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The web of connections between tourism companies: Structure and dynamics

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ABSTRACT

Tourism destination networks are amongst the most complex dynamical systems, involving a myriad of human-made and natural resources. In this work we report a complex network-based systematic analysis of the Elba (Italy) tourism destination network, including the characterization of its structure in terms of several traditional measurements, the investigation of its modularity, as well as its comprehensive study in terms of the recently reported superedges approach. In particular, structural (the number of paths of distinct lengths between pairs of nodes, as well as the number of reachable companies) and dynamical features (transition probabilities and the inward/outward activations and accessibilities) are measured and analyzed, leading to a series of important findings related to the interactions between tourism companies. Among the several reported results, it is shown that the type and size of the companies influence strongly their respective activations and accessibilities, while their geographical position does not seem to matter. It is also shown that the Elba tourism network is largely fragmented and heterogeneous, so that it could benefit from increased integration.

'Make voyages! Attempt them! - there's nothing else...' (T. Williams)

1. Introduction

Tourism, probably the largest economic sector today, has fairly indefinite boundaries and comprises a wide diversity of organizations. A tourism destination, loosely defined as the goal of a traveler, is considered a fundamental unit of analysis for the understanding of the whole tourism sector [1]. From a socio-economic viewpoint it consists of a number of companies and organizations (public and private) who manage different and non-homogeneous attractions and services to be offered a visitor [2]. A tourism destination is a complex adaptive system sharing many (if not all) of the characteristics usually associated with it: nonlinear relationships among the components (companies and organizations), self-organization and emergence of organizational structures, and robustness to external shocks [3,4]. The dynamic set of relationships which form the connective tissue holding together the system's elements suggests a network approach to be indispensable for the understanding of a tourism destination. Several authors have used this perspective, mostly at a qualitative level [5–7]. Only a few, however, have adopted quantitative methods and tools in order to improve our knowledge of the structure and the dynamic behavior of a tourism system [8–12]. Today, more than ever, strong international competition induces an

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imperative to innovate to remain competitive. Many authors recognize that a prerequisite for innovation is the capability to cooperate and collaborate effectively. Tourism, more than most other economic sectors, involves the development of formal and informal collaborations, partnerships and networks, as well as the understanding of the patterns of linkages among the destination components and the assessment of the system's structure are crucial points [9,11,13,14]. Not less important is the effective access to local information and knowledge maintained by each participant of this intricate system.

With its origins going back to Flory [15] and Erdős-Rényi [16] works on random graphs, the area of complex networks [17–21] has established itself as one of the most dynamic and exciting alternatives for representing the structure and dynamics of the most diverse natural and human-made complex systems. One of the main reasons for the growing popularity and success of complex network investigations consists in its generality for representing and modeling virtually any system composed of discrete parts (e.g. Ref. [22]), encompassing from protein–protein interaction (e.g. Ref. [23]) to scientific collaboration (e.g. Ref. [24]). In addition, by representing any type of connectivity, complex networks are intrinsically suited for the investigation of more general types of dynamics. As a matter of fact, growing attention in complex network research has been focused on investigations of relationships between structure and dynamics (e.g. Ref. [18–20]). Three of the most important subjects currently pursued by complex network scientists correspond to: (i) the characterization of the structure of complex systems by using several topological measurements (e.g. Ref. [21]); (ii) the investigation of the modularity (i.e. community finding) of complex networks; and (iii) studies of the relationship between structure and dynamics of complex systems.

The current work reports a complex network approach to the comprehensive investigation of the complex system corresponding to the tourism destination in the Island of Elba. Each tourism agent is represented as a node, while the relationships between such agents are expressed by undirected edges. It is important to notice here that this is one of the first attempts at using network analysis methods in a tourism destination environment. The main objective of this exploratory work was to assess the usefulness of this approach for the understanding of the structural and dynamical characteristics of these systems. Therefore a 'minimalist' approach was taken leaving more detailed and refined analyses for future work. Nevertheless, our investigation encompasses all the three main approaches identified above, namely structural characterization in terms of several measurements, identification of communities, and investigation of the relationship between structure and function by using the *superedges* concept introduced recently [25]. The work starts by describing the construction of the tourism destination network and proceeds by briefly reporting the characterization of its structure and modularity. This is followed by the superedges approach to the structure:dynamics investigation.

2. The tourism destination network

The island of Elba (Italy), analyzed here, belongs to the Tuscany Archipelago National Park (located in the central Thyrrenian sea) and is the third Italian island. It is an important environmental resource and a significant contributor to the country's economy. Almost 500,000 tourists spend some 3 million nights per year in several hundred accommodation establishments. Elba is considered a mature tourism destination with a long history. Its has gone through a number of different expansion and reorganization cycles. The great majority of the stakeholders are small and medium sized companies, mostly family-run. Several associations and consortia operate on the island and try to recommend and develop different types of collaboration programs in an attempt to overcome the excessive 'independence' of the local companies [26,10].

Mapping a socio-economic system such as a tourism destination into a network is a difficult task as the choices in the definitions of nodes and connections may strongly affect the resulting graph and, consequently, its topological characteristics. In our case, we took into account the largest connected component of a destination network, in which, apart from some features described later on, all elements are considered to be equivalent and the connections are unweighted. Though simplistic, this approach has been able to provide interesting insights and to confirm the usefulness of the application of network analysis method in this field, paving the way for future more refined and thorough investigations. Moreover the adopted approach is consistent with many tourism studies where a first level of analysis of characteristics and behaviors of a tourism destination considers all stakeholders as being of the same 'type', without distinguishing their nature (public, private, single companies, associations etc.) as their first basic objective is (or should be) the balanced economic and social growth of the destination [1,2,5].

The destination network was built in the following way. The core tourism companies and associations operating at Elba were considered the nodes of a network whose links are the relationships among them. According to the local tourism board, the list of companies comprises 1028 items. The links reflect basic 'business' relations between organizations (i.e. commercial agreements, co-ownerships, partnerships, membership in associations or consortia etc.). They were collected by consulting publicly available sources such as associations listings, management board compositions, catalogs of travel agencies, marketing leaflets and brochures, official corporate records (to assess the belonging to industrial groups). These data were then verified with a series of in-depth interviews to 'knowledgeable informants': director of tourism board, directors of associations, tourism consultants etc. This triangulation [27] allowed to validate existing links and uncover others. The so-obtained network can be reasonably estimated to be nearly 90% complete.

Finally, based on the information available, all the nodes were recorded along with their membership to a specific type of business (8 types: e.g. hotels, travel agencies, associations etc.), geographical location (9 areas reflecting Elba's municipalities) and size (small, medium, large, estimated on the real size of the company). Overall, 8 different types, 9 geographical areas and 3 sizes are present. Table 1 shows the different node groupings according to the three main classifications.