

CURRENT ISSUES IN METHOD AND PRACTICE

Social network analysis in tourism

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Elements such as tourists, service-oriented organizations, tourism resources, destinations and public institutions all have a role in tourism activity. If we are to understand the world of tourism, we need to examine the ties between these elements. Social network analysis (SNA) provides tourism research with a set of methods and tools that allow us to comprehend the patterns and the structures of these ties. The objective of this work is to establish how SNA is being applied to tourism, to describe its principal elements and to inquire into its potential in the development of tourism research. To do so, the articles that apply SNA research methods, published in tourism and hospitality journals, and the network of citations between their authors are all analysed. It was found that the application of SNA in tourism-related contexts is rare and very recent, although a cohesive and relevant group of authors is currently applying it. An exciting opportunity for tourism research becomes apparent with the use of SNA and future lines of research are presented in which its methods may be applied.

Keywords: tourism research; social network analysis; relational data; centrality; egonet

Introduction

The study of networks has undergone extensive development over the last three decades in various social and organizational fields (Zaheer, Gözübüyük, & Milanov, 2010). As an area that may easily be included in both, tourism appears not to have received similar levels of attention (Leung, Li, Fong, Law, & Lo, 2013; Morrison, Lynch, & Jones, 2004; Sorensen, 2007).

We may understand a network as a set of elements and the ties between those elements. Social network analysis (SNA) concerns itself with a structural analysis of those ties. It involves the preparation of concepts and techniques that further the research of the ties and their patterns, in disciplines as far removed from each other as anthropology and physics. SNA basically involves processing those ties and employs data on their different aspects to do so.

Tourism is full of situations in which the ties are essential to a full understanding of its activity: tourism flows, movements between destinations and routes, inter-business relations such as alliances and franchises, stakeholder relations at the destinations, informal relations between the different actors, management of relations with clients and tourists, etc.

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Some authors have already pointed to the importance of using the study of networks in relation to destinations (Baggio, Scott, & Cooper, 2010), in cases in which collaborative relations occur (Schaffer & Lawley, 2012), in marketing (Wang & Xiang, 2007), in geography (Lee, Choi, Yoo, & Oh, 2013; Shih, 2006) and in sustainable tourism (Albrecht, 2013). Others have even used SNA to research the field of tourism (Benckendorff & Zehrer, 2013).

These previous studies in tourism research have used theoretical concepts that are related to networks. However, the use of SNA as a mathematical tool for analysing relational data is not found among the most widely used methods in tourism (Wu, Xiao, Dong, Wang, & Xue, 2012), although it has a degree of general usage in similar fields such as leisure studies (Blackshaw & Long, 1998).

This study centres on the methods of SNA. Its objective is to present SNA methods applied to tourism research that are based on sound knowledge of their present use. It then proposes future developments within the same field. To do so, the following two sections seek to summarize the main aspects of SNA that tourism researchers should learn, if they are to make appropriate use of these tools. We then go on to study the set of articles published in tourism journals that describe the use of these methods. Finally, we set out the conclusions and new research paths that build on the use of SNA in tourism research.

The study of networks

The development of SNA is relatively recent. Although it has an earlier conceptual background (sociograms by Moreno and anthropologists from the University of Manchester in the UK), it was in the 1960s that researchers from the University of Harvard included mathematical developments in the study of social relations. Harrison White and his colleagues, such as Wellman and Berkowitz, were the first to experiment with the idea of employing mathematical models to perform the structural analysis of all types of ties, which meant that this technology was no longer limited to social fields (Scott, 1991). Since then, the development of algorithms that explain the structure of the ties has been constant and has grown exponentially with the use of information technology.

The study of networks is now institutionalized in the academic world. The year 1977 saw the launch of the International Network for Social Network Analysis (INSNA), the multidisciplinary association that brings together researchers with an interest in this set of theories, methods and techniques. Somewhat later on, two journals specializing in SNA appeared: *Social Networks* and *Connections*. A large number of congresses are held each year, including the annual INSNA conference, and various manuals have also been published and distributed (Hanneman & Riddle, 2005; Scott, 1991; Wasserman & Faust, 1994). There are also many software tools that facilitate the use of SNA for different purposes (UCINET, Pajek, Gephi, EgoNet, SIENA, etc.).

Although the analysis of social networks is present in a large number of scientific fields, because of the interdisciplinary nature of network studies, they have concentrated on both personal and organizational networks. Disciplines such as sociology, anthropology and social psychology, of a markedly social nature, have concentrated on networks of individuals and the groups that constitute them, while disciplines linked to economics, politics and management have concentrated on inter-organizational ties. All these perspectives and disciplines enrich research into tourism (Benckendorff & Zehrer, 2013; Tribe, 2010), which is why the network perspective may also assist the convergence of different points of view in research into tourism. In addition to personal and organizational networks, other types of networks of relevance in tourism may be studied, such as those constituted by cities,

destinations, physical spaces, etc. or generated by migrations, mobility or tourism flows (Duval, 2007).

Two main types of networks may be analysed: the global or complete network, which includes the study of all of its elements and the ties between them, and the egonet, which implies the study of the ties between the actors that have ties with the focal actor around which the network has developed.

SNA covers a group of methods that reveal the structures of the relational data that are present in different areas of tourism activity. Therefore, their true relevance stems from their potential to analyse the complex processes that arise when the different types of elements and actors that intervene in tourism activity relate to one another. Hence the necessity to establish the reasons for the use of SNA in tourism and the way it may be used. In the following section, the basic elements of the method and its analytical capabilities are discussed: pointing out network characteristics, studying centrality (related to both prestige and power), identifying the subgroups that appear and analysing the roles that the different actors play.

The elements of SNA

Relational data

The characteristic element of SNA, as opposed to other methods used in tourism, is the use of structural or relational information. In the majority of social investigations, the data sets are usually presented in a rectangular matrix, in which the rows represent the cases and the columns represent the attributes, characteristics, opinions and so on that are under analysis. The analysis of social networks, on the other hand, is concerned with the ties that arise between a series of elements or actors that constitute a network. These ties are turned into the most important observations that the researcher makes. The relational data generally appears in the form of a squared matrix (*adjacency matrix*) in which the rows and the columns represent the set of elements and/or actors in the network (nodes) and the observations (or matrix squares) are composed of the ties that each element of the network has with each of the others.

The use of relational data goes beyond the simple representation of the ties between two elements. SNA is intended to establish the structure of the data jointly and globally and the patterns of those ties between the elements. Therefore, it is the ties between the elements that are of importance, rather than the individual attributes of those elements, although that type of attributive data may also be incorporated in SNA.

Wasserman and Faust (1994) noted different types of possible ties: individual appraisals (friendship, trust, respect, thankfulness, etc.); transactions or transferences of material resources (purchase, sales, renting, lending, requesting, etc.); interactions (any situation that implies the presence and performance of actors and nodes); movements (physical, such as movements from one city to another, or social, such as the change from one social class to another or a rise in the hierarchy); formal roles (e.g. the tie between manager and employee or between the main contractor and sub-contractor) and family relations (matrimony, descendancy, etc.). For example, a simple tie between the authors of an article consisting of one author who cites another or one article in which another article is cited. The authors of the articles cite the authors of other articles. This tie links a network of articles and a network of authors.

A variety, only one, or no ties at all may arise between each pair of nodes; however, it is a matter for the researcher to decide on the ties of greatest interest. It is not only the

existence or otherwise of a tie that is of interest, but also are other questions such as the direction of the ties and their strength. With regard to the first point, the links between two nodes may be directional or non-directional. In the first case, the selection or mention of one node by another is taken into account, in such a way that one is an output node and the other, an input node. These types of ties may or may not be symmetrical. Non-directional ties are concerned with the existence of the tie, rather than its direction. For example, the citation of an article is a directional relation.

The second question is linked to the measurement scales of the relational data. The same scales may be used both for relational data and for attributive data. However, two aspects have to be considered: the amount of information to be collected and processed and the existence of sufficient algorithms to manipulate that type of scale. The simplest scales are binary, which only consider the existence of one tie. This information is minimal, but is the foundation of the majority of SNA techniques. For example, it may be of interest to know which authors cite other authors rather than the number of times the citations appear.

The instruments for collecting relational data are basically the same as those in other types of research (Scott, 1991; Wasserman & Faust, 1994). However, the design and the application of such instruments should take account of the particularities of the type of data for collection. SNA may also be enriched by relational and qualitative information and, particularly in tourism (Baggio et al., 2010; Pavlovich, 2003), the use of qualitative data-collection techniques (observation, cases, interviews, etc.), and validation processes, while the corresponding triangulation processes should be integrated to gain an acceptable understanding of the ties. The combination of qualitative and quantitative techniques in the mixed network-analysis methods implies one of the most important paths for the development of SNA and has clear applications in tourism research (Domínguez & Hollstein, 2014). As a defining feature of data collection, the researcher should consider the exponential increase of data and information to be studied as the numbers of network nodes and elements increase.

The relational data are managed through graphs and matrices. The original representation of the relational data was done in the form of graphs (in particular, sociograms). Each network node or actor is represented in the graph and their ties are illustrated with arrows with or without direction. These arrows can be valued in some way. The problem with a graphical representation of a network with a high number of nodes is that visualization and identification of structural properties through the graph become very complex.

Without losing information, the data in the graphs may alternatively be represented in the form of a square matrix on which mathematical operations may be performed to generate indicators. The relational data may also be taken from a rectangular matrix in cases where the ties between actors and events are studied, such that the size of these two sets will not have to coincide. This gives rise to affiliation matrices that may easily be transformed into matrices of actors by actors or events by events.

Network elements or nodes

The network is composed of a series of inter-related elements, actors or nodes that have to be clearly identified for the study to proceed. The importance of an individual node is decisive to network analysis, as many of the ties between different elements pass in an intermediate way through that focal element, in such a way that if it were not identified or studied, then the network structure could not be satisfactorily understood.

A sample population is used in a large number of social science and tourism studies. The sampling process begins with the independence of cases. However, the independence

of cases is not a characteristic of relational data. On the contrary, the particular ties between two nodes are influenced by the global structure of the network as well as by the ties between the other nodes. In addition, information losses due to the lack of nodes grow at an exponential rate.

Therefore, the analysis of social networks under normal conditions usually works with the overall population of the members of the network. In consequence, not only should they be finite populations, but the enumeration of their elements is required. This raises the important problem of establishing the limits of the network. In some networks, these limits may be very clear, while the boundaries in other cases are uncertain and cannot always be clearly identified.

Wasserman and Faust (1994) pointed out two broad approaches to the definition of the limits of a network. The first is an external definition that determines the elements that belong to the network. The second possibility needs a specification of the limits of the network by the researcher. This specification can either follow realist or nominalist criteria: realist, if membership is perceived by the same actors, for example, a network of friends in a tourism firm; or nominalist, if based on a choice that imposes the criteria of the researcher on the selection of the members of the network, whether due to theoretical assumptions or convenience in the investigation. Other criteria may also be employed, such as the intensity of the ties (Laumann, Marsden, & Prensky, 1989).

Despite all this, the analysis of social networks also uses sampling techniques such as the *snowball*, which, on the basis of an initial set of nodes, identifies the other nodes with which they are related and repeats the process until a network is obtained, or the study of egonets which are articulated around an ego or node that is taken as a reference and that can be analysed with different tools: name generator, position generator, and resource generator (Lin, Fu, & Hsung, 2001; Van der Gaag & Snijders, 2005).

Basic network properties

There are a series of properties with which we can identify and characterize a network in a way that differentiates it from others (Figure 1). These properties are structural, as they reflect the scaffold or skeleton within which the ties between the nodes develop. The *size* of the network is a measure of the number of nodes or elements that compose it. It provides insight into the opportunities and the drawbacks that a focal element may encounter. For example, communication is more fluent in small networks or there is a greater sense of belonging, while the large networks allow access to diverse resources and distant information.

Density is the number of ties that in fact exist in the network in relation to the number that is theoretically possible. Analytically, it is the coefficient between the number of existing ties and the number of possible ties calculated on the basis of network size.

Centrality

One of the structural properties of networks that has attracted the attention of researchers since the very first studies is the measurement of prominence or the influence that some actors or elements have over others, due to their particular situation within the network. The conceptual development of this concern has subsequently revolved around the concept of centrality.

Freeman (1978) pointed to various ways of formulating centrality (power or influence): degree centrality, closeness and betweenness. These three basic forms of centrality refer to

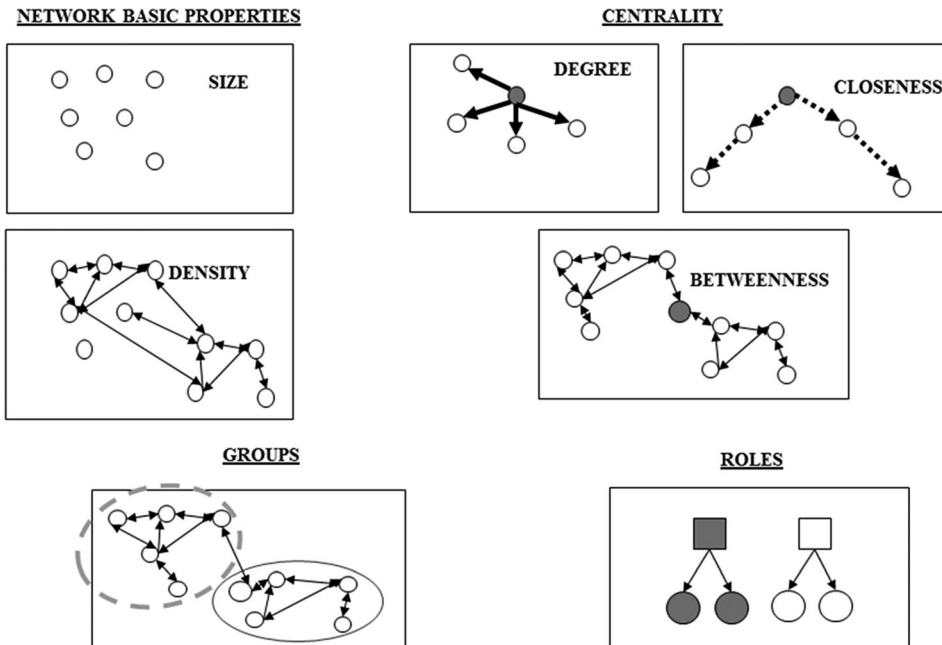


Figure 1. Elements of SNA.

the individual actor, but may be the subject of extension as a network measurement, referred to as centralization.

Degree centrality is the number of connections that a network actor has, such that, if the actor has a high degree or more connections, that actor will be in a more advantageous position or will have greater power. A powerful position will influence the autonomy or independence of the actor with regard to the other nodes, in such a way that it may choose between various alternative channels to conduct its exchanges and to communicate. This situation guarantees the availability of different sources for the actor to obtain resources and to satisfy its needs, thereby reducing its level of dependence (Pfeffer & Salancik, 1978).

Closeness not only considers the direct links of an actor but its position in the network, taking into account the indirect ties, on the basis of the distances between it and other elements of the network.

Finally, there are actors or elements in the network that have another type of centrality arising from their role of intermediation. This idea has been developed by Burt (1992) through the concept of structural holes. There is a form of power, of influence and of centrality called *betweenness*, characterized by the existence of nodes that connect different zones or points of the network. The greater the number of actors that depend on the focal node to establish their contacts with other nodes along their shortest or geodesic paths, the greater their centrality.

There are other measures of centrality: flow betweenness, Bonacich power, eigenvector, etc.

Groups

The identification of groups, subgroups, cliques and substructures in the network is important, on the one hand, because the opportunities and the limitations that the network

structure imposes on the actors depend on the groups to which they belong. On the other hand, because the existence of overlaps between the groups can lead to a pattern of ties between them that, in the absence of those overlaps, would be different.

The two principal concepts around which the different forms of grouping revolve are the component and the clique. The concept of a *component* is that of a subgraph maximum; in other words, a component comprises a set of nodes each of which may reach the others along some path or other (through direct or indirect ties). Therefore, any one actor can access all of the others within the same component.

The concept of a *clique* refers to a subgroup of the network in which the actors (more than two) are all linked to each other. This idea implies that grouping in the concept of the clique does not establish disjointed sets, but on the contrary can produce overlap between the different cliques.

There are other more complex forms of grouping such as the one based on *factions* or the division between the *core* and the periphery. Finally, there are other multiple possibilities of finding groups or subnetworks that run from the traditional methods (cluster, MDS, etc.) to the use of more sophisticated network algorithms (Baggio, 2011; Baggio et al., 2010).

Roles

SNA also allows us to detect roles and positions that actors can play and occupy and that imply specific relational behaviour, not because of the characteristics or particularities of an actor, but precisely because they occupy that position or play that role in the network. Categories of actors are sought in the network, in such a way that the structure of the network may be represented by those categories. The actors are exchangeable with each other on the sole condition that the basic structure, or skeleton, of the network remains intact.

The principle type of equivalence at a conceptual level is *structural equivalence*. Two nodes are (in a strict sense) structurally equivalent, if they have the same ties with the other nodes. At a relational and structural level, those elements or actors may be thought of as identical or substitutable. This concept has been used to analyse destinations (Hwang, Grezel, & Fesenmaier, 2006). The concept of *regular equivalence* is of great utility, as it articulates the well-known notion of social roles. A regular equivalence between actors arises when they are related with the same actors, as would happen with structural equivalence, but with other actors that also occupy the same position.

Other SNA instruments

The set of methods used in SNA, not restricted to the study of structures discussed earlier, also permits further developments. For example, it permits the statistical treatment of data to test hypotheses. Given that the relational data do not comply with the condition of independence, other tests based on the 'permutations test' and quadratic assignment procedures (QAP) are used, instead of traditional statistical models (Krackhardt, 1987).

Further levels of analysis are also interesting, such as dyads and triads. Four possible forms may be given for dyads. A total of 64 different patterns of interaction between three nodes in the asymmetrical ties are possible at the triadic level, but the most widely studied are the transitive and the cyclic patterns. Transitive ties imply the indirect influence of two elements on a third. Other complex ties such as cyclic ones can show, for example, the existence of closed information circles. The other variants within the triads add greater

complexity and are a fertile ground for the establishment of relational hypotheses in tourism investigation.

In addition to the simple structures previously pointed out, other more sophisticated ones may be studied, such as networks based on the model of the small world, stochastic networks and complex networks (Albert & Barabási, 2002; Baggio, 2011; Baggio et al., 2010).

Due to the dynamic nature of tourism activity, longitudinal studies will provide a better understanding of both the functioning of the different phenomena and their evolution. The ties between actors and elements change over time. These data may be gathered through SNA and may be processed in software packages such as SIENA (Snijders, 2005) that analyse network evolution.

SNA in tourism research

Methodology

Studies published in some of the most relevant tourism and hospitality journals were identified, so as to gain a balanced view of the use of SNA methods in tourism. The selection of relevant journals from the area is a controversial question to which earlier investigations have responded (Hu & Racherla, 2008; Kim, Savage, Howey, & Van Hoof, 2009; Song, Liu, & Chen, 2013; Wu et al., 2012). In this study, we follow a more comprehensive approach, by including 19 journals that appear in the section on Hospitality, Leisure, Sport & Tourism, in the 2013 edition of the Thompson Reuters Journal Citation Report (*Annals of Tourism Research, Asia Pacific Journal of Tourism Research, Cornell Hospitality Quarterly, Current Issues in Tourism, International Journal of Contemporary Hospitality Management, International Journal of Hospitality Management, International Journal of Tourism Research, Journal of Hospitality and Tourism Research, Journal of Hospitality Leisure Sport and Tourism Education, Journal of Leisure Research, Journal of Sustainable Tourism, Journal of Tourism and Cultural Change, Journal of Travel Research, Leisure Sciences, Leisure Studies, Scandinavian Journal of Hospitality and Tourism, Tourism Economics, Tourism Geographies and Tourism Management*). We have not therefore considered studies on tourism that employ SNA and that have been published in other tourism reviews (e.g. Becken, 2013), in other disciplines (e.g. Lazzarini, 2007) or that have yet to be published (e.g. Casanueva, Gallego, Castro, & Sancho, 2014; Lee, 2013; Sainaghi & Baggio, 2014).

A keyword search strategy was followed to locate the articles in the major fields of three databases (Scopus, ProQuest and Web of Knowledge), which has previously been used in other tourism studies (Song et al., 2013; Ying & Xiao, 2012) since 2000, when the method was popularized. The keywords (in their different forms) were *Social Network Analysis, SNA, Ucinet, Pajek, Netdraw, Structural hole, Betweenness and Degree centrality*. This search generated over 100 references. Subsequently, the search results were filtered by reading each one, thereby ensuring that the methodology was in fact used in all these studies (particularly those with relational data) and not only the concepts of networks or other more closely related ones (e.g. Barros & Santos, 2009; Bramwell & Meyer, 2007; Zhao, Ritchie, & Echner, 2011). Articles were also omitted that described marginal use of certain SNA techniques (e.g. Chalkiti & Sigala, 2008; Liu, Lui, & Man, 2009; Pan & Fesenmaier, 2006; Paris, 2012; Ribeiro, 2012) or that only represented the network, without obtaining indicators (e.g. Kim et al., 2009; Kimbu & Ngoasong, 2013; Pforr, 2006; Wu et al., 2012). The total number of studies analysed amounted to 23 and are

shown in Table 1. Finally, SNA was used to analyse the network, which was composed of the 46 authors of these articles linked by the fact that they all cited each other in their articles.

Results

Table 1 shows a data set for each article, including authors, year of publication, journal, the discipline in which it can be classified, the topic, the type of elements that constitute the network, the SNA indicators and tests that have been used and whether they are complete studies of the network and/or the egonet. The analysis of this information allows us to approach the use made of SNA methodology in tourism research.

First of all, we see from the data that most of the articles are quite recent: 18 correspond to the period running from 2008 to 2013, while only 5 were earlier. Moreover, the works were published in only very few journals. There were basically three: *Tourism Management* (6), *Annals of Tourism Research* (6) and *Current Issues in Tourism* (3). None appeared in the majority of the 19 journals under consideration.

SNA methods have principally been used in two types of research. The first refers to the study of interorganizational relationships (IORs), with nine articles. This demonstrates that stakeholder relations and the participation of non-entrepreneurial organizations are basic to the development of tourism activity and that the study of this type of network is a basic concern in the field. The second type of investigation could be classified as a meta-investigation, as it involved bibliometric studies of a different type that attempted to throw light on the fields of study, invisible colleges and areas of interest in tourism research. Other investigations involving SNA refer to social capital and the study of destination networks.

With regard to the disciplines that serve as a reference to tourism investigation, a classification was prepared that adapted earlier ones (Benckendorff & Zehrer, 2013; Tribe, 2010). The majority of the articles (amounting to eight) concentrated on the study of the discipline of tourism (Social Science of Tourism); the second largest group of articles were catalogued under Tourism Planning (six articles), while the others were evenly grouped between Geography, Business, Sociology and Sustainability.

All the articles studied complete networks and three of them also analysed the egonet. A broad majority used graphs to illustrate the networks under study.

The network analyses reported in the articles were of a broad variety. In a good number of works, these studies examined both the size and the density of the network, while some of them looked at network density and the clustering coefficient. More than half discussed different strategies of centrality (basically degree centrality and betweenness). They also used different strategies to identify subgroups in the network, at least to distinguish the core and the periphery. Finally, only one work concerned itself with roles and positions of equivalence (Hwang et al., 2006).

The ties that defined the networks were also so very varied – informal ties, information exchange, bibliometric ties (co-citations or co-authorship), ties in physical space, completion of joint activities and airline code sharing – for which we were unable to establish a homogeneous classification.

An analysis of Table 1 reveals no patterns between units of analysis, the methods employed, the themes and disciplines, which means that a more in-depth analysis is necessary to systematize them and to understand their content. Thus, it may be seen that there were really five basic types or groupings of articles.

The most numerous groups consisted of articles that share the analysis of tourism destinations and clusters and that study the ties between the stakeholders (firms from different

Table 1. SNA in tourism and hospitality publications

Author(s)	Journal	Topic	Nodes	Discipline	SNA methods
Benckendorff and Zehrer (2013)	<i>Annals of Tourism Research</i>	Bibliometrics	Articles	Social Science of Tourism	Groups. Cluster
Casanueva Gallego and Sancho (2013)	<i>Tourism Management</i>	IORs	Firms	Business	Centrality (degree, closeness, betweenness, flow). Structural holes. Egonet
Lee et al. (2013)	<i>Tourism Management</i>	Geography	Destinations	Geography	Centrality (degree, betweenness, eigenvector). Core
Ye, Li, and Law (2013)	<i>Journal of Hospitality & Tourism Research</i>	Bibliometrics	Authors	Social Science of Tourism	Distance. Clustering coefficient. Components. Degree centrality
Leung, Wang, Wu, Bai, Stahura, and Xie (2012)	<i>International Journal of Tourism Research</i>	Geography	Destinations	Geography	Density. Betweenness
Schaffer & Lawley (2012)	<i>Current Issues in Tourism</i>	IORs	Stakeholders	Tourism Planning	Density, cohesion, distance, centrality (degree)
Ying and Xiao (2012)	<i>Journal of Hospitality & Tourism Research</i>	Bibliometrics	Subjects	Social Science of Tourism	Size. Density. Betweenness centralization. MDS. Core/periphery. Egonet. Longitudinal
Baggio (2011)	<i>Current Issues in Tourism</i>	IORs	Stakeholders	Social Science of Tourism	Clustering coefficient. Groups. Complex networks
Beritelli (2011)	<i>Annals of Tourism Research</i>	Social Capital	People	Tourism Planning	Degree. Regression and Correlation (QAP)
Beritelli and Laesser (2011)	<i>Tourism Management</i>	Social Capital	People	Tourism Planning	Degree. Regression and Correlation (QAP)
Baggio et al. (2010)	<i>Annals of Tourism Research</i>	IORs	Stakeholders	Social Science of Tourism	Size. Degree. Density. Cluster coefficient. Groups. Cluster
Erkus-Öztürk and Eraydın (2010)	<i>Tourism Management</i>	IORs	Stakeholders	Sustainability	Centrality. Groups
Racherla and Hu (2010)	<i>Annals of Tourism Research</i>	Bibliometrics	Authors	Social Science of Tourism	Centrality (degree, closeness, betweenness)
Romeiro and Costa (2010)	<i>Current Issues in Tourism</i>	IORs	Firms	Business	Centrality (degree, closeness, betweenness)

(Continued)

Table 1. Continued.

Author(s)	Journal	Topic	Nodes	Discipline	SNA methods
Xiang, Gretzel, and Fesenmaier (2009)	<i>Journal of Travel Research</i>	Bibliometrics	Subjects	Social Science of Tourism	Betweenness centrality. Cluster
Hu and Racherla (2008)	<i>International Journal of Hospitality Management</i>	Bibliometrics	Articles	Social Science of Tourism	Density. Degree. Core/Periphery. Cliques
Scott, Cooper, and Baggio (2008)	<i>Annals of Tourism Research</i>	IORs	Stakeholders	Tourism Planning	Density. Centrality. Cluster
Timur and Getz (2008)	<i>International Journal of Contemporary Hospitality Management</i>	IORs	People	Sustainability	Centrality
Hwang et al. (2006)	<i>Annals of Tourism Research</i>	Geography	Destinations	Tourism Planning	Centrality (degree, closeness, betweenness). Centralization. Groups. Core/Periphery. Cliques
Shih (2006)	<i>Tourism Management</i>	Geography	Destinations	Geography	Centrality (degree, closeness, betweenness). Structural holes
Harshaw and Tindall (2005)	<i>Journal of Leisure Research</i>	Social Capital	People	Sociology	Regression and Correlation
Warde, Tampubolon, and Savage (2005)	<i>Journal of Leisure Research</i>	Social Capital	People	Sociology	Egonet. Size, network position, multiplex
Pavlovich (2003)	<i>Tourism Management</i>	IORs	Stakeholders	Tourism Planning	Density. Centrality

tourism sectors, non-business organizations, government agencies, etc.). Among these, there was a group of works that centred more on cooperative ties than on the destination itself. Beritelli and Laesser (2011) analysed, on the basis of prominent actors, the cooperative ties and reputation at an Alpine destination through centrality. Beritelli (2011) extended their study to various Alpine destinations to analyse cooperative behaviour. At a Spanish rural destination, the ties between rural firms were analysed to connect cooperation with innovation (Romeiro & Costa, 2010). Another subgroup of works centred on sustainable tourism, such as the study in Antalya (Turkey) by Erkus-Öztürk and Eraydın (2010) on the ties between public and private organizations and their connections with sustainability and the analysis of ties between the tourism industry, the government and the host environment at three North American urban destinations (Timur & Getz, 2008). The other works centred more on the destination, two of them from an evolutionary viewpoint. The first was by Pavlovich (2003), who studied the evolution of the stakeholder structure at a destination in New Zealand and the second was by Schaffer and Lawley (2012), who looked at the evolution of stakeholder networks at Queensland (Australia). Finally, the works of Baggio and colleagues examined the idea of destinations as a dynamic and complex network composed of stakeholders. In Baggio (2011), the focus was on the simplification of that complexity, identifying groups or modules in the network of ties between the stakeholders of the island of Elba. In Baggio et al. (2010), statistical models were used in the same context, but were combined with the analysis of virtual networks to highlight the dynamic component of the destinations. In addition, they made an interesting presentation of Network Science in tourism. And Scott et al. (2008) demonstrated the potential of network analysis, through four case studies on Australian destinations.

The second group of articles consisted of those that used SNA in bibliometric works. Four of them begin with the analysis of papers published in tourism and hospitality journals. Three of these four articles analysed the relation of co-authorship or scientific collaboration. Racherla and Hu (2010) and Hu and Racherla (2008), beginning with different journals in each case, used SNA instruments that were also different to describe the structure and the most central positions in the tourism research community. Ye et al. (2013) study the relationship between scientific collaboration and researchers' outputs. On the contrary, Benckendorff and Zehrer (2013) used co-citation ties to understand the influence of certain works and authors on the evolution of the structure of research in tourism. Further data sources are doctoral theses that are used to analyse the ties between the principal subjects in tourism (Ying & Xiao, 2012). Finally, Xiang et al. (2009) combined semantic analysis with SNA to study these subjects on tourism-related websites.

The third group of articles had a clear destination component from a geographic perspective. The unit of analysis was the city, the destination or the tourism attraction at a destination and these articles analyse the distances and flows between them. Lee et al. (2013) focused on the network of destinations at Korea, highlighting the role of their position in the structure of the network for rural areas. The other three were concerned with the patterns in the sequences and flows of tourist trips on airline routes between cities in the USA (Hwang et al., 2006), tourism routes by car in Taiwan (Shih, 2006) and routes between tourism attractions in Beijing at different times, taking the Olympic Games as a reference (Leung et al., 2012).

Finally, two articles inquired into leisure studies from a sociological point of view (Harshaw & Tindall, 2005; Warde et al., 2005), while the last corresponded to a strategic management and studied access to network resources in airline alliance portfolios (Casaneuva, Gallego, & Sancho, 2013).

The network of authors

SNA allows us to go beyond the data as reflected in Table 1 and to discover structures and associations between elements on the basis of their ties. In what follows, we will analyse the network composed of the authors of the 23 selected publications. There are a total of 46 authors between whom different ties may be assigned (same country or language, same discipline, co-authorship, etc.). However, we intend to study a tie that has been mentioned earlier: citations. In other words, one author cites another. Crane (1972) proposed that it is possible to understand the social and intellectual structure of a field of knowledge or a particular disciplinary approach by studying different ties between the authors, particularly the citations. SNA has been used in tourism to analyse networks of authors but on the basis of ties of co-authorship (Racherla & Hu, 2010; Ye et al., 2013).

Ties based on citations come from one author who cites another in a paper. We shall use those citations that appear in the 23 articles between those authors. In total, the 46 authors cited over 1200 authors in their references, but our interest is limited to the ties between them within the network that we have defined. These ties are not symmetrical as has been pointed out. We do not consider the weight of these ties; so, it is not the number of times that an author cites another author, merely the fact that one is cited. We work with dichotomous ties. We can therefore construct a squared matrix of 46×46 elements in which a 1 in each box indicates that the author in the row has cited the author in the corresponding column and a 0 if otherwise. That matrix may be represented in a graph, such as the one that appears in Figure 2.

The network structure can be analysed by a series of indicators supplied by the Ucinet VI software (Borgatti, Everett, & Freeman, 2002). The size is 46 and density is 0.1077, which is quite high. Racherla and Hu (2010) found a density that was 100 times lower in their co-authorship network. This result showed significant cohesion between the authors of tourism that apply SNA, if their intellectual links are considered. One part of

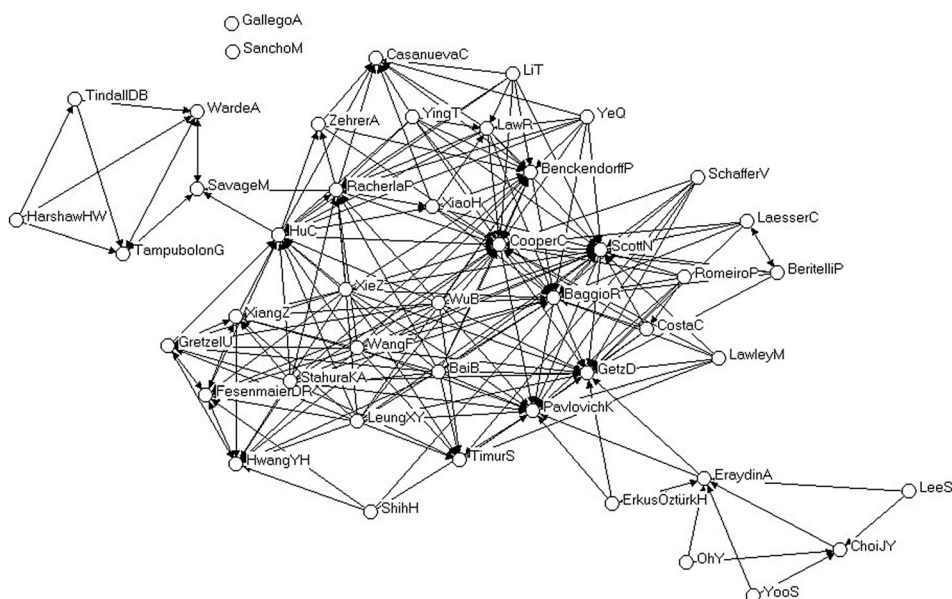


Figure 2. The network of authors.

these citations corresponded to the citation of co-authors and may also reflect social links and collaboration. The network only had two isolated elements (authors that neither cite nor are cited by other authors in the network). There was only one principal component that involved 95.65% of the network, a further reflection of the high level of network cohesion. The clustering coefficient, which is the measurement of the egonet densities of all the authors and an indicator of their tendency to group themselves into network cliques, was 0.350. Although the figure is high, it is half that of the co-authorship network in tourism (Ye et al., 2013). This may be due to scientific collaboration that is usually concentrated in more stable and smaller groups (at least in the social sciences), while the intellectual reference in the investigation may connect ideas of very different sources. In any case, the indicator also showed an important degree of internal cohesion in the network.

Table 2 shows the most central authors, considering two basic measures of centrality. One of these is in-degree centrality, in other words the important aspect of this tie is the most frequently cited authors, not whoever makes most citations. It corresponds with the number of arrows that reach each author in the graph in Figure 2. The most central authors are Cooper, Scott, Baggio, Getz and Pavlovich. Betweenness centrality refers to the authors with the most connections to different parts of the network. The most central are now others: Hu, Savage, Racherla, Cooper and Fesenmaier. Some of these intermediate positions are clearly observable in Figure 2 (Eraydin, Savage or Hu). The possibilities and exploitation of degree centrality and betweenness centrality are different.

The groups that comprise the network may also be analysed. Using the clique-based grouping, substructures may be identified that are closely linked to the type of study that is done. For example, among others, a group of authors linked to the analysis of stakeholders appears (Pavlovich, Baggio, Cooper, Scott, Getz, Timur, Staura, Lawler and Wu) and a group linked to the bibliometric analyses that cite or that are cited (Casanueva, Benckendorff, Law, Hu, Racherla, Ye, Ying, Xiao and Zherer). Smaller groups also appear such as those linked to leisure studies, those linked to rural tourism and those linked to social capital in tourism clusters. The Ucinet VI software package also provides an algorithm that divides the network into its more central elements and the periphery. The core of this network of citations in SNA works on tourism is formed of the following authors: Baggio, Bai, Benckendorff, Cooper, Fesenmaier, Getz, Gretzel, Hu, Hwang, Leung, Pavlovich, Racherla, Scott, Stahura, Wang, Wu, Xiang and Xie.

Table 2. Author's centrality.

Degree centrality		Betweenness centrality	
Cooper, C.	23	Hu, C.	97.00
Scott, N.	20	Savage, M.	36.00
Baggio, R.	19	Racherla, P.	32.00
Getz, D.	18	Cooper, C.	29.83
Pavlovich, K.	18	Fesenmaier, D.R.	29.00
Hu, C.	15	Xiao, H.	22.50
Benckendorff, P.	12	Eraydin, A.	12.00
Racherla, P.	12	Scott, N.	6.83
Fesenmaier, D.R.	10	Baggio, R.	3.83
Hwang, Y.H.	10	Zehrer, A.	3.50
Casanueva, C.	9	Benckendorff, P.	2.00
Gretzel, U.	8	Tampubolon, G.	1.00
Timur, S.	8	Warde, A.	1.00
Xiang, Z.	8	Getz, D.	0.50

Finally, the structure of the network can also be understood better if certain roles are detected. The use of Ucinet allowed us to distinguish four types of roles among the authors: (1) those who cite but are not cited; (2) those who are frequently cited, but cite others very little; (3) those who cite and are cited at an intermediate level and (4) those who do not cite and are not cited by others.

Discussion

The analysis of publications in tourism journals that have used SNA raises some relevant questions. In the first place, we have to admit that the number of articles that employ these methods in a field as wide as tourism is very low. In disciplines like management, the number of publications is so high that it generates a veritable jungle (Parmigiani & Rivera-Santos, 2011; Zaheer et al., 2010). In second place, these publications basically correspond to the last few years (only five earlier than 2008), which means that SNA is entering tourism research late in the day. These two pieces of information point to a great potential of the methodology and the significant path has yet to follow.

Almost a third of the works are not linked to studies on tourism activity, but on the analysis of the investigation itself. It is true that bibliometric studies make widespread use of SNA and that it is highly explanatory, because of its capability to make the underlying structures apparent in the field of knowledge. However, this characteristic contributes little to tourism activity in practice.

SNA is present across a broad spectrum, suggesting that the seeds of future SNA in tourism research are extensively scattered throughout various disciplines in application to various problems. Nevertheless, the ties between destinations (related by routes) and the ties between stakeholders at a particular destination are prominent. A large part of future research will probably concentrate on these sorts of research questions. In contrast, researchers have hardly applied relational data and SNA indicators to the study of widely analysed problems in tourism such as inter-firm business activity, alliances and client relations.

Despite the variety of analyses, it is clear that researchers have made very little use of many SNA applications in the articles that we have analysed. There is a notable absence of longitudinal analysis using SNA techniques. Some works use different network moments (Schaffer & Lawley, 2012), but without proposing an explanation for their evolution. Although the authors of various works employ different techniques for hypothesis testing, their use of specific SNA techniques such as multiple regression quadratic assignment procedures is minimal (Beritelli, 2011; Beritelli & Laesser, 2011).

The analysis of the community of researchers in tourism who have employed SNA has shown that, although the authors are of diverse backgrounds, it is a very cohesive community. With few exceptions, 46 authors were cited among themselves and almost all of them were connected in this process of intellectual ties. Taking into account that the source of the ties was limited to the citations of 23 articles, this connection between authors is especially relevant. Besides, the groups appear to be linked more to the type of works (bibliometry and stakeholders) than to the disciplines in which the authors are specialized. In this way, the studies that employ SNA generate great permeability between the disciplines and strengthen the multidisciplinary nature of tourism. Finally, authors have appeared among the most central elements and among those that occupy the core in tourism studies with SNA because they occupy central positions and have a high level of activity in the field in earlier studies (Racherla & Hu, 2010; Ye et al., 2013). This shows that intellectual networks in the field of tourism overlap each other in different ties (as co-authors or

citations) and that some of the leading authors of the discipline are already using SNA in their work.

Conclusions

With this work, we have sought to cover the objectives which are of interest to the readers of these types of articles: familiarity and an understanding of the workings of the method, knowing how the method has been employed in its discipline (usually seeking intellectual support for its own investigation) and an awareness of the possibilities and opportunities that it offers. The main contribution of this study is its explication of the as yet very limited use of SNA methods in tourism research. There are therefore both opportunities and a need for the use of SNA methods. Opportunities, insofar as they represent a set of techniques that tourism research has scarcely employed, which have only lightly penetrated many of their disciplines and which may, in themselves, shed light on different interpretations and events, as well as those that are already well known. There is a need for their use, insofar as the exploration of the extensive field of ties from various angles is as yet incomplete. Tourism researchers themselves finish off their conclusions by encouraging the use of SNA, for a satisfactory understanding of the circumstances that they are studying (Chalkiti & Sigala, 2010; Chiu, Chiu, Sung, & Hsieh, 2013).

However, working with SNA also has limitations and inconveniences, some of which, as we have pointed out, are basically linked to the use of relational data. It is difficult to obtain relational data because of its volume grows exponentially with the number of nodes, the ethical problems implicit in its collection (as some links are subject to confidentiality or to emotional factors), the difficulty of collecting and processing ties of different weights and values, etc. Perhaps this is one explanation why there are not so many works that apply SNA in the field of tourism, and why a number of them are focused on bibliometric studies where relational data are secondary, accessible and easy to collect and to process.

However, globally, we should recall that the present situation of SNA in tourism is at an introductory stage and that a stage of rapid and fruitful growth is therefore expected. The areas in which researchers have used it least of all imply, in reality, future research areas of great interest.

There are disciplines such as management, with a consolidated tradition in SNA, in which researchers have not, however, made such profuse use of this method in tourism centred research (study of alliances, supplier networks, networks that are internal to the firm that affect processes of motivation and leadership, client relations, etc.). The same happens with geography (analysis of tourist routes and flows, destinations as networks with elements of a different nature, local and regional development, etc.). In some tourism-related (artistic, legal, economic, etc.) disciplines, dissemination of its use is not extensive among researchers in that specialist field.

The use of techniques that remain insufficiently explored and exploited in tourism such as longitudinal analysis working with SIENA and the contrast of the hypothesis with relational data represent further paths of inevitable growth that will enhance scientific research in tourism.

Considering the actual point of development of SNA in tourism, the potential of the set of techniques and tools that it involves and the areas of the discipline that could be further developed on the basis of relational data, we would suggest that, at the very least, the following research topics will be developed through the application of SNA to tourism:

- Understanding of the double level of tourism activity with the joint analysis of organizations and destinations (Scott et al., 2008). These two units of analysis of tourism studies are interrelated as between organizations and destinations. Particularly, the analysis of stakeholders that highlight horizontal, vertical and crossed ties between actors, understanding of the generation of social capital and the transmission of knowledge in tourism clusters, patterns of ties between places, destinations and tourism resources and the co-evolution of organizations and destinations can all progress through the use of SNA.
- The use of SNA to analyse the networks between people who are linked to the processes of tourism disintermediation, virtual social networks and Big Data will not only allow scientific advances, but will also generate practical applications for taking decisions in the public field and in private organizations. This will help to propose the conceptual development and the practical application of Smart Cities tourism and Smart destinations in an acceptable way. Tourism investigation and tourism activity may benefit from the potential of simplifying complex phenomena and of discovering macro structures that make use of network developments in scientific disciplines (e.g. physics and mathematics) (Baggio et al., 2010).
- However, in addition to helping to understand these phenomena at a macro level, SNA also allows us to go deeper into the processes at a micro level, in the areas in which the people (employers, suppliers and clients) and organizations are found. How and why the first and the principal ties occur in tourism activity (a purchase, the provision of a service, acquiring a resource, maximizing its value, etc.) need a careful study of these ties, their intensity, their origin and their characteristics. The use of mixed network methods, which mix quantitative and qualitative aspects, is the main platform to do so (Domínguez & Hollstein, 2014).
- With regard to the development of the research field in tourism, SNA should allow a qualitative leap from the descriptive to the explanatory. The consideration of the ties as a cause or as an effect of aspects of tourism activity and the use of statistical techniques that are specific to SNA to test hypotheses may already be used in all tourism disciplines.
- The basic field of application of SNA in tourism covers all of the cooperative processes that arise at different levels (between people, between firms, between business and non-business organizations, between destinations, etc.). Although some of the previously mentioned studies have already examined this question, there is still an enormous field of work to be done on the intense ties between business cooperation and strategies, the adaptation of markets, entrepreneurship, sustainability, economic development and so on (Zaheer et al., 2010). Advances with the concept of social capital, which is strongly linked to networks, in the different perspectives of tourism research may be the most acceptable path along which to move in this direction.
- At a practical level, the knowledge arising from SNA may also be used for the intervention in reality. Intervention at the level of people, organizations, destinations and tourism policy development units can and should rely on knowledge of the relational patterns between the elements of those systems, so as to take appropriate action and subsequently to evaluate the results.
- Given the dynamic character of tourism activity and its constant, intense and unpredictable changes, it is necessary for people, firms and tourism institutions to develop adaptive capabilities (Day, 2011) to confront that context and to adapt rapidly to it. Understanding the dynamics of the ties, based on the different networks in which

they are embedded, will mean that the actors achieve those adaptive capabilities. SNA tools permit dynamic analyses of the ties and facilitate satisfactory positioning in the networks (Baggio et al., 2010).

Finally, SNA is not a cure-all for tourism-related research problems nor is it for practical problems. It is only a powerful analytical tool, still young and in a growth process, of a multidisciplinary nature, that is capable of unravelling partially hidden structures and processes, making them explicit through simple observation and with other standard research techniques. It uses a group of tools to solve specific problems linked to ties, many of which are yet to be discussed and are unresolved in the field of tourism.

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