Analysing Linkage between ICT and US State Tourism Websites

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Destination websites have been an important component in the online travel ecosystem since the beginning of the commercial Internet, and their adoption and use of ICT websites to serve their online marketing goals reflects their overall strategy and ability to adapt to the ever-changing environment. The purpose of this study is to examine 1) what types of ICT websites are hyperlinked to destination websites, and 2) how the linkages to ICT websites have evolved along with the significant technological developments during the last two decades. To that end we analysed archival hyperlink data for state tourism website in the United States. We find that the connectivity between US state tourism websites and ICT websites increased dramatically with the availability of social media and Web2.0 websites, and fragmentation of the network was reduced likely due to technology convergence. This study offers several research directions for understanding technology adoption by destination marketing organizations.

Key words: ICT; Internet; tourism websites; hyperlink analysis.

Introduction

Tourism destination websites have been an important component in the online travel ecosystem since the beginning of the commercial Internet and, over the years, have evolved into elaborate online representations of destinations (Buhalis & Law, 2008; Benckendorff, Xiang, & Sheldon, 2019). As the liaison between the supply and demand of tourism, destination websites employ and leverage cutting-edge technologies in order to effectively connect the tourism industry with their visitor markets (Yuan & Fesenmaier, 2003; Zach et al., 2010). While the success of these websites relies on a wide range of organizational and technological factors, destination marketing organizations (DMOs) extensively employ hyperlinks on their websites to a variety of external online resources for visitors (Morrison, Taylor, & Douglas, 2005). These outbound hyperlinks often point to attractions, lodging, transportation and similar travel relevant resources, forming a digital network of the local tourism industry (Baggio, Corigliano, & Tallinucci, 2007). In addition, they may also point to technological websites to offer different values to visitors (e.g., search) or to improve the effectiveness of the destination websites (Wang & Fesenmaier, 2006).

As ICTs continue to evolve, so does destination websites' strategy and ability to use and leverage ICTs to serve their online marketing goals. Destination websites often rely on websites we refer to as ICT websites. They include purely technical services such as a download pages for smartphone apps or codecs for sound or video, services that allow the posting of a virtual tourism brochure resembling flipping pages in a paper brochure, and embedded content from social media platforms. The purpose of this study is to examine 1)

what types of ICT websites are hyperlinked to destination websites, and 2) how the linkages to ICT websites have evolved along with the significant technological developments during the last two decades. To that end we analysed archival hyperlink data retrieved through Wayback Machine with monthly snapshots of the landing pages of each state tourism website in the United States since they were launched. We then catalogued the hyperlinks to ICT websites and described their changes over time in order to understand the use of ICTs on these tourism websites.

Research Background

Due to the continuous technological development and innovations on the Internet, the online tourism ecosystem has evolved to become more and more complex. Since its early commercialization in the early 1990s, the Internet has undergone several stages of development with significant improvements in supporting user experience of information search, navigation, interactivity, content creation, and social networking (Xiang et al., 2015). Owing to these developments, destination websites have transformed from the initial static websites, to dynamic ones built on the Web2.0 framework with the capabilities to incorporate user-generated contents to today's smartphone-enabled portals with increased support for the use of client-site scripts.

Given the significant role of destination websites in the online tourism ecosystem, there has been extensive research focusing on a variety of issues. For example, destination websites have been seen as a bundle of functions that primarily serve the goal of communications between the tourism industry and the travel market (Lee & Gretzel, 2012). Because of this, destination websites may have considerable impact on a range of behavioural aspects of travel such as the formation of destination image (Choi et al., 2007). Applying Roger's Theory of Innovation Diffusion (2010), destination websites have also been viewed as a reflection of DMOs' effort to adopt and use innovative Internet technologies in order to improve their capacity to adapt to a changing world (Yuan & Fesenmaier, 2003; Zach et al., 2010). Others (e.g., Baggio et al., 2007; Wang & Fesenmaier, 2006) have considered destination websites as not only information and communication services to travellers but also a way to build collaborative partnerships within the tourism industry and beyond.

While existing research has established the functional and strategic role of destination websites as a whole for the tourism industry, the linkages between them and the ICT industry are not well understood. What we do know is that hyperlinks allow us to understand how information flows through a destination (Raisi et al., 2017) and that the structures of the real and online destination co-evolve (Baggio & Del Chiappa, 2014). Given the significant developments and increasing complexity in the technological world in the last two decades, how destination websites use linkages to ICT websites in order to achieve their functional and strategic goals, and how these linkages have evolved over time, warrants further research.

Methodology

Data Collection and Sample

To map the linkages between tourism destination websites to technology websites and, specifically to learn if tourism destination websites leveraged the same technologies, it was necessary to gain access to a set of websites that compete in the same market space over several years. To that end we opted for the websites of US state tourism offices as they operate under similar market and political conditions, exchange development ideas at US tourism conventions, are exposed to similar technological developments and have websites written mostly in English. For all 50 states plus Washington DC we identified 106 URLs that spanned from 1996 to the end of 2018. Then, we used Wayback Machine (https://archive.org/web/) to download the landing page (aka home page) for each month that the Internet Archive had the websites in its repository. We then built 23 networks: one per year for the period 1996-2018 and evaluated the presence of the websites merging URLs belonging to same domains. In this process we classified also those belonging to state tourism organizations considering them as a unique digital ecosystem. The final list comprises 3,111 URLs. For all the domains with three or more appearances in the time frame considered, we identified 247 information technology websites (7.94%). Table 1 shows the distribution of technology websites across this sample. Next, we analysed the connections between state tourism ecosystems and technology domains.

Table 1: Frequency Distribution of Unique ICT domains

Segment	Examples	Frequency	Percentage
Internet Publishing and Broadcasting and Web Search Portals	yahoo.com, usa-800.com, vtlife.com, Google, emap.com, roadtrippers.com	112	45.3%
Custom Computer Programming Services	Macromedia, Adobe (Flash)	57	23.1%
Data Processing, Hosting, and Related Services	facebook.com, pinterest, linkedin, tumblr, vine, bit.ly, hugehosting	42	17.0%
Marketing Research and Public Opinion Polling	vovici.com, tourvey.com, milesmedia.com, destinationanalysts.com	20	8.1%
Marketing Consulting Services	addthis.com, glengroup.com, maddenmedia.com	8	3.2%
Software Publishers	Microsoft, Netscape	6	2.4%
Electronic Shopping and Mail-Order Houses	cafepress.com, celebratemaryland.com	2	0.9%

Data Analysis

For each year we extracted the subnetworks consisting of the state ecosystems and the ICT domains. In order to understand the patterns of formation of these networks we assessed the connectivity by identifying the disconnected components. To know the whole picture of connectivity we used a fragmentation index as defined by Borgatti (2006):

$$F = 1 - \frac{\sum_k s_k(s_k - 1)}{N(N - 1)}$$

where s_k = order of components (num.nodes); N=order of network (num nodes). F is naturally normalized, thus varying from 0 (no fragmentation, the network is entirely connected) to 1

(complete fragmentation, all nodes are isolated).

Findings

The resulting networks show a generally low density with an average over the years of 0.016±0.009. The number of hyperlinks to ICT websites (Figure 1) increased slightly in the late 1990s, but then remained nearly steady until the mid-2000s.
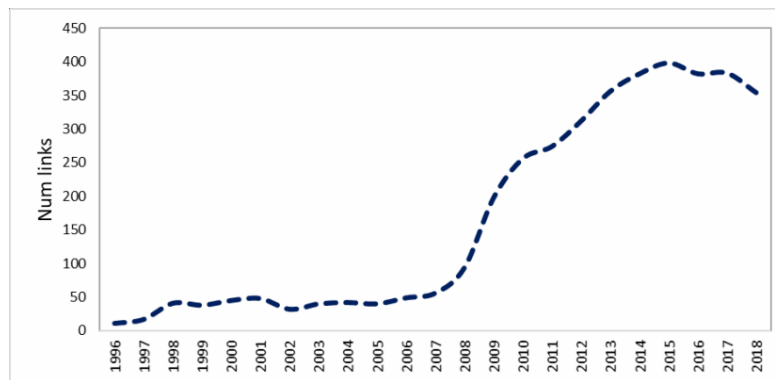

Figure 1: Number of hyperlinks (1996-2018)

There was only a decrease to ICT around from 2001 to 2002 from 48 to 33 (31.3% drop) when the US economy slipped into a recession following the tech bubble burst and several IT companies faltered. The number of hyperlinks to ICT websites increased in the mid-2000s and nearly doubled from 58 in 2007 to 101 in 2008 (42.6% increase). This was likely triggered by a confluence of two events: first, social media and Web2.0 websites came to prominence in the mid-2000s. Second, with the beginning of the Great Recession in 2008 the budgets of many US state tourism offices were cut dramatically; for example, the Commonwealth of Pennsylvania reduced its tourism budget from US$ 16.9 million in 2008 to US$ 5.2 million in 2010 (69.2% decrease) (Pennsylvania Office of Budget, 2019). These budget cuts required state tourism offices to do the same work – or more – with less, resulting in the increased use of various social media tools to spread the word at little to no cost. Following a peak of 417 hyperlinks in 2015 there was a decrease to 369 in 2018.

The overall connectivity is represented in the fragmentation index shown in Figure 2. The initial index score of 0.8 and higher until 2007 tell us that most US state tourism websites were not connected with each other – either directly or indirectly via ICT websites. However, starting with the increased linkage to social media and Web2.0 websites starting in 2007 the fragmentation index drops from .825 to .470 in 2008 and .285 in 2009 and bottoms out at 0.016 in 2011 when essentially all US state tourism websites were connected with each other via ICT.
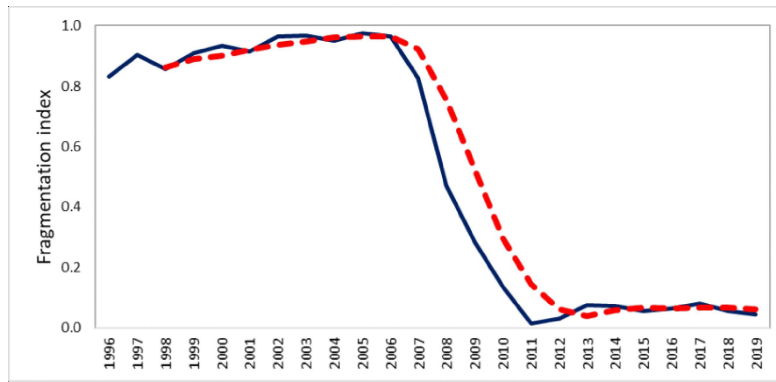
Figure 2: Fragmentation index (dotted line is a 3-years moving average)

This dramatic increase in connectivity may stem from Winner-Take-All effects in networks. First, this conjecture is well in line with the idea of a preferential attachment mechanism in the growth of networks (Barabási, 2016), that - as shown in Figure 3 - contains a cumulative degree distribution for the networks of the last few years of the data (2013-2018). For the most part (degrees > 10) the distribution is consistent with a power-law $N(k) \sim k_{-\alpha}$ with $\alpha=3.23\pm0.16$, which is a typical signature of a preferential attachment mechanism (Barabási, 2016). Second, several of the ICT websites are social media and social networking websites that gain attractiveness the more users connect use the platform versus many users using different platforms. Indeed, eight of the top 10 ICT websites acting as hubs between state tourism websites are social media and social networking websites (see Table 2). Since 2011, however, it appears that some US state tourism websites dropped their hyperlinks with some providers resulting in a slight decrease in overall connectivity.
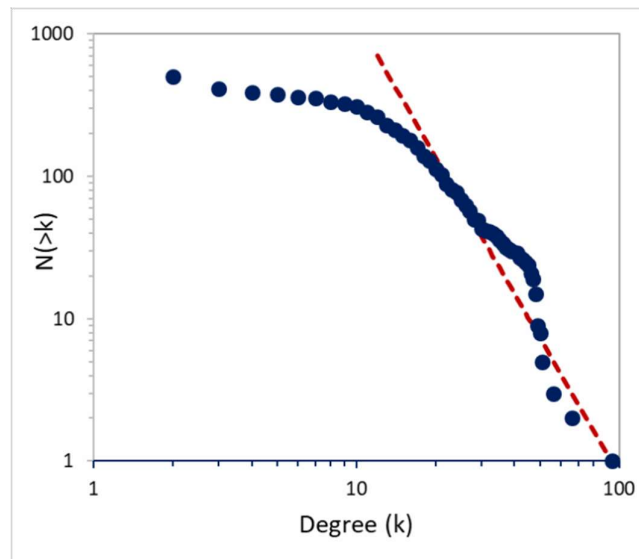

**Figure 3: Cumulative degree distribution for the networks of 2013-2018
(dotted line is a power-law with exponent $\alpha=3.2$).**

Table 2: Top 10 2013-2018 ICT websites (ranked by degree centrality)

Rank	Website	Rank	Website

1	twitter.com	6	google.com
2	facebook.com	7	flickr.com
3	youtube.com	8	tripadvisor.com
4	pinterest.com	9	apple.com
5	instagram.com	10	foursquare.com

Conclusions

The first few years of online marketing by US state tourism offices suggest that the technologies utilized to create website visitor experiences varied considerably. During later stages, triggered by the prominence of social media websites, state tourism websites became more connected as they started to utilize the same technologies, thus linking more and more to the same ICT websites. While the use of the same technologies does not suggest similar website content, we learn that the potential experiences state tourism websites created became not only more and more similar, but also that they became more familiar to website visitors as technologies embedded in one website behave similarly on other websites and – if need be – can require the same clicks to extract information about a state.

From a technology use point of view, we learn that state tourism websites since the start of the economic downturn of 2008 embraced a multitude of ICT websites of which several were common to several state tourism websites. Despite the decrease in hyperlinks in the past few years, the small increase in the fragmentation could be triggered by either consolidation among ICT providers or shutdown of some services (e.g. vine.com) in general, or a tourism marketing specific preference for some technologies and services, resulting in the discontinuation of usage of other technologies and services.

While the increase and decrease of hyperlinks to ICT websites in Figure 1 looks like an innovation adoption curve, it is not possible to make this claim as several technologies are bundled together. However, future research could investigate the appearance of specific ICT technologies (e.g. programming languages) to assess how well tourism websites keep pace with technological development. Another opportunity to fully understand state tourism websites in their completeness is to assess not only outbound hyperlinks, but also website content.

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