

Teenagers' Destination Website Navigation. A Comparison Among Eye-Tracking, Web Analytics, and Self-declared Investigation

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Abstract. The aim of this study is to verify if teenagers' actual navigation through webpages match with their self-declared preferences (in terms of tourist attractions), and if these preferences are in line with the official DMO data about most viewed pages. Particularly, self-declared attractions are confronted with the contents visualized during navigation, thus making possible to understand to what extent the exposure to certain themes influence preferences towards certain attractions. Results from this comparison suggest that contents that teenagers pay attention to during navigation are not always what they declare to prefer as tourist attraction.

In a second stage, a comparison with the official DMO data showing the most viewed pages is carried out in order to verify if there are any commonalities in terms of preferred attractions. Results show commonalities in terms of preferences: outdoor/sports and events/concerts are the preferred themes across all sources. But results also show discrepancies. In fact, at the same time, according to each type of approach used, the ranking of preferred themes changes. Therefore, results suggests that a multi-source approach helps to eliminate possible biases that may occur if only one approach is adopted.

Keywords: Website navigation · Eye-tracking · Online behaviour · Teenagers · Web-analytics · DMO

1 Introduction

Eye-tracking, intended as the technique that allows understanding where a person is looking (Nielsen and Pernice 2010) is becoming a relevant source of information not only for usability studies, but also for investigating online consumer behaviour (Gidlöf et al. 2013; Venkatraman et al. 2014). Understanding the online consumer behaviour of its own costumers is also crucial for a Destination Management Organization (DMO), in particular for understanding preferences of prospective tourists who might use online sources (e.g. official website) to get information and inspiration on their next travel. DMOs generally study log files, and online behaviour happened on their own website (s) thought web analytics data (Yang et al. 2014), and several managerial decisions

might be based on such source of data; for example: from a decision to improve a specific section of the website as a result that majority of people visited it, till a consideration to repute a specific tourism attraction as more relevant as majority of people mainly viewed a page dedicated to it. Nevertheless, offline market research and other source of information are generally used to integrate such decisions, however relying only on web analytics data might limit the interpretation of the online behaviour. Moreover, relying only on traditional method such as a user test based on pre-post questionnaire with self-reported perceptions on a website content/structure, might limit the interpretation of the data and might contain biases (Marchiori and Cantoni 2015).

Therefore, this study proposes a new approach to triangulate three sources of information: eye-tracking, web analytics, and self-declared investigation, with the objective to better understand the relevance of using a multi-source approach on online consumer behavior investigation. The official website of a Swiss destination at the border with Italy is used as case study, and a specific segment is analyzed. The segment under investigation is a group of teenagers living in an Italian city at the border with Switzerland. This specific segment allowed to identify if there is (or not) particular tourism attractions which attract them the most, and which type of elements of the pages generally capture their attention.

Understanding teenagers' online preferences (Gidlöf et al. 2012; Loranger and Nielsen 2013; Kaplan 2013) is still a sensitive segment for the difficulties to have access to teenagers (e.g. need of a consent form signed by their parents or legal representatives), and for their velocity to adapt to new trends and preferences. However, a DMO might find relevant to understand if this specific segment presents specific preferences, and in turn, might decide to create a dedicated section, and/or web navigation apt for them, and/or provide/improve specific services offline. Therefore, this study wants to contribute to the body of knowledge on the use of a multi-source approach to investigate tourism-related online consumer behavior, and at the same time, providing new evidences on teenagers' online consumer behavior when it comes to navigate an official DMO website.

As an introduction to this work, the concept of eye tracking, its application to the tourism industry, and the online behaviour the teenager segment are introduced. The research design and discussion of the results are then presented. Contributions of this study and future research are finally discuss in the conclusions.

2 Literature Review

2.1 Eye-Tracking Technique and Tourism

With the term "eye-tracking" is intended a technique that allows understanding where a person is looking, more precisely to measure the movements of the eyes with respect to the head (Nielsen and Pernice 2010). The concept of eye tracking evolved over time, from the first techniques based on direct observations on eye movements till the most recent ones based on modern eye-trackers hardware and software. Nowadays, thanks to technological advances, the eye tracking technique has been applied in various fields,

and particularly has been proved to be a very effective tool specifically in psychology and marketing to gain a deeper understanding of users' behaviour (Gidlöf et al. 2013; Venkatraman et al. 2014). In recent years, eye-tracking has been also applied to investigate the online consumer behaviour in the tourism and hospitality domain. For example, the eye-tracking technique has been used in the hospitality sector to investigate the online decision-making process of potential clients (Noone and Robson 2014). Another study focused the attention on people's perception of tourism-related images according to ethnicity (Wang and Sparks 2014). Eye-tracking research has been carried out in the field of social media and tourism as well. Taking as a reference point previous studies applying an eye-tracking approach to social media (Wan Adnan et al. 2013), this branch of research has attempted to analyse what are the digital aspects that attract users the most while are navigating on tourism-related social media pages (Marchiori and Cantoni 2015). Moreover, other studies used the eye-tracking technique to analyse advertising effectiveness on tourism-related blogs, social networks and reviews portals (Méndez 2015).

2.2 Teenagers' Online Behaviour

One of the main studies carried out on the teenager segment has been developed by Gidlöf et al. (2012), analysing the exposure of Swedish teenagers to online advertising. Particularly, the study found out that out of all the potential online advertisings to which teenagers were exposed, only the 10 percent of it was actually seen, revealing great resistance to this type of advertising. The research also found that teenagers' visual attention is significantly influenced by the size and position of the online advertisement, whether the gender of the users appeared to have not influence. A study by Khan and Locatis (1998) about information retrieval on the Internet, found that when it comes to prioritize tasks, experienced high school students are more efficient than novices, even though their success rate in search process is less higher. In line with these results, Lazonder et al. (2000) observed that experienced high school students can locate websites (in terms of online navigation) better than inexperienced ones, but at the same time, results show that experienced students are not better at browsing in websites to find information. A more recent article by Kaplan (2013) analysing online purchasing behaviour of teenagers, pointed out that this particular segment has short attentions spans towards online advertisement. However, an effective way to gain their attention is to adopt a concise and transparent messaging style. Loranger and Nielsen (2013) analysed the online behaviour of teenagers and their performance in achieving tasks. Their study underlined that despite feeling confident while navigating online, teenagers have a lower success rate (71%) in accomplishing tasks compared to adults (83%). That is, teenagers tend to leave a task uncompleted quite fast if they are not able to find what was desired, showing a lower level of patience and cautious compared to adults. Moreover, the study discovered that teenagers have the highest success rate in e-commerce websites, while have more difficulties on dealing with government and non-profit ones. The study also proved that teens don't like to read a lot on webpages, and prefer contents that are presented visually, entertaining, and quick to be loaded online.

3 Methodology

For the present study, an ad-hoc eye-tracking experiment was design and performed. The case study selected for the experiment was the official website of Regional Destination Management Organization located in the South of Switzerland. The group of teenagers' object of the experiment were instead from a border city located in the North of Italy. A total of 23 participants aged between 17–19 years recruited on a voluntary basis took part to the test. Participants have been recruited from a high school of an Italian city located in the North of Italy, a neighbouring region of the Swiss destination under study. A consent form signed by the parents of the students have been required in order to involve them in the test.

3.1 Setting of the Experiment

The setting of the test was structured as follows: each participant was invited to sit in front of a PC, equipped with the Tobii X2-60 hardware mounted below the PC screen. Once the eye calibration process was completed, the test started. The test was based on a user free navigation of the official destination website of Canton Ticino, the Italian-speaking region in Southern Switzerland on the border with Italy (www.ticino.ch). The navigation time for each participant was fixed to five minutes, after which the test automatically ended. Each participant was also asked to complete a pre-post questionnaire, aimed to investigate teenagers' self-reported preferences on the aspects viewed during their website navigation. This study reports the results for a specific question that asked which attractions of the destination impressed them the most. The self-reported top attractions were then classified according to themes in order to obtain a map of what contents appeal participants the most. This classification was then compared with the themes that were visualized the most during the free navigation, which were instead resulted from the heat maps analysis emerged from the eye-tracking.

3.2 Eye-Tracking Data Analysis

The free navigation analysis was performed using Tobii Studio 3.4.5 software. Results from free navigation were studied analysing heat maps generated by the software, that is, coloured maps showing where participants fixated over each page. A single page might contains several areas coloured by the heat maps corresponding to different top fixation areas within that page as in Fig. 1. A total of 126 pages were viewed by the 23 participants (16 pages viewed in average per participant). Out of those 126 pages, 82 have been analysed. The pages not considered for the analysis were the ones that reported a loading error caused by a technical problem with the Tobii eye-tracker.

Specifically, the heat map analysis followed a four-step process:

- (1) *Selection of the pages to analysis from the official DMO website:* (web) pages considered for the analysis were selected according to the number of participants visiting each page. For example, the heat map related to the homepage has been



Fig. 1. Example of a page with heat-areas

ranked first, being visited by all the 23 participants, while the heat map for the page “Explore” has been visited by 10 participants, and ranked second, and so on. In order to be considered for the analysis, at least 2 people had to have seen a single page.

- (2) *Identification of the heat-areas within each web page:* heat maps for each page were analysed identifying heat areas where fixations were concentrated the most, namely those areas where the colours resulted more intense towards yellow/red.
- (3) *Content analysis of the topics corresponding to the heat-areas:* the specific topics over which colours were more intense were then content analysed by one coder and classified into themes. The analysis of the most viewed topics considered the number of participants who visualized each page (data provided by the Tobii software). For example, for a page visualized by 10 participants, there might be two heat-areas to be coded in order to define the topic of the elements viewed. If the element of the first heat-area (e.g. a picture) was about the topic “lake of Lugano”, it was considered visualized 10 times. Then, if in the same page the second heat-area (e.g. a text) was again about the topic “lake of Lugano”, this specific topic gained 10 more visualizations, bringing the total count to 20 views, meaning that the person was exposed twice to that specific topic.
- (4) *Ranking of most visualized themes:* the ranking of all the macro themes emerged by summing all the visualizations per specific topic. Macro-themes emerged after a saturation process, listing all the single topics and then assigning them to themes.

3.3 Comparison Among the Data Gathered from the Self-reported, Eye-Tracking, and Web Analytics Investigation

Results coming from the eye-tracking analysis (namely heat maps investigation) are confronted with the self-reported description of the top attractions mentioned by the

participants, allowing to verify any relation between what has been seen and what has been declared. Most visualized themes in free navigation and most cited self-declared attractions are then confronted with the official web analytics data provided by the DMO. In order to match with the segment investigated, the web analysis data have been filtered selecting the age (e.g. 18–24), and the same geographical area of the respondents. Then, the ranking of the most visualized pages according to the analytics is confronted with the most visualized themes and most cited attractions.

4 Results

4.1 Top Tourism Attractions Emerged from the Three Different Dataset

Self-declared top attractions: Among the 23 participants, 15 declared to have visited the destination to which they were exposed to. In the post-questionnaire, where participants were asked to declare their preferred attractions after the free navigation on the official DMO website, the most cited ones were falling in 14 macro-themes (see Fig. 2), namely: Sports/Outdoor Activities, Lugano and the Lake (8 attractions each), Events/Concerts, Beaches/pools (6 attractions each), Nature, Shopping, Lake Maggiore (4 attractions each), Nightlife, Attractions (3 attractions each), Locarno, Culture/Museums, Accommodation, Gastronomy (1 attraction each).

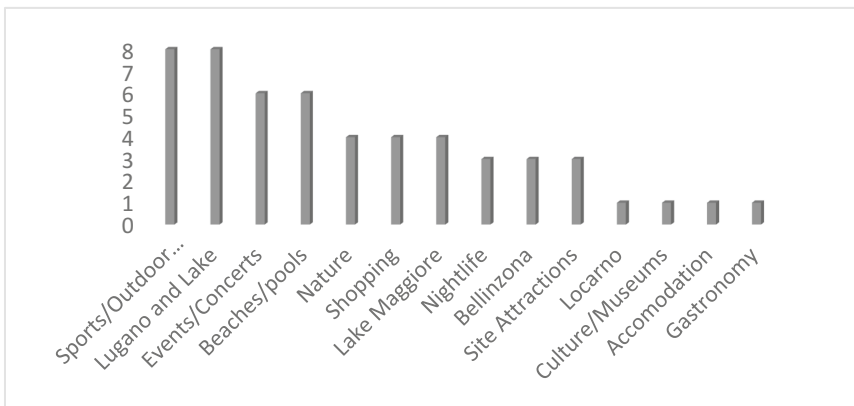


Fig. 2. Themes of most cited attractions

Most viewed contents (eye-tracking data analysis): The most visualized contents gathered from the heat-maps analysis resulted in the following 19 macro-themes (see Fig. 3), individuated thanks to heat-areas: Nature (100 visualizations), Sports/Outdoor Activities (47 vis.), Lugano and the Lake (39 vis.), Shopping (29 vis.), Site Attractions (28 vis.), Beaches/pools (27 vis.), Seasons (22 vis.), Nightlife (21 vis.), Culture/

Museums (vis.), Events/Concerts (18 vis.), Other (18 vis.), Gastronomy (15 vis.), Lake Maggiore (10 vis.), Locarno (10 vis.), Transports (9 vis.), Ascona (7 vis.), Accommodation (4 vis.), Mendrisiotto (3 vis.), Bellinzona (1 vis.).

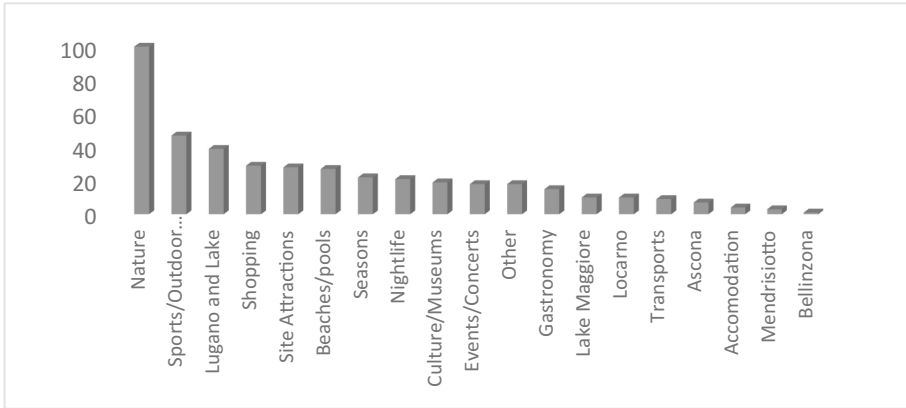


Fig. 3. Ranking of the most viewed contents

As part of the research, the same heat-areas were analyzed in terms of type of graphic elements. For the analysis, six types of graphic elements were considered: Picture, Picture with text, Text, Central text (that is, a main text –a title for example– presented at the centre of a page), Google maps tool, Google street view tool. The most viewed graphic elements resulted to be in order: Picture with text (no. 258), Text (86), Central text (66), Picture (54), Google maps tool (12), Google street view tool (5) (see Fig. 4).

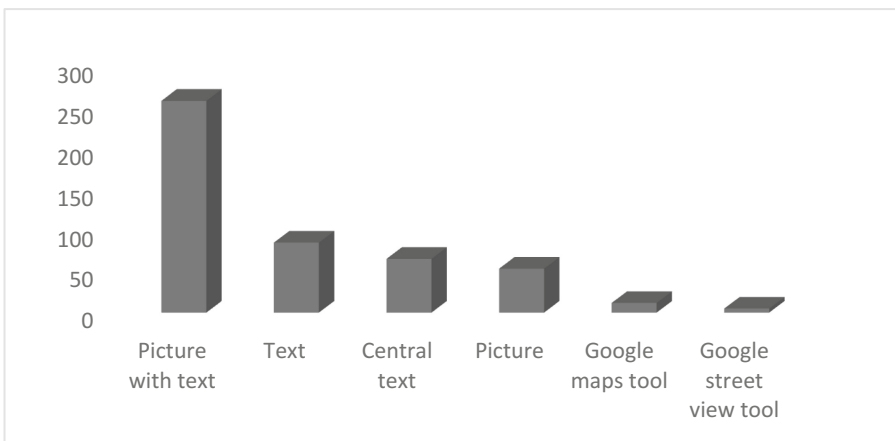


Fig. 4. Ranking of the most viewed graphic elements

Most Viewed Pages (DMO data): According to the Web Analytics data provided by the DMO under study, filtered about online sessions of users aged 18–24 coming from the same province of the Italian respondents area, the first 10 pages which received more sessions are showed in the following table (Table 1):

Table 1. Top 10 web pages of the official DMO website (filtered for the 18–24 segment, and a specific province)

ID web page	Content of the page	Sessions	Themes
Page 1	Homepage	906	Varies
Page 2	Weather forecast	891	Weather Forecast
Page 3	Tibetan bridge	532	Outdoor/sports
Page 4	Market of Como, Italy	496	Events
Page 5	Market of Como, Italy (German version)	399	Events
Page 6	Excursions	343	Outdoor/sports
Page 7	Excursion in Verzasca Valley	302	Outdoor/sports
Page 8	Market of Como, Italy	174	Events
Page 9	Sledging at Nara	159	Outdoor/sports
Page 10	Fair of San Martino	159	Events

4.2 A Comparison Between the Results Gathered from the Eye-Tracking Data vs Self-reported Attractions

From the eye-tracking analysis emerged that participants viewed mainly contents related to the theme “Nature” during their navigation (100 visualizations), while (see Table 2), after the free navigation participants reported mostly attractions related to the theme “Sports/Outdoor Activities”, and specifically “Lugano and the Lake” (8 cited attractions each, occupying the first place in the ranking of the most cited attractions).

Table 2. A comparison between the eye-tracking data vs self-reported attractions

Most cited attractions (Self-reported Attractions)	Most viewed contents (Eye-Tracking data)
Sports/Outdoor Activities 1st	Nature 1st
Lugano and Lake 1st	Sports/Outdoor Activities 2nd
Events/Concerts 2nd	Lugano and Lake 3d
Beaches/pools 2nd	Shopping 4th
Nature 3rd	Site Attractions 5th
Shopping 3rd	Beaches/pools 6th
Lake Maggiore 3rd	Seasons 7th
Nightlife 4th	Nightlife 8th
Site Attractions 4th	Culture/Museums 9th
Locarno 5 th	Events/Concerts 10th

The second most cited attraction was related to “Events/Concerts” and “Beaches and Pools” (6 attractions each). During navigation instead, contents related to this two themes were not ranked in a very high position in terms of visualized contents (respectively 27 and 18 contents, occupying 6th and 10th place in the ranking of most visualized contents).

At the third place in the ranking of the most cited attractions there are the ones related to the themes “Nature”, “Shopping” and “Lake Maggiore” (4 attractions each). As mentioned before, during navigation contents related to “Nature” were the most visualized (100 visualizations) while “Shopping” occupies a quite high position (29 visualizations, occupying 4th place), and “Lake Maggiore” a quite low one (only 10 contents visualized, occupying 13th place). In the fourth position among the most cited attractions there are the ones related to the themes “Nightlife” and “Site Attractions”. During navigation, contents related to “Nightlife” were visualized 21 times (occupying 8th position) while contents related to “Site Attractions” were visualized 28 times (occupying 5th position). All the other cited attractions were cited only once, all occupying the fifth position.

This result suggests that what participants looked at during navigation does not reflect exactly what they cited as preferred attraction. For example, even if participants viewed mainly contents related to nature, they cited more attractions related to sport/outdoor and to the destination Lugano. However, even if not in the first position, among the most viewed themes we find as well sport/outdoor (2nd place) and Lugano and the Lake (3rd place), meaning that in both rankings these themes are significant. Attractions related to events and concerts are also cited often, but find little correspondence with the number of visualizations (only 18), meaning that despite the little number of visualized contents, teenagers were impressed by this type of attractions. This is the same case for the beaches and pools, which in the ranking of the most cited attractions are second, but recorded a relatively low number of visualizations. Therefore, it is possible to argue that, as confirmed also by previous studies the eye-tracking technique represents a valid aid in identifying the most relevant contents within a page, but this does not automatically mean that what they look more is what they like the most.

Moreover, it is possible to sum up what appeared to be the most successful type of page layout for teenagers navigating a tourism related website. If we consider that the most viewed graphic elements are pictures with text, and the most viewed contents are related to “Nature”, we can state that this combination could be the one that appeals the most teenagers. Even though, it should be more precise to include the most cited attractions: “Sports/outdoor” and “Lugano and the Lake”. Including these data, the best possible layout should include pictures with text related to the themes “Nature”, “Sports/Outdoor” and “Lugano and the Lake”.

4.3 A Comparison Among Eye-Tracking, Web Analytics, and Self-declared Investigation

The following paragraph reports the results from a comparison among eye-tracking, web analytics, and self-declared investigation.

Table 3 reports the themes emerged from the top 10 web pages of the official DMO website (filtered for the 18–24 segment, and a specific province), and the top themes emerged from the eye-tracking and self-declared investigation.

Table 3. Summary table of most relevant themes across the three dataset

Most relevant themes for the teen segment	Self-reported (cited attractions)	Eye-tracking (viewed contents)	Web analytics (online sessions)
Sports/Outdoor activities	8	47	1336
Events/Concerts	6	18	1228

From the official DMO web statistics, the homepage is the page that receives the majority of sessions being the most popular page of the website. This is in line also with the results coming from the free navigation, where all participants visualized the homepage as all of them were forced to start from that page.

The second most viewed page according to the web analytics data, was the thematic page “weather forecasts”. This theme doesn’t appear in the ranking of most cited attractions and most visualized themes, and this probably due to the fact that weather conditions are normally checked only in the very short time before the visit to the destination, and don’t represent attractions themselves.

Interestingly, the web analytics data for the segment teen for a specific province of Italy, revealed that the third position is occupied by the “Tibetan Bridge” page (related to the theme of Outdoor/Sports). The sixth and seventh most popular pages are also related to the theme of Outdoor/Sports, namely the pages “Excursions” and “Excursion in Verzasca Valley”. Therefore, the sessions counted for the Outdoor/Sports theme are 1336. As reported in Table 3, the presence of these pages among the most popular ones is in line with what participants declared to appreciate as a favourite attraction, and as well as with what people looked at during navigation.

In fourth, fifth and eighth position in the ranking of the most popular pages we find pages related to the “market of Como”, which can be attributed to the theme “Events”. The ninth position is also occupied by a page related to the same theme, namely the page “Fair of San Martino”. Sessions for this theme reach a total of 1228. The theme “Events” is very popular in the self-declared attractions, although less in the ranking of most visualized themes during navigation.

Overall, it is possible to argue that there is a correspondence between some specific themes that people see during navigation, themes that people declare to be attracted by after navigation and themes belonging to the pages that received more sessions. Relating these results with the specific segment under study, it is possible to state that (Italian cross-border) teenagers visiting the destination website are attracted the most by sports/outdoor activities and events, which are the common top themes emerging from the three different sources.

5 Conclusions

The study compared the results from three different research approaches, namely: eye-tracking, web analytics, and self-declared investigation in order to gain an understanding of teenagers' preferences in terms of tourist attractions for a specific destination. The study identified two main types of preferred attractions themes: Sports/Outdoor Activities and Events/Concerts. These themes revealed to be the only ones appearing in the results of all the three approaches, while other themes were less or more relevant according to each research approach adopted. In fact, the study revealed certain correspondences in terms of preferred themes, but some results may seem contradictory. For example, even if participants mostly looked at themes related to the theme "nature", the majority of self-declared attractions belong to the theme "sports/outdoor", indicating that what users look at does not always reflect their preferences. This shows the importance of adopting a multi-source approach: if only one approach is used, possible biases may occur in identifying teenagers' online preferences. The research is not free from biases though. A major bias comes from the DMO data about online sessions. These data comes from teenagers of a specific city in Italy. Moreover, teenagers from other regions may have different preferences. Future research might consider to specify the nature of the online user, being it a local or a tourist. Furthermore, future research should also consider to enlarge the sample to other regions, and confront the results with other segment in order to better understand specific web navigation path.

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