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What network analysis can reveal about tourism destinations

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Abstract

Tourism is probably the largest economic sector of the World's economy, and a tourism destination is considered to be a fundamental unit of analysis for the understanding of this industry. This research examines two such systems, Fiji islands and the island of Elba (Italy), investigating their structural characteristics. Network theoretic metrics are used to gauge the static and dynamic attributes of the networks formed by the websites belonging to the different tourism operators. The general topology is found only partly similar to the one peculiar to many complex socio-economic systems. The differences appear due to the rather poor connectivity and clusterisation of the networks. The structural characteristics are then interpreted in terms of the evolutionary growth of a tourism destination.

Introduction

- Tourism is the largest economic sector of World economy [1]
    - 11% of World GDP; 6×10^9 € (growing 5% per year);
    - 240×10^6 jobs (8.7% of World's workforce);
    - 840×10^6 tourists in 2006.
- The *"sector"* boundaries are quite indefinite, it comprises many diverse economic & social activities.
- Tourism *activities* are geographically concentrated in a "tourism destination" (TD).
- The destination management approach is considered an important strategic and operational approach to foster the development of areas where tourism is a relatively important activity and where the economy may be significantly influenced by tourism revenues [2].
- The stakeholders of a destination (the companies and organisations providing basic tourism services) are connected by a set of relationships of diverse types, ranging from a simple information exchange to complex economic and technical collaboration agreements.
- Having diverse objectives, the different operators need a shared strategic vision which can enable a winning offer to be presented to tourists. Therefore a high degree of collaboration and cooperation is crucial for the success of the TD and, cascading down, of the single operators [3].

Objective

- Examine how network thinking can inform our understanding of the interactions between tourism operators within a destination.
- Derive insights into the dynamic evolution of a tourism destination.

Main hypotheses

- Complex social & economic systems can be represented by a network graph [4].
- Topology and dynamics of networks can provide insights in system's behaviour [5].
- A tourism system is a complex adaptive system [6, 7].

and

- Connections among the websites (hyperlinks) are not simply a technological manifestation but may be considered a reflection of social processes [8, 9], i.e.: the web network (B2B) closely represents the underlying socio-economic network.

Methods

The study considers two tourism destinations: Elba island (Italy) and Fiji islands (fig. 1).

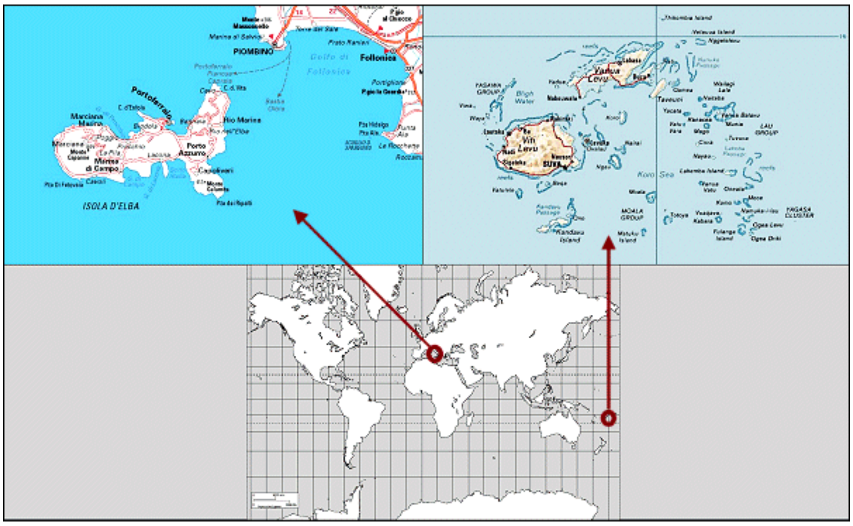

Figure 1. Elba and Fiji tourism destinations

The destinations exhibit similar characteristics:

- most of the economy depend on tourism
- both are “summer” tourism destinations
- sizes (# of stakeholders & tourist fluxes) are comparable
    - ~ 500,000 arrivals & ~ 3,000,000 overnights per year, with a strong seasonality

Main steps

- Identified core tourism organisations (hotels, restaurants, travel agencies etc…) and their websites (from official lists provided by Elba Tourism Board and Fiji Visitors Bureau)
- Enumerated the connections (hyperlinks) among them
    - a DIY crawler plus visual inspection of the websites
- Drawn and analysed the networks using a combination of SW packages (Pajek and SPSS) and self coded Matlab programs
- Derived network theoretic metrics and compared with published results for similar networks [5, 10]

Results

The network graphs are depicted in fig. 2 and their main measured characteristics [11, 12] are shown in Table 1, with a comparison with the typical Web quantities found in the literature [5, 10, 13, 14].

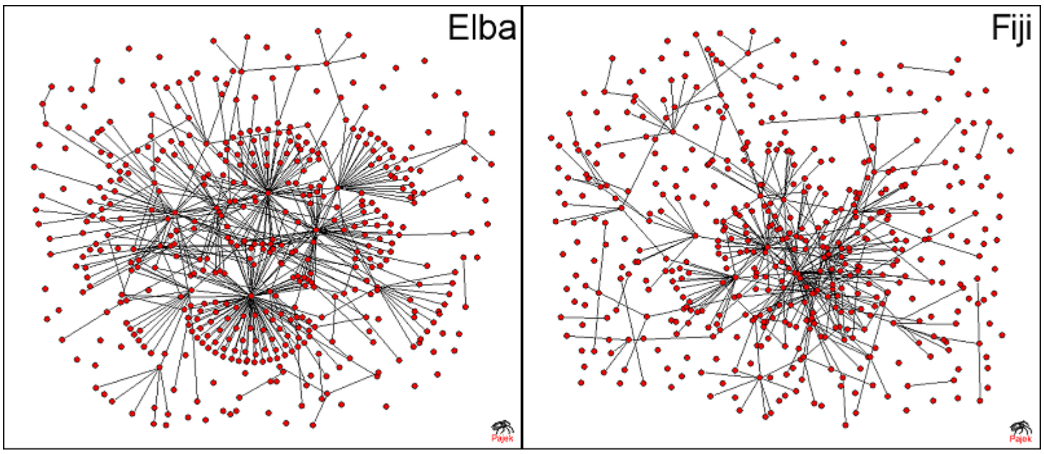

Figure 2. The network graphs of Elba and Fiji tourism webspaces

The general connectivity (link density) is very low and there are large proportions of disconnected elements. Clustering is quite limited, as is the efficiency both at a local and at a global level. Very small and negative correlation among the nodal degrees (assortativity coefficient) is found. This is the opposite of what is typically reported for social networks and consistent with the values reported for purely technological systems [15].

Table 1. The network characteristics of Elba and Fiji compared with those typical of the WWW

	Elba	Fiji	vs. WWW
Size (# of nodes)	468	492	---
Link density (δ)	0.0023	0.0016	↓
nodes with no connections	21%	35%	↑
Average path length (L)	4.5	2.9	≈
Diameter (D)	11	6	≈
Clustering coefficient (C)	0.003	0.024	↓
Efficiency			
local	0.0145	0.0275	↓
global	0.1698	0.0710	↓
Assortative mixing coefficient	-0.101 ± 0.094	-0.137 ± 0.102	↓ (<0!)

The cumulative degree distributions are shown in fig. 3. Both networks show scale-free topology, consistent with many artificial and natural complex networks. Elba in- & out-degree and Fiji in-degree distributions follow a power-law consistent with the preferential attachment growing mechanism suggested by Albert and Barabási [13]. Fiji out-degree distribution shows a cutoff at high degrees (see Table 2).

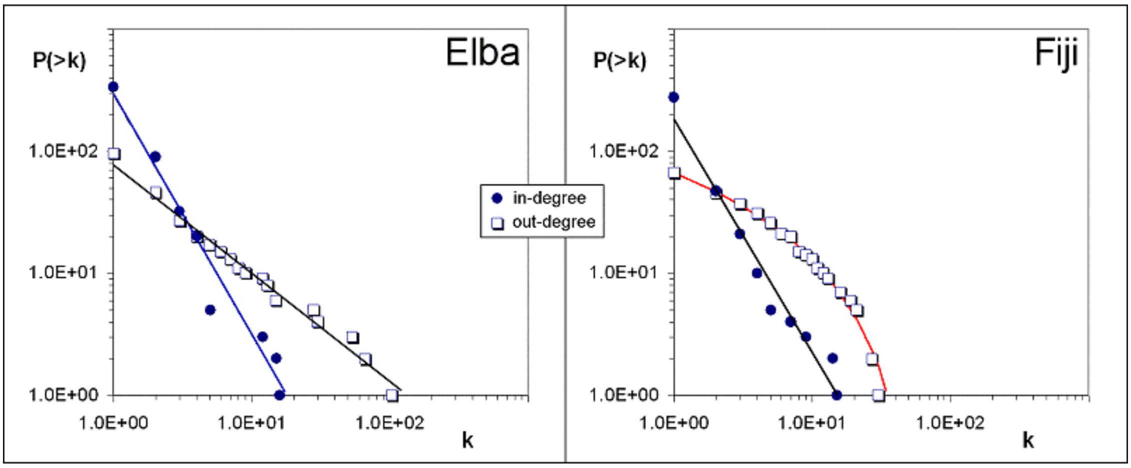

Figure 3. Cumulative degree distributions for Elba and Fiji tourism web networks

Table 2. Degree distributions of Elba and Fiji networks

TD				vs. WWW	
Elba	in-degree	$P(k) \sim k^{-\gamma}$	$\gamma_{in} = 2.96$	↑	> concentration
	out-degree	$P(k) \sim k^{-\gamma}$	$\gamma_{out} = 1.89$	↓	flatter & > spread
Fiji	in-degree	$P(k) \sim k^{-\gamma}$	$\gamma_{in} = 2.91$	↑	> concentration
	out-degree	$P(k) \sim k^{-\gamma} exp(-k/k_c)$	$\gamma_{out} = 1.4$ $k_c = 15$	↓	flatter & > spread exponential cutoff

Discussion and conclusions

Two considerations can be made when looking at the results of the network analyses. The first regards the use of technology (Internet and Web) in the two TDs, the second concerns the socio-economic networks, with the hypothesis that the web network represents the set of “real” connections in the TDs.

Use of technology:

- poor connectivity can be interpreted as a misuse of the investments made for having missed out on the benefits of networking;

- poor clustering leads to a difficult identification of the tourism communities and makes the destination stakeholders' websites poorly reachable
- new generation search engines, and their dynamic agents based on community identification techniques may relegate these websites to lower rankings, with possible detrimental effects for the economic development of the destinations.

Socio-economic networks:

- poor connectivity and clusterisation and poor efficiency make problematic a good transfer of information across the systems
- high disconnectedness is a symptom of the reluctance to form collaborative groups. This can be quantitatively assessed by using the clustering coefficient as a static measure, and the assortativity coefficient as a measure of tendency to group [12].

Degree distributions

A cut-off in the degree distribution is usually interpreted as some limitation on the network [5, 10, 16]. Elba is considered to be a mature destination [17] while Fiji is at an earlier stage of development [18]. Adopting Mossa's interpretation (limited information or *bounded rationality*) [16], the topological differences in the networks are consistent with the dynamical evolution of our destinations [19]: in a "young" destination large operators (high degrees nodes) do not have yet realised the existence of a dynamically growing number of new organisations and do not have yet established relations with them.

Conclusions

The usage of network theoretic methods in analysing socio-economic systems such as a TD proves effective both from a structural (static) and a dynamical point of view. It has shown to be able to provide quantitative assessments of their characteristics and their evolution. Future more extensive work will provide the possibility to generalise these results and to set up more rigorous methodological tools to study and manage these systems.

References

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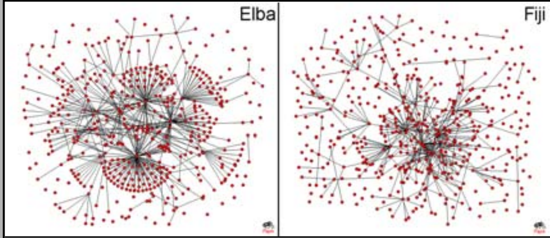

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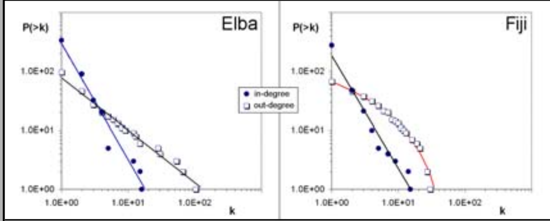

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