# Use of Network Analysis in Tourism Research

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## Abstract

**Purpose**
This paper discusses the status of the network concept in tourism, examining the historical development of network thinking in the wider literature and the origins of network thinking in sociology, anthropology as well as mathematics. It then examines the usefulness of the network concept for the study of tourism and reviews a number of different applications in tourism research reported in three tourism journals over a six year period. Based on this analysis and previous typologies of approaches to the study of networks, the paper develops a fourfold topology of types of network research in tourism.

**Methodology**
The paper reviews recent network research in tourism using a convenience sample of refereed journal articles from Current Issues in Tourism, Tourism Management and Annals of Tourism Research between 2000 and 2006 and categorises these on a fourfold typology.

**Findings**
The paper highlights a number of research areas where the authors consider that further application of the network concept would be of benefit. These areas include application of complexity and chaos theory and the study of the tourists' networks of friends and acquaintances that influence tourist behaviour.

**Research limitations**
The review of the tourism literature is limited to three journals and a six year period.

**Originality/value of paper**
The paper develops an original typology of network studies in tourism and discusses complexity theory and the application of physical network concepts in social systems.

**Keywords:** network analysis, review, typology, complexity

**Type of paper:** conceptual paper

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## 1. Introduction

Many authors have discussed the idea that tourism is a fragmented industry, geographically dispersed with many small specialist businesses contributing to an overall product experience. To deal with such an environment, a number of hierarchical organisational structures have been developed to provide cohesion in planning and policy and to stimulate and coordinate destination marketing and promotion. While useful in allowing government to engage with organisations in the tourism sector and to provide a measure of coordination especially amongst larger operators, organisations in tourism also develop peer to peer networks of relationships for social support, operational integration, and acquisition of knowledge. Such networks are informal and diffuse, yet no less important than those developed by government bureaucracy. Given the importance of network forms of organisation for the functioning of a tourism destination, it is somewhat surprising that there has not been more academic study and practical use of tourism networks.

In this paper, we examine the status of the network concept in tourism, examining the historical development of network thinking in the wider literature before developing a fourfold topology of types of network research. The paper then reviews recent network research in tourism and highlights a number of research areas where the authors consider that further application of the network concept would be of benefit.

## 2. The historical development of the network concept

An examination of the literature on the historical development of the network concept reveals a number of streams of thought. These can be generally divided into a mathematical based stream and a conceptual stream in the social sciences, with these two streams merging to some extent around the middle of the 20th century. A network is usually represented by a diagram in which the various elements are represented by dots and the connections among them by lines that link pairs of dots. This diagram is called a graph and the branch of mathematics known as graph theory constitutes the framework providing the formal language to describe a network and its features. These origins of graph theory are attributed to the Swiss mathematician Leonhard Euler (1707-1783) and to his paper Solutio problematis ad geometriam situs pertinentis published in 1736. In it, Euler deals with the now famous problem of the bridges of Königsberg. The people of Königsberg used to entertain themselves by trying to work out a route around the city crossing each of the seven bridges once and only once. All the attempts had always failed, so that many believed that the task was impossible (Biggs, 1976). Euler proved this impossibility, giving also a simple criterion which determines whether or not there is a solution to any similar problem with any number of bridges connecting any number of bridges connecting any number of areas. More than the solution of a problem, the real importance of Euler's paper is that it considers the object of study from an abstract point of view, giving significance to the structural characteristics more than to the pure geometrical ones. The title itself indicates that, and Euler's work is also the cornerstone of that discipline envisioned almost a century before by Leibniz, the geometria situs, which will become the branch of mathematics known today as topology.

In the early 20th century, the ideas and techniques developed for the study of these abstract objects were applied to a completely different field. Realizing that a group of individuals can be represented by enumerating the actors of the group and their mutual relationships, sociologists started to use graph theory and methods to describe and analyze patterns of social relations (Freeman, 2004; Wasserman & Faust 1994). Jacob Moreno (1934) introduced the topic of sociometry and, by using sociograms (diagrams of points and lines used to represent relations among persons), he aimed to identify the structure of relationships around a person, group, or organization in order to study how these configurations may affect beliefs or behaviours.

From the sociological and anthropological point of view, networks form part of the structural tradition where researchers hypothesise that variations in the pattern of relationships surrounding social actors affect the behaviour of those actors and correspondingly, that people also consciously manipulate situations to create desired structures (Stokowski, 1992). Wellman (1988:83) writes that:

> "The concern of structural analysts with the direct study of networks of concrete social relations connects strongly back to post-World War II developments in British social anthropology. Then as now, anthropologists paid a good deal of attention to cultural systems of normative rights and duties that prescribe proper behaviour within such bounded groups as tribes, villages, and work units."

Barnes (1952) used the concept of "the social network" to examine ties between people in a Norwegian fishing village and explain such key social processes as access to jobs and political activity. Soon afterward, Bott's (1957) work brought the network concept to the wider attention of social scientists. She developed the first distinct measure of network structure - "knit" (now called "density") - to show that densely knit English extended families were more apt to contain married couples who did most things independently rather than jointly. In America "sociometrists" used network diagrams to represent interpersonal relations in small groups (e.g., Coleman, 1958) and such techniques were later used to study a variety of phenomena such as communication, the diffusion of innovation and the spread of diseases.

A parallel development in the political science literature took a more ethnographic and qualitative approach. In this tradition, researchers seek to examine how patterns of ties in social systems allocate resources. Wellman (1988:91) writes that:

> "…Structural analysts have developed "resource mobilization" analyses to explain political behaviour. They showed such behaviour to be due to structured vying for resources by interest groups - and not to reflect the aberrant cravings of a mob. Their work emphasized how patterns of links between interest groups structure coalitions, cleavages, and competitive relations and how direct and indirect ties differentially link individuals and groups to resources."

Most recently, developments in the complexity sciences in physics have overlapped into the study of social systems. Here social networks are examined using techniques derived from the study of physical, biological and computer networks. This work has been driven by interest in the self organising processes and the emergence of structure from randomness. It has contributed a wide range of possible metrics and, more importantly, it has provided evidence of the connection between network structures, their functions and their dynamical evolution (Albert and Barabasi, 2002; Boccaletti et al, 2006; Watts, 2004)

Today, these traditions combine and interact creating opportunities for intellectual stimulation but also confusion. The term network is used in everyday speech without precision as a definition of a particular phenomenon. The concept of a network has 'blurry edges' such as in its usage as part of a network ideology that advocates egalitarian, open communities (Wellman & Berkowitz, 1988:81) or confusion with the term networking in a business context. This problem of definition of the term network is not unique to tourism research and has been identified as applicable to network studies in the wider management literature. This wide usage has led to a diverse literature where the term network analysis is used as a metaphor, homology, paradigm or method (Wellman, 1988) in different contexts. In this paper the definition used is "a complex set of inter-relationships in a social system" (Mitchell, 1969).

Within this diversity in the study of networks, certain commonalities may be identified. Kilduff et al. (2006) suggest that there are four core concepts in social network theory; the primacy of relations between organizational actors, the ubiquity of actors' embeddedness in social fields, the social utility of network connections, and the structural patterning of social life. Wellman (1988:82) lists five characteristics of structural network analysis:

1. Behaviour is interpreted in terms of structural constraints on activity rather than in terms of inner forces within units.

2. Analyses focus on the relations between units, instead of trying to sort units into categories defined by the inner attributes (or essences) of these units.
3. A central consideration is how the patterned relationships among multiple alters jointly affect network members' behaviour. Hence, it is not assumed that network members engage only in multiple duets with separate alters.
4. Structure is treated as a network of networks that may or may not be partitioned into discrete groups. It is not assumed a priori that tightly, bounded groups are, intrinsically, the building blocks of the structure.
5. Analytic methods deal directly with the patterned, relational nature of social structure in order to supplement - and sometimes supplant mainstream statistical methods that demand independent units of analysis.

Built around these common or core concepts, network analysis is used in a variety of disciplines and subject areas. Each of these has developed its own traditions and indeed Berry et al (2004) considers that there are three main traditions in network analysis today focused on social network analysis, policy networks and public management networks. In addition, there are a variety of uses of network concepts in situations where the objects of study are not socially related people or enterprises but other linkages such as transport connections (Lew & McKercher, 2002; Smith & Timberlake, 1995). Network analysis techniques may also be used when the linkages between objects are inferred such as in textual analysis where links are defined as co-occurrences of words within a paragraph.

The first tradition based on analysis of links between people has been shown to be important in such phenomena as knowledge transfer, social cohesion, and development of social capital. In a now classic study Granovetter (1973) demonstrated the importance of friendship ties in finding out important information but surprisingly given the importance of 'friends and relatives' in the decision making process for travel. A second field of network research, that of the study of linkages and relationships between organizations has been divided into two based on methodological considerations. Policy network research relies on thick qualitative description of relationships while inter-organizational network studies tend to be more numerical in nature.

Dredge (2006a) argues for the separation of inter-organizational networks from policy network studies and here, public management networks are considered a form of inter-organisational network. Berry et al (2004) discuss and distinguish some of the issues of policy networks versus other approaches to policy. Van Waarden (1992) indicates that the main concepts involved in studying policy networks are actors and agencies, functions and structure of the network, characteristics of institutionalisation, rules of conduct and power relations. The inter-organisational network approach has been reviewed by Pearce (1996) and Podolny and Page (1998). Borgatti and Foster (2003:995) write "since organizations are already thought to be embedded in a network of economic and social relations, do we need to posit a new organizational form in order to theorize about, say, what industry conditions lead to more or stronger ties."

An inter-firm alliance is a voluntary arrangement among firms that exchange (ie exchange networks) or share resources and that engage in the co-development or provision of products, services, or technologies (Gulati, 1998). Organisational relationships may be established for a number of purposes such as obtaining resources, promotion or examination common areas of interest or even to adjudicate in areas of dispute (Lovelock, 2001). Until recently, scholars examining the competitive advantage of firms have focused on internal resources. However the network literature on competitive advantage highlights the importance of *external* resources available to the firm through its linkages (McEvily & Marcus, 2005; Gulati & Gargiulo, 1999). The strategic network perspective avers that the embeddedness of firms in networks of external relationships with other organizations holds significant implications for firm performance (Gulati, Nohria, & Zaheer, 2000). A number of authors have highlighted the importance of collaborative advantage for organisational advantage (Dyer & Singh, 1998) and for business activities such as marketing (Pillai, 2006). Gulati (1999) who studied how a firm's alliance network shapes alliance formation decisions introduced the notion of network resources.

The concept of network resources is consistent with Hunt's (2003) resource advantage theory. In resource advantage theory, a competence is a higher order resource that consists of a distinct package of basic resources. Specifically, competencies are viewed as socially complex, interconnected, combinations of tangible and intangible basic resources that could coherently together in a synergistic manner. Intangible resources include formal and informal social structures.

Thus, resource advantage theory allows for the impact of social structure in social relations on competition which is ignored in neoclassical economic theory where to become more competitive the firms in an industry must move towards or become closer to perfect competition. However when firms form networks, they move away from, not towards, the atomised firms in perfect competition. Resource advantage theory provides a theoretical foundation for organisational competencies. In this way business relationships deliver advantages (Watkins & Bell, 2002). The resources and competencies developed include access to diverse knowledge (Burt, 1992), pooled resources and cooperation (Uzzi, 1996), and third-party endorsements (Stuart, Hoang, & Hybels, 1999). Since resources and capabilities are differentially available to a firm depending on its network structure and the firms to which it is tied (Gulati & Gargiulo, 1999), we need to consider the pattern of a firm's ties, as well as the resource endowments of its alters, to more fully understand the prospects for resource acquisition and consequent performance (Stuart, 1998).

In addition to the prior literature however, a further approach based on application of complexity theory and network theory from the physical sciences is evolving. Thus, we identify four different traditions in the study of social networks and these are shown in Table 1. Each of these traditions makes certain assumptions, favours particular methods for the study of networks and seeks to answer some central questions. The personal social network and intra-organisational network traditions for example share similar types of methods and emphasise quantitative studies (although using different units of analysis) while policy network studies emphasise case study and qualitative methods.

**Table 1 Four traditions in network analysis**

| | Personal Social network analysis | Policy networks | Inter-organizational networks (inc. public sector) | Physical network approach |
|---|---|---|---|---|
| Assumptions about behaviour: | "Intention" from embedded context (Granovetter); "Contingent value" (Burt) | Rational pursuit of actors' preferred policies | Pursuit of economic and strategic outcomes Effective service delivery; Instrumentalism | Common laws underlie physical systems and social systems :i.e. complexity theory Network theory |
| Methods in use: | Block modelling analysis Euclidean distance analysis Regression analysis Dynamic-network modelling | Case studies Regression analysis Time series Event history analysis | Case studies Block modelling analysis Euclidean distance analysis Regression analysis Dynamic-network modelling | Statistical modelling Analysis based on chaos and complexity theory |
| Principal questions | Network structure and position as | How policy actors achieve | Comparative network | How do physical models inform |

| | | | | |
|---|---|---|---|---|
| | results and antecedents of action, attitudes, and outcomes. | desired policies; How actors' network roles influence policy outcomes | performance; How managers' actions affect network outcomes; What types of networks exist and how they differ Effect of alliances, competition and cooperation | social theory |

Source: Berry et al (2004), Dredge (2006a) and authors

**3. Application of the four traditions of network analysis in the tourism literature**

Is network analysis suitable for the study of tourism? It is considered here that tourism is a network industry par excellence. Network in tourism is more important than in other areas of the economy of Australia (Bickerdyke, 1996).Further support for this claim is found in the definition of tourism as systems where interdependence is essential (Bjork & Virtanen, 2005) and collaboration and cooperation between different organisations within a tourism destination creates the tourism product (Pechlaner, Abfalter, & Raich, 2002; Tinsley & Lynch, 2001). In this way, local alliances, agreements and other formal and informal governance structures help to compensate for the fragmented nature of a tourism destination. Buhalis (2000) indicates that most destinations consist of networks of tourism suppliers and that the benefits of such networks include a more profitable tourism destination (Morrison, Lynch, & Johns, 2004). Such networks are also found among sectors of the tourism industry (Grangsjo, 2006). Networking and partnerships in destination development and management was the topic of an ATLAS conference in 2004, as well as a theme for the present conference.

A second reason for study of networks as a central part of tourism is that they form a basis for collective action. In tourism, many of the main resources of a tourism destination are community "owned" that are used jointly to attract tourists. These may be physical resources such as beaches, lakes, scenic outlooks and national parks beaches; built resources such as museums, art galleries and heritage buildings; or intangible resources such as destination brands or the reputation for friendliness of local people. Such collective action does not necessarily require a network organisation but in a situation with a general lack of resources and where decisions related to tourism are not often seen within the government mandate, the response is often a network of interested stakeholders.

Network analysis can therefore deliver a number of useful outcomes for tourism studies. It provides a means of visualizing complex sets of relationships and simplifying them, and so can be useful in promoting effective collaboration within a destination group, supporting critical junctures in destination networks that cross functional, hierarchical, or geographic boundaries; and ensuring integration within groups following strategic destination restructuring initiatives (Cross, Borgatti, & Parker, 2002). The use of standard methods and questions enables networks of relationships to be compared between destinations over time thus allowing the study of dynamic situations. A more ambitious aim is to provide recommendations as to how the relationships and overall efficiency of the network can be improved.

Each of these individual domains of study will now be examined. In the social sciences, studies of individual social networks provide some evidence of how ideas and patterns of action develop among groups of individuals. However in tourism, there has been little use of the study of individual social networks. One example is from Stokowski (1992) who discusses the use of social network analysis to understand an individual's tourism behaviour. Individual social networks may also have the important in the development of community tourist or rural tourism (Verbole, 2000).

In policy network theory the unit of analysis may be individuals or organisations. Pforr (2005:334) considers that policy studies are concerned with the complex, diffuse and non-rational nature of the policy process. Certainly, as found in the wider policy literature, policy network theory in tourism considers that quantitative structural network analysis does not provide 'thick' description necessary to understand the complexity of the policy approach. In tourism, Dredge (2005, 2006a) discusses a four level framework for investigating policy networks. In this framework network structural characteristics such as centrality and resource sharing seemed to provide a background for understanding the influence of networks and in fact managing them. Tyler and Dinan (2001) have examined the nature of policy networks regarding tourism in United Kingdom. Treuren and Lane (2003) discuss planning in tourism and how it is contingent on alliances networks etc. Pforr (2005) uses a structural approach and focuses on 'who are the core actors in the TDMP process?' (pp. 336-337) rather than the overall characteristics of the network. A number of authors have developed taxonomies of networks. For example Lynch (2000) divides networks into formal, semiformal and informal based on the nature of the aims of the set of actors. Morrison et al (2004) classify the types of networks using organisational type, inter-organisational configuration, degrees of formality, and extent and intensity of co-operative relationships between members, functions and aspired benefits. Dredge (2005) indicates that the dimensions of networks are: actors and agencies, functions of the network, structure of the network, characteristics of institutionalisation, rules of conduct, power relations, and actor strategies.

Inter-organisational network theory helps understand the collective nature of organisational action, constraint and coordination within tourism. Indeed tourism's organisation in a country can be considered as a series of hierarchical networks (Pearce, 1996). Part of the reason for this collective action is that many of three main resources of a tourism destination are jointly owned. These may include intangible resources such as brands or physical resources such as beaches. Alford (1998), for example, focuses on how regional tourist boards seek to establish a market position, and how they benefit from networking with other sectors of the industry. In the context of sustainable tourism planning and development Selin and Beason (1991) provide an early examination of the importance of inter-organisational relationships in tourism and focuses on alliances and collaboration (Selin, 1993). Lovelock (2001) discusses the importance of inter-organisational relationships, collaboration and cooperation. In fact a network approach to sustainability is necessary within an industry such as tourism were a relatively large number of small actors with few resources cannot pursue sustainable development in isolation (Halme, 2001). A similar network of stakeholders is found in study of events (Stokes, 2006).

The physical network approach has only recently been introduced to the tourism literature. Examples of this approach may be found in the work of one of the authors of this paper. It aims at combining the main metrics describing a network with available qualitative information in order to gather useful insights on the structure, the characteristics and the functions of a tourism destination. A further objective is to identify the relationships between the topology of the relations network and the dynamical (historical) evolution of the system (Baggio, 2006, 2007; Baggio, Scott & Wang, 2007).

## 4. The topics studied in recent tourism literature

In order to illustrate the current use of network theory in tourism, articles from Tourism Management Annals of Tourism Research and Current Issues in Tourism were identified and categorised in terms of the tradition and also the major focus of the study and concepts involved. This study is not intended as definitive or comprehensive. Instead it selected articles in these three journals during the period 2000 to 2006 as a convenient sample. As may be seen below, the majority of studies in the tourism literature reviewed based on the inter-organisational networks tradition. Relatively few articles examine policy networks and an examination of individual social networks in tourism is rare. As discussed above, the physical network tradition is not yet in evidence in the papers is reviewed.

**Table 2: Recent tourism literature concerning social networks**

| Article | Tradition | Concepts |
|---|---|---|
| Winter ( 2007) | none | Metaphor – assumed |
| White and White (2007) | none | Metaphor - assumed |
| O'Brien (2006) | Inter-organizational networks | Networking – business leveraging |
| McGehee (2002) | Individual social networks | Networking – social movements |
| Tufts and Milne (1999) | Inter-organizational networks | Networking -- alliances |
| Murphy (2001) | Individual social networks | Networking – information search |
| Steene (1991) | Inter-organizational networks | Networking -- competitive advantage |
| Pforr (2006) | Policy networks | Policy networks -- density, subgroups |
| Tremblay (1998) | Inter-organizational networks | Networks -- coordination and organisational structures |
| Jackson and Murphy (2006) | Inter-organizational networks | Networks -- cluster theory |
| Cooper (2006) | Inter-organizational networks | Networks -- knowledge management |
| Yuksel et al. (2005) | Inter-organizational networks | Networks -- governance |
| Sheehan and Ritchie (2005) | Inter-organizational networks | Networks -- stakeholder identity and salience |
| Jones (2005) | Community/Inter-organizational networks | Networks -- collaboration |
| Vernon et al. (2005) | Community/Inter-organizational networks | Networks -- Social capital |
| de Araujo and Bramwell (2002) | Inter-organizational networks | Networks -- partnership |
| | Tourism management | |
| Wang and Fesenmaier (2007) | Inter-organizational networks | Networks -- collaborative destination marketing |
| Novelli et al. (2006) | Inter-organizational networks | Networks -- innovation |
| Dredge (2006b) | Policy networks | Networks -- partnership |
| Yuksel and Yuksel (2005) | Inter-organizational networks | Networks -- learning and innovation |
| Beesley (2005) | Inter-organizational networks | Networks -- learning, collaboration and emotion |
| Saxena (2005) | Inter-organizational networks | Networks -- learning and innovation |
| Pavlovich (2003) | Inter-organizational networks | Networks -- density and centrality |
| Plummer, Kulczycki, and Stacey (2006) | Inter-organizational networks | Networks -- cooperation |
| (Plummer, Telfer, and Hashimoto (2006) | Inter-organizational networks | Networks -- cooperation |
| Pforr (2005) | Policy networks | Networks -- planning |

Source: authors work

In terms of the concepts examined in this literature (see Table 2), we find a wide range, including knowledge management (Cooper, 2006) and learning (Beesley, 2005), governance (Yuksel, Bramwell, & Yuksel, 2005), social capital (Vernon, Essex, Pinder, & Curry, 2005), network density (Pforr, 2006), partnerships (Dredge, 2006b) and innovation (Novelli, Schmitz, & Spencer, 2006). In addition,

some authors use the concept of a network as an analogy rather than relating it to substantial prior theory (Winter, 2007).

## 5. Discussion and conclusion

The use of network theory in tourism is developing. A scattered literature based around the inter-organisational network and policy network traditions has been found in an ad hoc review of the literature. One limitation of this work is that it has been restricted to only three journals and a more comprehensive study would examine a wider range of sources including a number of specialized services journals which publish tourism related studies. Further, some progress appears to have been made in moving from networks as an analogy to networks as a theoretical concept and linked to other areas such as innovation, partnerships, cooperation, collaboration etc. The use of the concept of a network appears logical in the study of tourism.

With particular reference to tourism marketing, the majority of studies have concerned inter-organizational or policy networks with the purpose of destination or enterprise marketing or market planning. These networks may examine event based networks (Stokes, 2006) or more usually destination networks (Grangsjo, 2003; Palmer, 1998; Palmer & Bejou, 1995; Pearce, 1996), Given the practical importance of tourism marketing within the industry, the lack of further network research appears puzzling and is attributed here in part to obtaining access for research with the relevant enterprises. Further research projects could overcome this reluctance by emphasising the potential for enhancing the effectiveness of collaborative marketing effort.

Further research in all four traditions is justified but it should be noted that two are relatively underrepresented on the basis of this admittedly simplistic review. The study of individual networks relates to tourism is scarce, while a case for the importance of word-of-mouth in selection of tourism destinations is easily made (but see Urry 2004). Further, the tourism destination provides an interesting context in which to examine the formation of new ties based on often transitory interaction. Secondly, the authors are enthusiastic concerning the use of new physical network analysis methods. Recently two of us have examined networks of relationships based on hyperlinks between websites (Baggio, Scott & Wang, 2007). Further, one of us is examining the dynamics of destination networks using advanced statistical modelling following his introductory work in this area (Baggio 2006, 2007). The study of networks in tourism is an interesting and developing area and we encourage research in this area.

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