

Hyperlink network analysis of a multi destination region: the case of Halland, South Sweden

Fanni Zoé Éber¹ · Rodolfo Baggio^{2,3} · Matthias Fuchs¹ 

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Abstract Over the past years, attention has been given to the relevance of network studies as an analytical tool to assess essential features of a tourism destination. This work analyzes the network of Halland County, a tourism destination in South Sweden. The study aims at enhancing the body of knowledge and the comprehension of the structural characterization of the tourism network, deriving indications for policy makers and local stakeholders in order to improve the effectiveness and efficiency of the regional tourism system. Tourism stakeholders' websites were explored using hyperlink network analysis (Baggio in *Phys A* 379(2):727–734, 2007; Raisi et al. in *J Travel Res* <https://doi.org/10.1177/0047287517708256>, 2017). Findings highlight the need for strengthened industry ties and contribute to the industry-wide discussion on exploring network topology as a key source of knowledge for destination management and development, respectively.

Keywords Hyperlink network analysis · Multi destination region · Tourism websites · South Sweden

✉ Matthias Fuchs
matthias.fuchs@miun.se

Fanni Zoé Éber
fanni_zoe@hotmail.com

Rodolfo Baggio
rodolfo.baggio@unibocconi.it

¹ Department of Tourism Studies and Geography, Mid-Sweden University, Kunskapens Väg 1, 83125 Östersund, Sweden

² Bocconi University, Milan, Italy

³ National Research Tomsk Polytechnic University, Tomsk, Russia

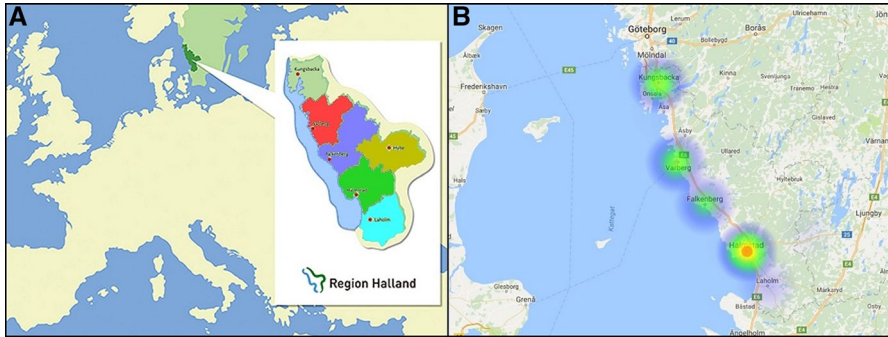


Fig. 1 The Halland County, Sweden, with its six tourism destination areas (a); and the distribution of tourist flows (b)

1 Introduction

The identification of a destination's network is particularly important for uncovering patterns of cooperation and collaboration in a destination. To this extent, a methodological approach that has gained attention in the last years is the analysis of the networks of connections between the stakeholders of a destination. While an increasing number of works has been devoted to the understating of the structural characterization of single destination areas, the networks of multiple areas have not yet been extensively explored (Baggio 2017; van der Zee and Vanneste 2015).

This work reports on preliminary findings from a network analysis conducted in a wider framework that aims at developing a strategy for the Halland County, a developing Swedish tourism region consisting of six destination areas. By doing so, the study contributes to the existing tourism network literature showing a case of multiple destination areas.

2 Materials and methods

Halland County (Fig. 1a) comprises six municipalities that stretch on the southwestern coast of Sweden over an area of about 5500 km² (roughly 1.2% of Sweden's total area). Outdoor recreational areas, camping and beaches are of great importance for the destination's economy. The area's diverse nature—attractive beaches, forests, and inland lakes—attracts a large number of visitors every year. In particular, the four rivers that cross the county are an important source for local fishing businesses, also devoted to sport fishing by both domestic and international tourists.

Over the last 10 years, the Halland County averages 2.5 million overnight stays (Statistics Sweden 2017), with a strong seasonality (i.e. seasonality index = 3.63, as the difference between the highest monthly value and the average annual value). A presence of domestic tourists is strongly predominant (87.8%). From the perspective of the tourism area lifecycle (Butler 2006a, b), Halland County is at an initial stage

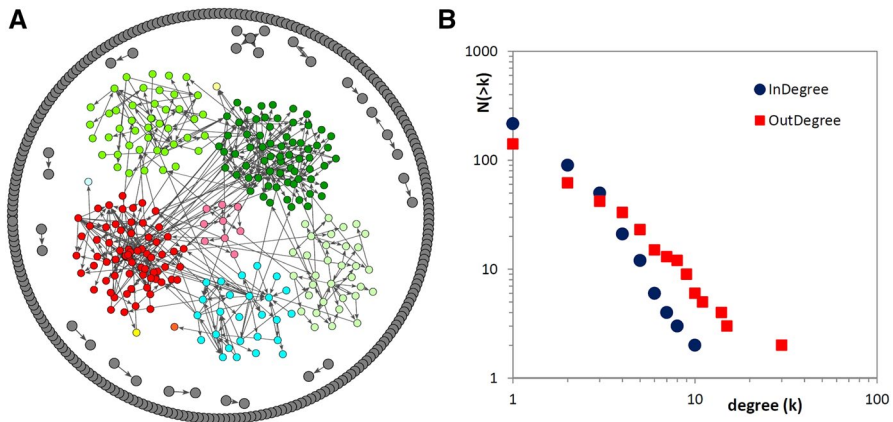


Fig. 2 The network graph of Halland County (a); and the cumulative degree distributions (b)

of tourism development. This stage is dominated by small and medium-sized businesses unevenly spread throughout the various municipalities (Fig. 1b).

As shown in previous studies (Park and Thelwall 2003; Baggio et al. 2010; Baggio and Del Chiappa 2014; Ying et al. 2016; Raisi et al. 2017), the hyperlinks of tourism organizations' websites are a good indicator for the configuration of the real-world relationships (links) between destination stakeholders. Thus, network data used in this work considers the websites belonging to tourism-related organizations and businesses in the Halland County as the elements (nodes) of the regional tourism network. The data file comprising all 738 tourism-related businesses and organization was obtained from the regional tourism authority, Halland Destination.

Although, compared to other similar studies, network size is relatively small (Ying et al. 2016; Raisi et al. 2017), it can be considered sufficient to analyze the topology of the underlying tourism network, thus, to provide meaningful empirical insights (Newman 2003). The analysis was conducted at three levels: macro (i.e. the global properties of the network), meso (i.e. the intermediate structure of the network), and micro (i.e. the characteristics of the most prominent actors). For their full definitions and further methodological discussions, the interested reader can consult the general network science literature (e.g. da Fontoura Costa et al. 2007; Baggio et al. 2010; Newman 2003, 2010). All results reported here are normalized (i.e. bound within $[0, 1]$) for easier interpretation.

2.1 The macroscopic network structure

After manually examining 3505 hyperlinks, the regional tourism network consists of 535 websites of tourism-related organizations (nodes) and 406 links. The (directed) network graph of the Halland County is visualized in Fig. 2a. Its network density is extremely low (0.0014), indicating a very sparse network, with a substantial proportion of isolated nodes: 52.1%. This sparseness is further confirmed by the small value of the average clustering coefficient, an indicator of local density (0.006).

Likewise, the global efficiency, defined as the capacity to transfer information across the network, is very low (0.0029). Furthermore, the assortativity coefficient (i.e. the correlation between an node's degree and those of its neighbors) is -0.052 , indicating a slightly negative tendency for an actor to connect to others with low degrees. Both, clustering and assortativity coefficients show a poor inclination to form collaborative and cooperative groups (Baggio 2007; Raisi et al. 2017). Moreover, these metrics (mainly assortativity) indicate a low resilience of the system (Newman 2002; Noldus and Van Mieghem 2015). In line with Butler's (Butler 2006a, b) tourism area lifecycle framework, this situation can be interpreted as a natural consequence of an early stage of destination's development that has not yet built a solid network structure among tourism stakeholders.

Similar to previous studies (Baggio and Del Chiappa 2014; Ying et al. 2016; Raisi et al. 2017), the degree distributions (in-degree and out-degree) follow a power-law with exponents: in-degree = 3.50 ± 0.58 and out-degree = 1.96 ± 0.34 (Fig. 2b). The marked difference in the two values indicates a greater dispersion and tendency to connect different actors, while receiving fewer and well-concentrated links (da Fontoura Costa et al. 2007). Similarly, this empirical finding can be interpreted as an indication of first attempts at establishing strong structural ties among regional tourism stakeholders at an early stage of the tourism area lifecycle (Butler 2006a). In any case, the power-law patterns are signaling a high concentration of links, with a few elements (nodes) of the network controlling, de facto, the entire regional tourism system. Again, this can be seen as a symptom of early stages of tourism development (Butler 2006b).

The topological structure of the World Wide Web has been studied by many researchers. The bow-tie structure model, first proposed by Broder et al. (2000), shows that a general WWW network displays six components:

- SCC: strongly connected components; the central core, "all of whose pages can reach one another along directed links" (Broder et al. 2000, p. 310).
- IN: web pages that are connected to SCC, but unreachable from SCC, as these sites are yet undiscovered in the network.
- OUT: web pages accessible from SCC, but do not link back to it.
- TUBES: web pages linking to IN or OUT pages without crossing SCC.
- TENDRILS: pages that can be reached from, or can reach IN and OUT, but have no links to SCC.
- DCC: disconnected components.

The main rationale for conducting a bow-tie analysis for a hyperlink network analysis purpose is to provide a clearer view of the tourism network connectivity as a whole (Raisi et al. 2017). As the results in Fig. 3 and Table 1 indicate, the largest component is disconnected components (DCC), followed by TENDRILLS, while the number of web pages related to strongly connected components (SCC), IN, and TUBES, is extremely small.

To conclude, there are numerous outside-oriented relationships within this destination network, which is clear evidence for the relatively low level of cooperation and collaboration between local tourism businesses. The bow tie structure analysis

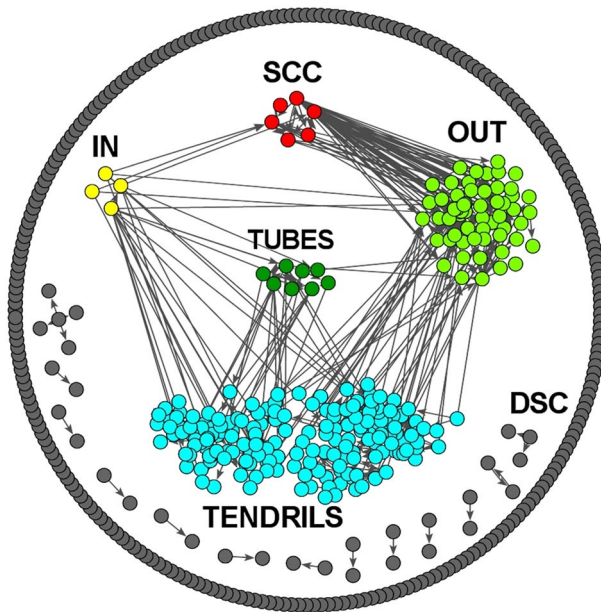


Fig. 3 The Bow-tie graph of Halland County

Table 1 Bow-tie components

Components	Node #	%
SCC	6	1.12
IN	4	0.75
OUT	59	11.03
TUBES	8	1.50
TENDRILS	179	33.45
DSC	279	52.15

clearly shows the components' tendency to connect out from the core components. The above analysis of the in-, and out-degree distribution (Fig. 2b) provided further evidence to this phenomenon: the out-degree shows a lower exponent than the in-degree, which is an additional indication of network members' tendency to refer to other members out of the region, rather than within the local or regional network, respectively (da Fontoura Costa et al. 2007).

2.2 The mesoscopic network structure

Figure 2a also shows an interesting characteristic of the network's mesoscopic structure. A relatively small central connected component (47.8%) made of well-defined clusters (communities) that reflect the municipalities of the County (colors are by

municipality). The modularity index Q , measuring the extent to which this subnetwork is divided into communities is $Q=0.739$.¹ At a first sight, this seems to be in contradiction with the idea of poor collaborative attitudes. However, if we consider the whole regional network and normalize this value to the number of communities and by also taking into account the fraction of disconnected nodes, we obtain a significantly lower value, $Q=0.167$, thus, reconfirming our previous deductions. It is important, again, to notice that at this early stage of the tourism area lifecycle (Butler 2006a), a combined destination is practically non-existent, although, initial seeds can be identified.

2.3 The microscopic network structure

Finally, on a microscopic level, we highlighted the most influential nodes in the network. As in Sainaghi and Baggio (2014), we considered an ‘importance index’, defined as the geometric mean of the various (i.e. normalized) centrality metrics, such as degree, eigenvector, clustering coefficient, betweenness and closeness (da Fontoura Costa et al. 2007). Interestingly enough, organizations involved in cultural and sporting activities are dominating the ranking (Table 2). This is a promising element for the prosperity and future development of this destination area, as these particular tourism and leisure activities are strongly bound to the features of this Swedish region, thus, are of high importance for developing and strengthening the destination brand (Chekalina et al. 2014, 2018).

3 Concluding remarks

The analyzed virtual tourism network of Halland County, Sweden, shows structural characteristics relatively similar to those of previous destination network studies (Baggio 2017; Raisi et al. 2017; van der Zee and Vanneste 2015; Ying et al. 2016). However, its topology seems rather sparse. In this particular case, the inspection of a composite destination highlights the early stage of its development, as only initial attempts to form inter-municipality connections are empirically identified (Butler 2006a). Thus, beyond valuable insights regarding most influential and important destination stakeholders, the proposed network analysis approach provides a good indication for policy makers in suggesting to create a sounder cooperative environment (McDonald 2009; Eagle et al. 2010; Feldman 2014; Baggio et al. 2016). The latter includes all of the destination areas, thus, strengthening the possibility to prosper in a balanced way, thereby creatively exploiting the combined attractiveness of the natural and cultural resources available (Gibson et al. 2005; Loorbach 2010; Fuchs and Baggio 2017). Being a preliminary analysis, and a first step of a wider and deeper study, this work is obviously limited mainly in that it needs further confirmations and cross-validation. The latter will come from a series of inquiries

¹ $Q = 1$ would mean completely separated groups (da Fontoura Costa et al. 2007).

Table 2 Top 30 most influential organizations ranked by importance index

Rank	Imp. index	Name	Type	Municipality
1	0.031	Berte Museum	Museum	Falkenberg
2	0.031	Atelje Grimsten	Tourist services	Falkenberg
3	0.025	Uggjarps Camping	Camping site	Falkenberg
4	0.023	Skogaby Golf	Golf club	Laholm
5	0.023	Thai Royal	Restaurant	Falkenberg
6	0.022	Gekåsbyn Ullared	Camping site	Falkenberg
7	0.022	Vallåsen Fritidsanläggning	Ski facilities	Laholm
8	0.022	Falkeergs Kommun	Museum	Falkenberg
9	0.021	Halmstad Äventyrland	Museum	Halmstad
10	0.020	Falkenergs Fotbollsförening	Sport club	Falkenberg
11	0.019	Äppelgården Café and Atelje	Restaurant	Falkenberg
12	0.018	Hotell Halland	Hotel	Kungsbacka
13	0.018	Tiraholms Fisk	Restaurant	Hylte
14	0.018	Hylte Kommun	Sport facilities	Hylte
15	0.017	Stiftelsen Tjolöhom	Restaurant	Kungsbacka
16	0.017	Hotell Hovgård	Hotel	Halmstad
17	0.016	Ringnäs Golf	Golf club	Halmstad
18	0.016	Grand Hotell I Falkenberg	Hotel	Falkenberg
19	0.015	Orbit Outdoors	Hostels	Halmstad
20	0.014	Vabergs Kommun	Recreation facilities	Varberg
21	0.013	Swedcamp and Hertings Bad Kontor	Hotel	Falkenberg
22	0.013	Torups Gästgivarengård	Hotel	Hylte
23	0.011	Falkenbergs Motorklubb	Sport club	Falkenberg
24	0.009	Laholms Vandrarhem	Hostels	Laholm
25	0.009	Grötviks Segelsällskap	Sport club	Halmstad
26	0.009	Halmstad Gold Arena	Sport facilities	Halmstad
27	0.008	Avgång Halmstad	Travel agency	Halmstad
28	0.008	Aktiebolaget Haverdals Golf	Golf club	Halmstad
29	0.008	Bryggcaféet Götvik	Restaurant	Halmstad
30	0.005	Relax Fishing	Sport facilities	Laholm

covering both, the quantitative and qualitative aspects of the problem, and can, ultimately, lead to a sound strategic development plan for the Halland County and other destinations.

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