

## Revealing the Structure of the Canadian Tourism Market: an Analysis based on Geographic Information Systems (GIS)

Shuyue Huang  
*Mount Saint Vincent University*

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**Revealing the Structure of the Canadian Tourism Market:  
an Analysis based on Geographic Information Systems (GIS)**

**Abstract**

Tourism has become a significant component of the economy in Atlantic Canada, especially in Prince Edward Island (PEI). This study sheds light on the Canadian domestic tourism market by using geographic information systems (GIS) to analyze travel data collected from PEI. This study aims to (1) visualizing tourism demand: place of origin, and the amount of expenditure, and (2) examining the geographical distribution of tourist behavioral intention. The dataset contained 1,556 respondents who have had taken at least one overnight pleasure trip to PEI in 2016. ArcGIS 10.4 and SPSS 24.0 were employed for data analysis. Three maps were generated, including (1) a map displaying the location and distribution of current visitors across Canada, (2) a map showing the market segment based on each visitor's average spending, and (3) a map delineating the customer post-consumption experience. Theoretical contributions and managerial implications were further discussed.

**Keywords:** Atlantic Canada, tourism market, Geographic Information Systems, place of origin, travel patterns

## **Introduction**

In Atlantic Canada, tourism has become a significant component of the economy, supporting 9,600 enterprises, employing 57,000 residents and generating up to \$5 billion annually to its Gross Domestic Product (GDP) (Atlantic Canada Opportunities Agency, 2017). As one of the six geographical regions that cover all of Canada, Atlantic Canada includes the provinces of Prince Edward Island, Nova Scotia, New Brunswick, Newfoundland, and Labrador on the Atlantic coastline, among which, Prince Edward Island (PEI) markets its most attractions through mountains, beaches, scenery, and local culinary products. PEI attracts about 1.56 million visitors and more than 1,025 thousand overnight stays in 2017 (Prince Edward Island, 2018). Also, estimated tourism spending by both residents and non-residents reached \$447 million in 2017 (Prince Edward Island, 2018). The analysis of tourist data is of great importance in maintaining the competitiveness of PEI in the domestic market, as well as contributing to the growth of gross domestic product (GDP). One of such analyses is the spatial visitor distribution in the current market, as geography is considered as one of the most critical factors in tourism marketing (Lew & Duval, 2008). Thus, this study sheds light on the Canadian domestic tourism market by using geographic information systems (GIS) to analyze travel data collected from PEI, Atlantic Canada. The present study uses a case study to provide empirical evidence to answer the following question: How can destination management organizations (DMOs) use GIS in mapping the geographical distribution of tourists' demand and travel patterns?

First defined in the 1960s, the term Geographic information systems (GIS) has gained significant attention from and been employed by a wide range of disciplines, including environmental science, urban planning, infrastructure siting, business, management, and also tourism. Specifically, GIS has diverse uses in the modern tourism industry in areas such as site selection, tourism planning, management, and marketing. In tourism marketing, it is suggested that GIS can be an effective tool in defining market areas, developing customer profiles, and exploiting a greater understanding of current and potential visitors (Miller, 2008; Supak, Devine, Brothers, Rozier Rich, & Shen, 2014). GIS enables an easy view of customer data by visualizing the spatial distribution of visitors' place of origin and travel patterns (Chancellor & Cole, 2008). The geographical map shows the specific regions and towns where tourism marketers can focus on and develop collaborations with local tourism organizations.

This study aims to achieve several research goals: (1) visualizing tourism demand: place of origin, and the amount of expenditure, and (2) examining the geographical distribution of tourists' behavioral intention (recommendation and revisit intentions). Worth noting that instead of developing spatial visitor distribution based on provinces and territories, this study adopted the economic regions as defined by Statistics Canada, each economic region is "a grouping of complete census divisions (CDs), with one exception in Ontario, created as a standard geographic unit for analysis of regional economic activity" (Statistics Canada, 2016). This modification enables a more detailed presentation of the current market, which enables a more efficient and effective marketing campaign. The study result helps to identify visitors of high value through the spatial distribution, the amount of money spent, and post-consumption experience.

## **Literature Review**

Geographic information systems (GIS)

GIS is widely acknowledged for its abilities to electronically capture, store, manipulate, analyze, and display geodata. It handles both geographical and attribute data and allows decision-makers to view, explore, and visualize data in the format of maps and tables. Specifically, the basic graphical units in GIS contain points, lines, polygons, and raster, which can individually be used to represent different attributes on the surface. For instance, the point can be used to represent a specific attraction or an individual customer, as long as the latitude and longitude coordinates are attached. Despite its original focus on natural resources and environmental management in the 1980s, it has been adopted in a wide range of fields, including tourism starting from the 1990s (Bahaire & Elliott-White, 1999; Eshun, & Owusu, Owusu, & Amankwaa, 2015).

#### Application of GIS in tourism marketing

With regard to its spatial analysis ability, GIS can be applied in both the supply and demand sides in tourism marketing analysis, for instance, identifying the touristic attractions, facilities, and service provider information in the supply side (Lau & McKercher, 2006; Zhang, Wong, & Lai, 2018), and discovering and visualizing the current and potential markets (Al qeed, Bazazo, Hasonah, & Al qaid, 2010; Chancellor & Cole, 2008), and determining the spatial-temporal behavior patterns (Feng & Morrison, 2002; Huang & Wu, 2012) in the demand side. Furthermore, after mapping the concentration of the existing customers, DMOs and tourism companies can further develop more specific marketing strategies using direct mail program or billboards to make the promotional tools more effective (Miller, 2008). Based on the assumption that customers with similar socio-demographic backgrounds reside in the same vicinity, marketers can even extend its promotion to the entire community.

Traditionally, the marketing application of GIS was built on the theories of marketing segmentation, niche, and geodemography (Musyoka, Mutyaulyu, Kiema, Karanja, & Siriba, 2007). Elliott-White and Finn (1997) were among the first attempts to explore the potential applications of GIS in tourism marketing; they highlight the significance of GIS in geodemographic market analysis. Even though the demographic segment is considered as one of the popular segment approaches, while adding the spatial component (e.g., postcode, address) of customer data, GIS allows business marketers to develop a more detailed result to support micro-marketing strategy. This change also makes the traditional geographic segment more appealing (Oppermann, 1997).

Last but not least, GIS also enables a better understanding of tourism demand by using visitor expenditure data (Lundie, Dwyer, & Forsyth, 2007). It is not uncommon to ask visitors to estimate their spending on destination and utilize this data for market analysis. Besides, the levels of customer expenditure can also be used for market segmentation (Spotts & Mahoney, 1991). For instance, Regan and Damonte (1999) use a geoeconomic approach and identify the high spending segment for South Carolina NASCAR markets. However, their study did not further examine the population characteristics of this high-value group.

## **Methodology**

### Data collection

The data was collected by a government-funded tourism research center in PEI, Canada. This institute conducts annual surveys using their online panel of 20,000 respondents who have traveled to or asked for tourism information from PEI. The survey collected both attribute data, like

information on attitudes, expenditures, behaviors, and socio-demography of potential and experienced customers, and geographical data such as postal code.

The survey was distributed via email in early 2017, with a result of more than 3,700 participants from North America. By reducing the scope to domestic tourism in Canada, the final dataset contained 1,556 respondents who had taken at least one overnight pleasure trip to PEI in 2016.

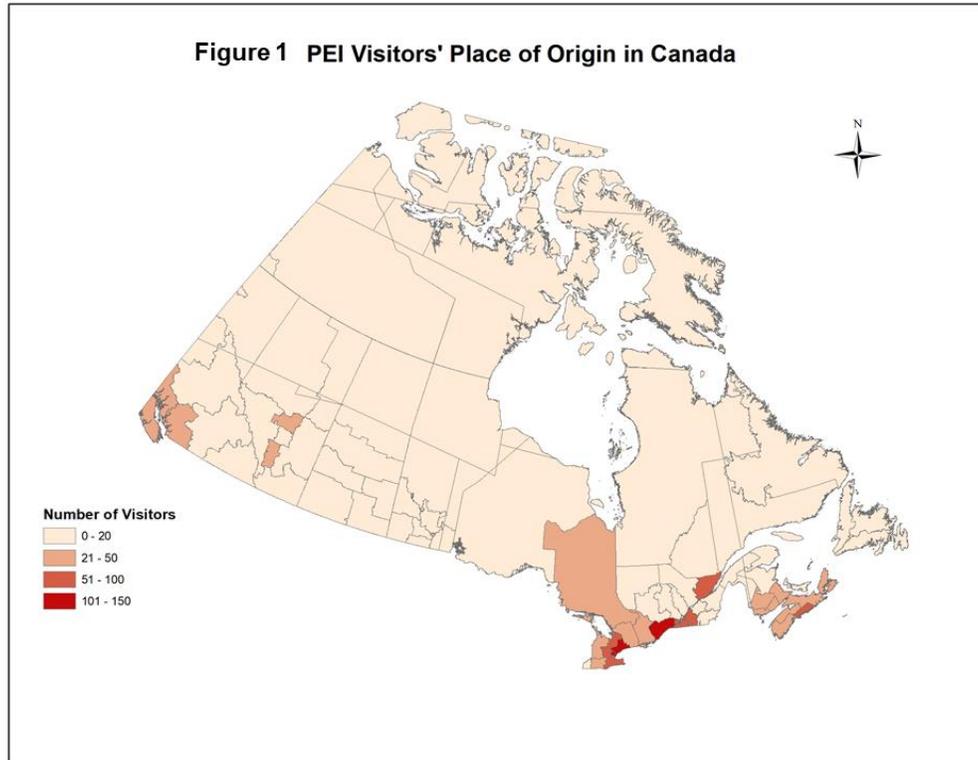
#### Data analysis

Four digital maps were generated to allow visual analysis. The first map displayed visitors' place of origin. The second map showed the average spending of each respondent. Next, two maps were generated to indicate the geographical difference in visitors' recommendation and revisit intentions. Environmental Systems Research Institute's (ESRI) ArcGIS 10.4 and SPSS 24.0 were employed for data analysis. This analysis demonstrates the critical role of GIS in supporting tourism marketing decisions. Respondents' geodata were related to the ESRI geocoded zip code database. This step matched addresses against the ESRI databases and then assigned latitude and longitude coordinates to different visitors. Therefore, different attributes can be spatially presented on the base map.

### **Results**

#### Geographical distribution of the overnight visitors to PEI

Study results showed the origins of overnight tourists visiting PEI. Some of the key spots can be identified according to the density of the customers (see figure 1). The top ten economic regions with the most visitors were Toronto, Ottawa, Hamilton--Niagara Peninsula, Kitchener--Waterloo--Barrie, Halifax, Montérégie, Montréal, Capitale-Nationale, Saint John--St. Stephen, and Moncton--Richibucto (in descending order). The geographical distribution indicates economic regions where tourism planners and DMOs should prioritize the marketing resources and efforts. Necessary arrangements for these potential tourists can be further examined based on their background information.



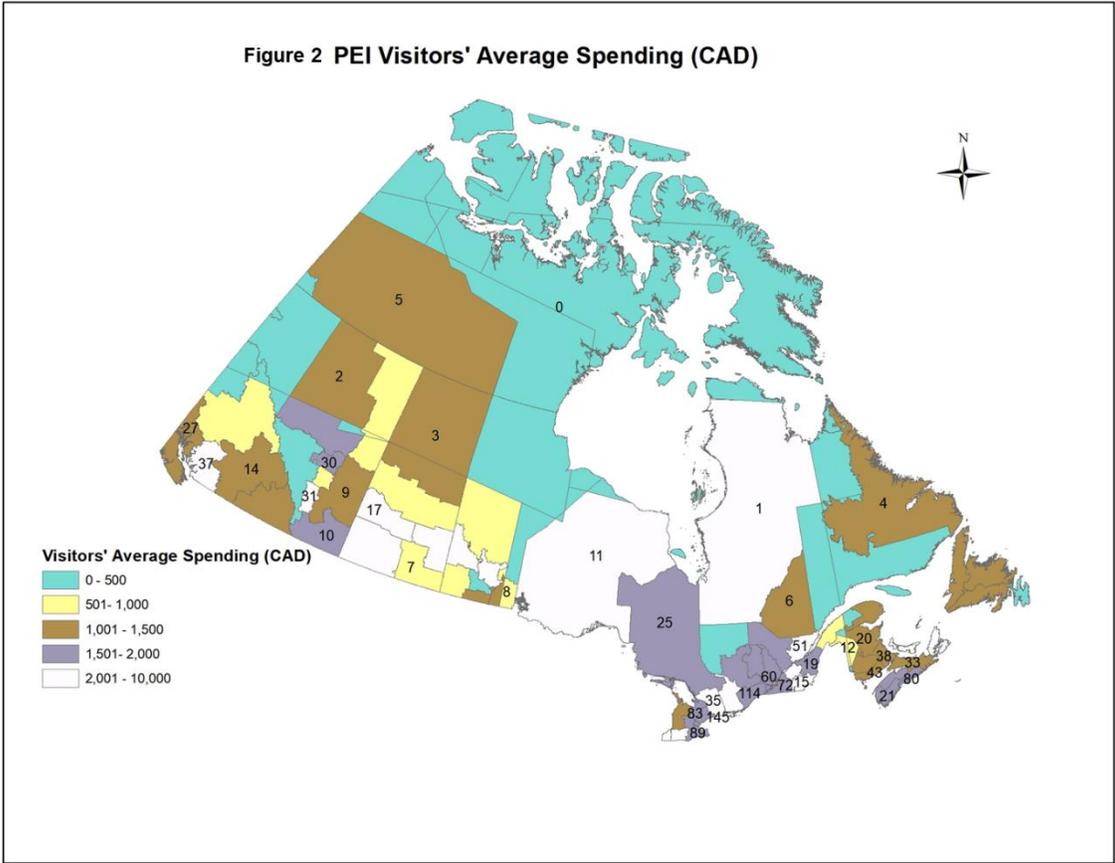
### Geographical distribution of the average tourism spending across Canada

The above map does not reflect the economic features of the market. Therefore, by using the average spending of each visitor, a second map was developed. The total amount of money spent by visitors ranged from \$2 to over \$18,000 per person, with an average of \$ 686/per visitor. As shown in Figure 2, visitors were segmented into five groups according to their average spending. The levels of customer expenditures were presented by different colors. Several micro-geographic neighborhoods with the highest spending (the white color regions) were found using geographic analysis.

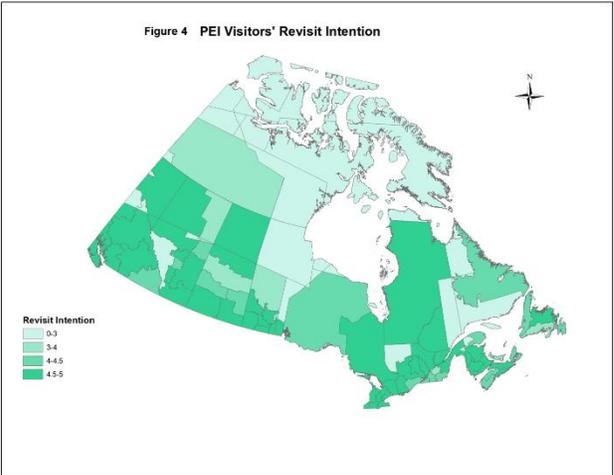
To further predict the average amount of spending of each visitor, a general linear model was used to consider the effect of age and income. This study tested both the main effect and interaction effect of these two factors, and results indicate a significant relationship: age ( $p < 0.05$ ), income ( $p < 0.00$ ), and age\*income ( $p < 0.05$ ).

### Geographical distribution of visitors' behavioral intention across Canada

Figure 3 shows the probability of visitors' intention to recommend PEI to others using a scale of 1 (very low) to 5 (very high). Specifically, respondents were asked, "If I had a chance to share my trip experience to PEI with others, the probability that I would recommend PEI to my friends or family." Figure 4 shows the likelihood of visitors' revisit intention using a scale of 1 (very low) to 5 (very high). Differences between the economic regions provide insights for marketing strategies.



Note: The north end of Nunavut was not showed in the map, due to the fact that there are no visitors from the north Nunavut.



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**Conclusion and Discussion**

It is suggested that individuals can absorb a large amount of information much quickly and easily if displayed in maps. This paper has shown how GIS combined with visitor data can be utilized in

mapping and tourism market analysis. Four maps were generated based on the customer data collected by PEI, including:

- A map displaying the location and distribution of visitors across Canada
- A map showing the market segment based on each visitor's average spending
- And two maps delineating the visitors' behavioral intention (recommendation and revisit intentions).

These maps provide a clear indication of potential marketing areas that DMOs can explore. They offer insights better to understand the relationship between potential sites and the destination.

### Theoretical contributions

This paper contributes to the literature in the field of tourism marketing (Eshun et al., 2015) and tourism information services (Li, Hu, Huang, & Duan, 2017). Despite the powerful ability in analyzing and display spatial data in the tourism industry (e.g., Huang & Wu, 2012; Muñoz, Hausner, Brown, Runge, & Fauchald, 2019), the application of GIS in tourism marketing is not widely implemented due to issues like the high cost of the software, and unfamiliarity. In other words, there are inadequate studies showing examples of how to utilize GIS when dealing with tourist data from official sources. This study thus contributes to increasing the awareness of GIS in tourism marketing and presents potential opportunities in market analysis. Also, this study contributes to a better understanding of visitors' heterogeneous characteristics at the geographic micro-level.

Furthermore, this study adds value to the geodemographic segmentation approach (Webber, Butler, & Phillips, 2015), which is a multi-attribute segmentation that combines components of geographic, demographic, and psychographic variables for a comprehensive analysis. It is noted that market segmentation aims to group customers with similar characteristics to ensure they are most likely to respond to the same market stimuli (Lin, You, Lau, & Demir, 2019). Generally, four types of variables that can be used for the market segment, including geographical, demographic, psychological, and behavioral factors. In this study, the author considered the expenditure and geographical data in market segmentation. In the future, more variables like age, income, gender, marital status, and educational background could be added in clustering visitors.

### Managerial implications

The capability of GIS in analyzing and visualizing customer data is critical for tourism marketers. It yields more powerful insights when exploring the diversity of the tourism market. However, the application of GIS in tourism marketing and how destination marketing organizations can utilize GIS is still underexplored. The study results are of great importance to DMOs as it highlights potential regions for marketing.

Some of the key questions DMOs have long been interested in include where visitors are from, how long visitors are staying, and how much money they would like to spend on destination. Even though the data on visitors' origins and socio-economic characteristics are collected, visualization can help to provide more information to understand the demand side of the tourism markets. Several managerial implications can be derived for tourism planning and evaluating marketing strategy. For instance, using the market segment of tourist average spending,

marketing programs can be launched in areas with the highest spending. Besides, user records can be combined with the geodata for loyalty program development. Also, regions with low expenditure need further examination; studies can be conducted to understand the obstacles of low economic value. These visitors could be targeted for exploitation by implementing innovative programs (e.g., lower-priced programs) to trigger their interests in staying longer or increase their expenditure in PEI.

#### Limitation and future studies

This study used cross-sectional data to explore the structure of the Atlantic Canadian domestic tourism market. Future research can further investigate the longitudinal data to explore how visitors' place of origin has changed over time and extend the scope to Canadian domestic tourism market. Meanwhile, this study mainly focuses on geographical distribution from the demand side. Future research can shed light on the application of GIS from the supply side, examples like the distribution of main attractions, and the interaction between attractions and visitors. Also, more studies can be conducted to explore the global distribution of international visitors to PEI. Last but not least, to increase the awareness of GIS in tourism practices, stakeholders from DMOs, tourism enterprises, and industrial associations can collaborate to develop learning modules based on empirical data, and further integrate it into the curriculum of tourism education (Chen, 2007).

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