and has always existed. 80% of tourism-relevant information originates in unstructured form, and organizations can only count on the 20% of structured data: for example, property management systems (PMS), Web or blog content management systems (CMS), or customer relationship management (CRM) systems can only deal with structured data, while the data on customer preferences at various points of contact are in the form of unstructured or semi-structured data, which require novel technologies to analyze them in order to develop new or improved products and services.

**Veracity** - Veracity means the truthfulness and accuracy of data given the context, the variety of communication “touch points”, and the speed at which things happen. Big data veracity refers to the biases, noise, and abnormality in data: Is the data being stored and mined meaningful to the problem being analyzed? Compared with volume and velocity, veracity in data analysis is the biggest challenge. In developing a big data strategy, you need your team and partners to help you keep your data clean and to have processes to keep “dirty data” from accumulating in your systems.

**Value** - Value is frequently seen as another important characteristic of big data. The value of tourism big data can be described by its novel application in the tourism industry. First, there is the personalized application of tourism big data. Personalized marketing and targeted product design are extremely powerful opportunities that can be obtained from big data (Jani, Jang, & Hwang, 2014). Personalization is a key tenet of big data. In order to most effectively win at true personalization, large travel companies must work across information databases to gather the myriad data points created by a consumer at different points. The second valuable application of tourism big data is the customer-centric experience. The customer should be at the center of all big data efforts. If big data gathering is seen as creepy or invasive, the consumer will not be pleased and loyalty will be lost.

However, all signs point to consumers being willing to accept big intrusions into their behaviors if the resulting product is more targeted and able to anticipate their needs throughout.

As far as the tourism sector is concerned, from a conceptual perspective, the main mechanics associated with the big data - data collect, data analysis and results publishing, are the result of an effort to obtain data from multiple sources of information. These sources gravitate between three main vertices - data from the organization itself, data from business partners (upstream and downstream of the organization) and data from key competitors. This view is illustrated in Figure 1.



**Figure 1 : Big Data Conceptual Model for Tourism (information sources)**

Personalized marketing and targeted product designs are extremely powerful opportunities for both customers and tourism service providers. It is crystal clear that big data can provide better, targeted, and profitable services and products to consumers (Pries & Dunnigan, 2015). However, the possibility of applying Big Data Analytics in this sector will depend on an analysis of the data that the sector captures, produces and maintains. According to literature there is a digital divide in rural regions and rural tourism destinations (Park, 2017; Saleminck et al., 2017), and thus a lack of evidence that there are conditions to support the full application of Big Data Analytics mechanisms. In order to address this question, we propose a matrix to gauge the maturity of existing data in the tourism sector. Our proposal assumes that the matrix can be filled using various mechanisms such as interviews, surveys, data analysis of national and sector statistical information sources. We also assume that, the data provided by the matrix, which is proposed in the next chapter, will allow us to answer the question that gives the title of this article – “Can We Use Big Data Analytics to Leverage Tourism in Rural Tourism Destinations?”. Regardless of the responses that can be achieved, it will certainly allow to produce an important number of recommendations to the use of Big Data Analytics and also a set of recommendations in order to create the necessary conditions for its use.

### **Matrix to Evaluate the Maturity of Existent Tourism-Related Data for Big Data Analytics Purpose**

The present paper intends to address the added value that may come from the application of Big Data Analytics in rural tourism destinations. Our concern, however, is the necessary answer to the fundamental question: Is the tourism sector in rural tourism destinations generating sufficient data, and of sufficient maturity, to allow the application of Big Data Analytics techniques? As a contribution, in order to assess the answer to the indicated question, it is proposed in Table 1, a

matrix that analyses, according to the 5 Vs of Big Data, the existence of a set of data. The proposed matrix is briefly explained below.

The matrix presents a set of main sources of information. It should be noted that this matrix does not have a static character; on the contrary, it presupposes that, depending on the tourism sub-sectors (accommodation, recreation, attractions, events, food and beverage, tourism services, transportation, travel trade), the sources of information that are illustrated may be altered and / or added. In this way there should be an adjustment for each sub sector.

The first column (Exists Y / N) records if the organization, which is being analysed, has or does not have data related to this source of information. Then, for each of the Big Data 5Vs, two questions should be asked - does the data have a real contribution applicable to the V in question? If the answer is "Yes" the respondent classifies on a Likert scale from 1 to 5, what is the degree of maturity of that data, i.e., to what extent can this data contribute to this V?

In order to be more objective, as an example we refer to "Registration of users" in a corporate Website:

- For the Volume V: if such register exists, then it should be affirmative ("Yes") otherwise it will be negative ("No"). If is a "yes", the respondent will analyse for each V its applicability. In this case, we consider it consensual that user registration data can be applied to the "Volume". There are 10 registered users or is there a million? Checking the exact number will allow us to catalogue from 1 to 5 the contribution of this data to the "Volume" V. Could we apply Big Data Analytics if there are only 10 users? Obviously it would not be relevant to do so.
- For the Veracity V: at the time of registration if the user is only asked to enter a user ID and a password, does this data make a decisive contribution to veracity? In our view, clearly not, since it will be simple for a user to create false and multiple registrations. This may give rise to a lot of data that does not means true information. However, if the registration has mandatory fields such as emails (necessarily confirmed), personal information, telephone number, address, etc.; then the contribution of this set of data will be much greater for the V of veracity.
- For the Value V: if the data in the user record has a lot of civil, contact, social profiles of users, data that reflects their main interests, etc.; then this data will have much more value than if such a record contains only a user ID and a password.

**Table 1 : Proposed Matrix**

	Exist? (Y/N)	Volume		Velocity		Variety		Veracity		Value		
		Applicable?	[1..5]	Applicable?	[1..5]	Applicable?	[1..5]	Applicable?	[1..5]	Applicable?	[1..5]	
<b>Website</b>	Registry of Users	Yes	Yes	3	No	-	No	-	Yes	5	Yes	5
	Products and/or Services showcase											
	Data-content format											
	Electronic Commerce											
	Discussion forum											
	Live chat for clients											
	Interactions monitoring											
	Security Mechanisms											
	Travel planner/route planner											
	Video and photos share											
	Events scheduler											
	Interactive map											
	Photo gallery											
	Accessibility info											
	Accessibility guide											
Weather guide												
(...)												
<b>Social Networks</b>	Diversity of social network presence											
	Posts											
	Comments											
	Likes											
	Followers											
	Events											
	Chat											
	Apps											
	Geo-location											
	(...)											
<b>Blog</b>	Posts											
	Comments											
	Followers											
	Integration with other channels											
	(...)											
<b>Apps</b>	Users Registry											
	Products and/or Services showcase											
	Electronic Commerce											
	Video and photos share											
	Photo gallery											
	(...)											
<b>Other Data Sources</b>	Loyalty programs											
	Enterprise Resource Planning System											
	Electronic Data Interchange											
	Presence in Cooperative Networks											
	External Data Providers											
	IoT Data											
	(...)											

The presented matrix, in our opinion, is an important contribute to better understand the basis of the Big Data Analytics in the tourism sector of rural regions.

Achieving the proposed matrix, based on the existing data of key players in the tourism sector, will require a diversified approach. We believe that such a task can be carried out using statistical databases and national and sectorial information, questionnaires addressed to these players, interviews, among other forms of data collection.

The next step that we propose is to carry out this data collection in order to answer the question that gives the motto to this paper - Can We Use Big Data Analytics to Leverage Tourism in Rural Tourism Destinations?

## Conclusions and Final Remarks

Technology has made a decisive contribution to the tourism sector around the world. This reality is, however, apparently less expressive in the context of rural tourism (Galloway et al., 2011; Park, 2017; Saleminck et al., 2017), where the main players are often micro and medium enterprises. The technological and financial capacity of these players is typically lower and raises a number of questions about the scale of the introduction of technology and its exploitation in order to maximize the competitive advantage that comes from using technology effectively for a more efficient and profitable business. We know that, more than in technology itself, it is in the data that organizations possess (which can be transformed into information and knowledge) the true competitive and differentiating advantage of success and innovation. In this context, for organizations to develop efficient strategies, the use of Big Data Analytics, is widely agreed as being a powerful tool at the service of organizations. However, its use implies the existence of a set of data with a set of characteristics that allow to respond to the different Vs of the Big Data.

The present paper scope are the key issues of technology applied to rural tourism through the concept of Big Data. Thus it proposes a matrix that is presented as a contribution to verify the existence of data and the degree of maturity of that data in the rural tourism sector. The main goal is to verify if the necessary conditions are met to apply, to this sector of activity, Big Data Analytics, with all the gains that could come from it.

In what concerns future work, we intend to apply the proposed matrix through a data survey to be carried out, using multiple strategies of data collection.

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