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Empirical Research Article

Can We Identify Trip Purpose from a Clickstream Data?

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Abstract

Destination marketing organizations (DMOs) utilize the official website for marketing and promotional purposes, while tourists often navigate through the official website to gather necessary information for their upcoming trips. With the advancement of business analytics, DMOs may need to exploit the clickstream data generated through their official website to develop more suitable and persuasive strategic marketing and promotional activities. As such, the primary objective of the current study is to show whether clickstream data can successfully identify the trip purposes of a particular user. Using a latent class analysis and multinomial logistic regression, this study found the meaningful and statistically significant variations in webpage visits among different trip purpose groups (e.g., weekend getaways, day-trippers, and other purposes). The findings of this study would provide a foundation for more data-centric destination marketing and management practice.

Keywords

destination management organization; website; clickstream; business analytics; destination marketing; trip purpose

1. Introduction

With the recently advanced information technology (IT), business analytics allows destinations and marketers to develop innovative solutions for their existing marketing and management practices. The location of mobile phones and social media posts with the geotag can be used for a better understanding of tourists' physical movement and their experience, which in turn, eventually connect to the performance of the tourism destination (e.g., Kim & Fesenmaier, 2015; Stienmetz & Fesenmaier, 2015, 2019). Such advanced business analytics allow Destination management organizations (DMOs) and tourism marketers to better understand their existing and potential customers, thereby developing a more effective marketing strategy.

In reality, DMOs and tourism marketers often collect all the different aspects of their customers almost in real-time (Fuchs et al., 2014; Höpken et al., 2011). Among these data, online website clickstream data is readily available to almost all DMOs as the official website is one of the most popular channels for marketing purpose (Choi et al., 2007; Yuan et al., 2006). However, DMOs monitor the usage of their official website to merely assess the performance of the official website (Önder & Berbekova, 2021).

Notably, the clickstream data (e.g., website usage patterns) downloaded from the official website would provide more meaningful implications for destination marketing practices. For example, online searching behaviors (e.g., searching patterns) are closely connected to their preference in the e-commerce context (Joachims et al., 2005). Thus, online searching patterns of tourists could reflect preference and purpose of travel concerning their upcoming trip. Therefore, this study investigates whether we can predict the purpose of a trip based on searching patterns derived from the official website. The findings from this study would help DMOs, and tourism marketers understand a better way of designing their official websites to attract more travelers and improve the effectiveness of their marketing and promotional strategies via a more personalized targeting strategy. Also, it will be a foundation for a more data-centric destination marketing and management practice by applying business analytics and multiple data sources altogether.

2. Literature Review

2.1 Business Analytics in Destination Marketing

Business analytics has been developed tremendously over the past few years. Such developments allow marketers to understand what is happening at the moment and predict the unknown results with very high accuracy using the collected data (Davenport, 2014; Mayer-Schonberger & Cukier, 2013). Indeed, Uber, Airbnb, Amazon, and many other tech-heavy companies in the 'data economy' compete with others using various data and analytics (LaValle et al., 2011). These proactive and even prescriptive analytics require extensive data collection and analytic techniques but ultimately help understand the markets and proactively develop an effective marketing strategy. Therefore, advanced business analytics certainly help DMOs better understand their customers more efficiently, which ultimately serves their customers better and improves the performance of a destination (Pike & Page, 2014).

Nonetheless, DMOs often face enormous challenges as technology continues to evolve; and they are often unable to adapt all newer advanced analytic techniques (e.g., Fesenmaier & Xiang, 2014; Gretzel et al., 2006). This study would emphasize the need

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to develop the capacity to more effectively exploit collected data for DMOs and marketers, which gives them a better understanding of their current and future customers. By doing so, the collected data, both with and without any specific purposes, offers many opportunities for destination marketers to develop a much better picture of visitor behaviors and business processes within the destination (Fuchs et al., 2014; Höpken et al., 2011). Moreover, smart tourism and its development certainly require smart destination governance. It needs to be an organization that effectively learns external situations, introduces liquidity into the smart ecosystem, and stewards (Gretzel, 2022). As such, DMOs should revisit their current approaches and strategies and then improve their marketing and management procedures by adapting the smart tourism paradigm.

2.2 DMOs' Official Website as a Data Source

Many DMOs offer their official website to the potential tourists by providing necessary information for trip planning – i.e., transportation, restaurant, accommodation, activities, and other information (Choi et al., 2007; Yuan et al., 2006; Zach et al., 2010). The use of DMO's website has been evolving in many ways. First, DMOs utilize the official website to promote the destination as an information channel and recommend unique tourism/hospitality services as an effective recommender system (Choi et al., 2007; Park & Kim, 2017). Second, the DMO's website can create a certain level of expectations and a mental image of the destination for tourists before they come (e.g., Govers et al., 2007). Third, the DMO's website influences both tourists' decision-making and behavior in the trip planning stage and the entire travel experience.

These developments in recent years necessitate DMOs to wisely collect and exploit the collected data, which helps DMOs develop an effective and powerful marketing and management strategy. To better understand tourists' preferences and potential behaviors, DMOs need to develop the capacities or abilities to learn from the empirical evidence and data such as clickstream data, social media data, or any other datasets they collected for their purposes. Indeed, DMOs often attempt to track current or potential tourists' usage of the official website by adopting various web analytics tools like google analytics. By doing so, DMOs can identify how to improve the efficiency of their websites by identifying the number of tourists or the number of links clicked and improve the attractiveness of tourism destinations (Önder & Berbekova, 2021). In line with Önder and Berbekova (2021)'s study, earlier studies in the tourism and hospitality industry evaluated DMOs' official website and optimized the official website (e.g., Plaza, 2011). Besides, several studies (i.e., Gunter & Önder, 2016; Yang et al., 2014) attempted to forecast tourists' demand using the data from official websites.

However, the current study argues that web analytics does not merely calculate the number of website visitors or the way of navigating the website. This argument, indeed, strongly emphasizes the vital role of re-purposing the existing or pre-collected data in potentially improving the efficiency of DMOs' marketing and management strategies. Re-purposing the existing data means in the current study that DMOs could facilitate utilizing the existing data (i.e., website clickstream data), which was initially collected for website evaluation and monitoring but now would utilize for the marketing and promotional purposes. By combining with other datasets (i.e., the same dataset for other time points, different datasets), the collected data could provide meaningful insights regarding the potential behaviors of residents and tourists while traveling at the destination. Thus, this study would exemplify whether the clickstream data from the official DMOs' website (i.e., the existing data) can help DMOs better understand tourists' trip purposes without any further information (i.e., different purposes than the original purposes of data collection).

2.3 Clickstream Data in Tourism Studies

Considering the popularity of the DMO's website as a promotion tool, earlier studies have been conducted to analyze the clickstream data generated from the DMO's website (i.e., website users' navigation) in two main areas: 1) the actual usage or the performance of the DMO's official website (e.g., Choi et al., 2007; Li & Wang, 2010; Park & Kim, 2017); and 2) the evaluation of the DMO's official website by users (e.g., Kim & Fesenmaier, 2008; Luna-Nevarez & Hyman, 2012; Stienmetz et al., 2013). Both perspectives allow DMOs and marketers to understand the current performance of online marketing strategies (i.e., official website). In practice, at the same time, many DMOs have recently adopted Google Analytics or similar tools to capture the performance of their website (e.g., Plaza, 2011). These tools are free tools to measure the effectiveness of the online website; however, they do not allow DMOs and marketers to fully control the data, which hinders the possibility of more in-depth analysis for the latter purpose. Nonetheless, these studies and practices may de-emphasize travelers' online website usage on their future behaviors (i.e., which information/pages make travelers visit the destination).

With this in mind, this study would argue that understanding the predictability of the website usage patterns would be highly beneficial for DMOs to provide a better information service and design proper information channel management. Indeed, by recognizing an in-depth knowledge about travelers' online behaviors while using the website, DMOs can develop a more human-centric approach (or tourists-centric approach) for the website and a better recommender system (e.g., Gretzel, 2011). This study would analyze online clickstream data to predict their purpose, which will be the foundation for tourists' information needs and subsequent behaviors at the destination. Many studies in e-commerce, tourism, and computer science have confirmed that online clickstream data can accurately predict implicit preferences for future behaviors and even actual behaviors (Bucklin & Sismeiro, 2003; Joachims et al., 2005; Van den Poel & Buckinx, 2005). Such analyses help DMOs proactively identify the optimal marketing strategies for their current and potential markets.

3. Methodology

3.1 Data Collection

This study used existing data collected to analyze the effectiveness and the performance of DMO's website. The destination is located in the Mid-West of the United States and is a typical Midwestern tourist destination that provides various natural and cultural attractions. As this study aims to predict the purpose of the trip based on the clickstream data from the official DMO's website, this study required using two different datasets – i.e., online clickstream data and pop-up survey data. The clickstream data collected using a Piwik contained website visitors' usage of official DMOs' websites. Pop-up survey data included trip characteristics collected from website users of the same official website. The pop-up survey was a voluntary online survey from those who spent more than 30 seconds on any website page. Respondents were asked to indicate their website behaviors (e.g., type of information sought on the website, satisfaction, intention to revisit the website, overall evaluation), travel behaviors (e.g., whether they visit, intention to travel), and demographic information. The reason behind collecting two different datasets was that the first one (e.g., clickstream data) could potentially show how to search for the necessary information via the official website. However, it did not explicitly explain the purpose of the trip itself. Thus, the current study attempted to collect a separate dataset that could reflect the purpose of the trip and combine two different datasets to demonstrate whether the clickstream data (i.e., the use of the

official website) can predict the purpose of the trip (i.e., the preference of trip activities).

3.2 Data Analysis

To achieve the goal of this study, this study first connected two datasets for further analyses. The matching process was one of the essential tasks in the current study. Since two different datasets are used in the current study, the accuracy of matching the datasets directly connects to the accuracy of the results. It is worth noting here that the collecting process of the two datasets was independent, which does not have any sole index variable. Thus, the current study utilized website id, user's IP address, and website/survey access date in both datasets. After matching two datasets, this study evaluated the quality of data integration (e.g., matching two datasets based on available information) before analyzing the data. This study confirmed that relatively low degree of non-matching bias in both datasets (approx. 5 percent for the Pop-Up survey and 2 percent for the online clickstream data) but adjusted this potential systematic bias using the weighting process between matched and unmatched samples. As a result, 2,214 survey responses and corresponding clickstream data were used for further analysis.

The current study utilized two different data analysis techniques – i.e., latent class analysis (LCA) and multinomial logistic regression. This study uses LCA to cluster respondents into fewer groups representing the unique trip purpose groups. LCA derives the unobserved latent clusters based upon the responded trip purposes mutually exclusive and exhaustive (Lanza et al., 2007). In this study, rather than having 11 different trip purpose groups, fewer trip purpose groups were identified using LCA. Then, multinomial logistic regression was applied to identify whether the use of DMOs' official website (i.e., clickstream data) could help to identify one's trip purpose category collected via a pop-up survey and LCA method.

4. Findings

4.1 Segmenting Respondents Based on Trip Purposes

Respondents were asked to indicate all their trip purposes among 11 different motives. The most popular trip purpose was weekend getaway (2-3 days; 30.4%), followed by day trip (23.6%), vacation (4 days or more; 17.7%). Indeed, the rest of the trip purposes (i.e., passing through, VFR, business, sports tournaments, group tour, reunion, attending festivals, and others) were relatively less popular for this region. The complexities of the 11 trip purposes used in this study necessitated reducing the potential groups into a smaller number of groups.

Table 1 shows the model fit indices for six LCA models (i.e., from 1 class model to 6 class model). The three classes model showed the best fit – i.e., the lowest value of BIC, and cAIC. As expected, two distinct groups were those who visited for a weekend getaway (group 2; 13.9%) and who visited for a day trip (group 3; 10.6%). Then, the rest of the samples emerged as one group (group 1; 75.6%). Indeed, a weekend getaway group and a day trip group could show different travel patterns as both have particular trip lengths and situations. Therefore, this study continues with three groups for further analyses.

Table 1. Results of latent class analysis

Model	log-likelihood	Residual df	BIC	aBIC	cAIC
1 class	-3598.66	2036	7282.05	7247.10	7293.05
2 classes	-3492.25	2024	7161.66	7088.59	7184.66
3 classes	-3431.22	2012	7132.02	7020.82	7167.02
4 classes	-3400.41	2000	7162.84	7013.51	7209.84
5 classes	-3388.81	1988	7232.07	7044.62	7291.07
6 classes	-3382.16	1976	7311.19	7085.62	7382.19

Note: aBIC: adjusted BIC, cAIC: the Consistent Akaike Information Criterion.

4.2 Relationships Between Searching Pattern and Trip Purpose

This study then used multinomial logistic regression analysis to assess the relative influence of several variables collected from website behaviors in differentiating the identified two distinct trip purpose segments compared to the other group (Group 1). This study includes additional information (e.g., device used, seasons, referred site, residence, and visit year) to control any potential bias while predicting trip purpose based on webpage visit patterns. The goodness-of-fit measures indicate a satisfactory model fit (Chi-square value = 2097.452, $p < 0.036$), and Nagelkerke R^2 was 6.1%. Further, the model can predict correctly 75.6% of the respondents.

The parameter estimates for each group are reported in Table 2. This study found few notable characteristics of two trip purpose groups in webpage visits compared to other purpose group (a reference group). For example, people who would visit the destination for weekend getaway purpose more likely visit the webpage showing accommodation (β =0.063, $p < 0.001$, $exp^{0.063}$=1.065), restaurant (β=0.046, $p < 0.05$, $exp^{0.046}$=1.047), shopping (β=0.049, $p < 0.01$, $exp^{0.049}$=1.050), and guidebook-related pages (β=0.091, $p < 0.05$, $exp^{0.091}$=1.095) but less likely for transportation (β=-0.716, $p < 0.05$, $exp^{-0.716}$=0.489). On the other hand, day-tripper would less likely visit the accommodation page (β=-0.093, $p < 0.01$, $exp^{0.093}$=0.911) but more likely visit the travel stories page (β=0.295, $p < 0.05$, $exp^{0.295}$=1.343). These results indicate that webpage visit patterns could be a good indicator to identify their future trip purpose. For example, accommodation-related information could be important for the weekend getaway group but not for the day trip group. Other tourism aspects (e.g., restaurant, shopping, transportation, and guidebook) are also for the weekend getaway group. Lastly, among control variables, temporal variables (e.g., season and visit year) and residence showed some effect while predicting their trip purpose groups.

5. Discussion and Implications

This study aims to demonstrate whether DMOs can repurpose the previously collected data for general purposes (or even without any specific purpose) to improve the efficiency of DMOs' operations. This study investigates the relationship between online searching patterns and the purpose of the trip based on the online clickstream data collected from the official DMO website. These results emphasize the possibility of identifying the 'hidden value' of the previously collected data when it comes to being combined with other existing data and advanced data analytics.

The results of the current study would have several theoretical and managerial implications. First, this study would benefit destination marketers and researchers by showing the clear connection among information searching behaviors (precisely, website information), information needs, and the trip purpose. Following Joachims et al.'s (2005) line of logic, the findings from this study confirmed that information searching patterns could predict the preference of online website users accurately. This study provides a foundation for destination marketing and management systems by showing the usability of existing data. Indeed, DMOs monitor the traffic of their official website to monitor the use of the website and evaluate the performance of the website (Önder & Berbekova, 2021). However, the current study's findings showed empirical evidence exemplifying the value of the clickstream data for marketing purposes.

Second, the results of this study identified a few information topics closely connected with future behavioral intentions. More specifically, those who visited particular topics (e.g., shopping, restaurant) while browsing the official website in the trip planning stage would be more likely to visit the destination for their weekend getaway.

Table 2. Regression results

Reference Category:		Weekend Getaway Group			Daytrip Group		
Other Groups		**B**	**S.E.**	**Sig.**	**B**	**S.E.**	**Sig.**
Intercept		-1.410	0.141	***	-1.789	0.156	***
Webpage	Accommodation	0.063	0.016	***	-0.093	0.035	**
Category	Things to do	0.012	0.015		0.012	0.016	
	Restaurant	0.046	0.023	*	-0.001	0.037	
	Map	-0.065	0.127		-0.125	0.139	
	Shopping	0.049	0.019	**	0.015	0.028	
	Transportation	-0.716	0.284	*	-0.175	0.255	
	Guidebook	0.091	0.045	*	0.042	0.057	
	Travel stories	-0.027	0.196		0.295	0.146	*
Device Used	Desktop	0.202	0.239		-0.261	0.273	
	Portable	0.179	0.242		-0.093	0.272	
Season	Jun. – Aug.	0.448	0.112	***	0.271	0.118	*
Ref: Jan. – May*	Sep. – Dec.	0.364	0.135	**	0.287	0.138	*
Residence	Instate	-0.313	0.131	*	-0.137	0.144	
Ref: Adjstate*	Outstate	-0.267	0.138		-0.363	0.158	*
Referred Site	Direct Entry	-0.492	0.347		-0.324	0.194	
Ref: Others*	Search Engines	-0.231	0.132		-0.142	0.135	
	Other websites	0.179	0.127		0.038	0.134	
Year	Year 2015	-0.827	0.294	**	-0.858	0.392	*
Ref: Year 2017*	Year 2016	-0.681	0.218	**	0.086	0.263	

Note: * p < 0.05, ** p < 0.01, *** p < 0.001. Ref: Reference group, Adjstate: Adjacent state

Such information can be used to design a specially tailored content design for target groups – e.g., coupons and promotions. Besides, a new way of recommending possible activities to potential tourists could increase the conversion rate of DMO's website via the increased awareness of possible tourism activities within the destination and improved destination attractiveness. Third, the data analytic approach used in this study would help tourism scholars to understand the benefits of merging multiple datasets while analyzing the data depending on the purpose of the study. In particular, DMOs could collect various datasets and merge them into a single dataset for further data analysis. For example, DMOs can get essential insights by combing their visitor survey, geographical information, traffic information (e.g., airline information, train information), official statistics from governments, or industrial reports.

However, this study has several limitations for guiding further studies. First, this study does not compare the performance of multiple analytic methods, which neglects the possibility of missing the best prediction model. Future studies can use diverse advanced research methods (e.g., machine learning algorithms) to improve the predictive power of the developed model. Second, this study included only one destination and thus suffered from the problem of generalization issues. To alleviate this issue, we may need to replicate the current study in different places to validate and generalize these findings. Third, this study does not consider several characteristics of clickstream data (e.g., the sequence of webpage visits, the length of each page visit, or other information). Future studies could further explore those characteristics and different methodological approaches to predict tourists' behaviors.

Declaration of competing interests

The author declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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