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Greek Hotels' Web Traffic: A Comparative Study Based on Search Engine Optimization Techniques and Technologies

Konstantinos I. Roumeliotis, Nikolaos D. Tselikas * and Christos Tryfonopoulos

Department of Informatics and Telecommunications, University of Peloponnese, 22100 Tripoli, Greece; k.roumeliotis@uop.gr (K.I.R.); trifon@uop.gr (C.T.)
* Correspondence: ntsel@uop.gr; Tel.: +30-2710372216

Abstract: Currently, websites rely heavily on digital marketing, notably search engine optimization (SEO), for success. In the COVID-19 era, hotels have to employ every feasible means to stay afloat despite the bleak business and travel conditions. Many of them have already invested in digital marketing, especially SEO, by applying SEO techniques to their websites to attract more visitors and bookings. This research examines hotels' websites regarding the SEO techniques they have applied and their impact on web traffic to their websites. During a one-year observation period (February 2021–February 2022), we collected and analyzed web data from 309 top-listed Greek hotels using our own-developed software. By creating and following a specific methodology, we came to valuable conclusions. In addition, we used fuzzy cognitive mapping to develop an exploratory model. From the descriptive analysis and technical SEO perspective, we have concluded that hotels websites' traffic and, by extension, their long-term viability are inextricably intertwined. Existing and future SEO marketers may benefit from our research's time-accurate insights on hotel SEO tactics.

Keywords: search engine optimization; SEO techniques; SEO hotels; hotels' websites

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1. Introduction

Today, it is more important than ever to apply SEO techniques and technologies to websites, regardless of their industry. A website's survival in today's competitive online environment will require it to adapt to several new factors, including the increasing prevalence of the web, changing web search habits, the predominance of eCommerce and online bookings, increased competition, the importance of organic traffic as an unpaid form of advertisement, and changes to search engines algorithms.

A website's traffic could be increased in various ways. Organic search, social media, direct, referral, and paid traffic are the most important, according to Google Analytics [1,2]. Users who utilize search engines to locate what they are searching for (free of charge) are the organic traffic. Each keyword search returns a list of web pages that use the term in question [3]. Thus, its search engine rankings and organic visitors influence a website's traffic. Since ranking in organic results cannot be paid, a high organic search ranking is in most cases hard to achieve [1]. To rank highly in search engine results, a website must fulfill specific criteria—ranking factors defined in the rules that search engine owners frequently publish [2]. These factors influence the search rankings. Still, search engines do not reveal their ranking algorithms or provide information about the criteria employed in the order [4]. Several studies [5,6] have examined the most common SEO tactics and how they affect organic traffic.

Through our study, we conduct a thorough investigation of 309 Greek hotels websites which are characterized as top-listed by the Google Map's reviewers. To determine how hotels design their SEO strategy and which particular SEO strategies are utilized to impose themselves against the competition, each website is put through a stress test using various SEO techniques and technologies checks. We use a fuzzy cognitive map to identify the

correlations between SEO techniques and the traffic they generate. Lastly, in our descriptive analysis, we use research hypotheses and problem-solving methodologies to link the hotel sector's sustainability to SEO's role in business success.

A PHP-based software tool has been designed from scratch to check for SEO strategies applied in the source code of each website and provide the related reports used in our descriptive analysis [7]. Proxy servers and desktop user agents were used to get through the websites' firewalls and obtain access.

The remainder of the paper is organized as follows: Section 2 analyzes on-page and off-page SEO techniques mentioned on Google Search Central documentation [2]. Section 3 describes the materials and methods used to retrieve and analyze our dataset, such as the implementation of the PHP-based web crawler tool, the APIs used to gather more information regarding our dataset, the problem formulation, and the research hypotheses. Section 4 refers to the data normalization and grouping of our dataset into smaller groups, the limitations we faced, and the data analysis performed using the SPSS software. In Section 5 we discuss about the valuable outcomes based on our study, such as the most used SEO techniques and the contribution of each SEO technique to organic traffic, while the paper concludes in Section 6.

2. Related Work

Search engine optimization (SEO) is the procedure used by SEO specialists to increase both the quality and the number of visitors from search engines to a website [1]. Keywords are words or phrases that online visitors type into search engines while looking for information. Users expect search engines to respond to their queries when they type them into the search box. A list of websites relating to the term is provided to offer the user the solution they are looking for. Search engine results pages (SERPs) are the pages that surface following a search (SERPs). It is common to see sponsored adverts in specific keywords' results; on the contrary, organic search results appear strictly algorithmically without advertising payments. Search engine results that have been paid for show up at the top of the list and are clearly labeled as "Ad". On the other hand, organic results are displayed below the ads. As a consequence, some website owners pay per click (PPC) to appear higher in the search results, while others rank naturally underneath the adverts without any cost (organic results).

Over 200 parameters are taken into consideration by Google's artificial intelligence (AI) algorithms to rank websites in the organic results section for each search query [2,3]. Search engines are not publicly revealing their algorithmic way of ranking websites [8]. Consequently, search engine optimization (SEO) professionals have to follow every accessible guideline, modifying the website's source code to discover their efficiency [8]. To help website owners meet the requirements of each ranking factor, SEO specialists have developed SEO techniques and technologies that aim to boost a website's position in search results for specified target keywords [4].

On-page and off-page SEO are the two main instances of SEO techniques and technologies. The adjustments and additions to the website's source code that must be made to accomplish each ranking criterion are referred to as on-page SEO techniques. On the contrary, a website's reputation may be enhanced by using off-page SEO techniques, which are actions that must be taken on third-party online sources [8].

In this article, we focus on the on-page SEO Techniques from a technical point of view.

2.1. On-Page SEO Techniques and Technologies

On-page SEO techniques, as previously discussed, refer to the required website's source code modifications, in order to meet the criteria of each ranking factor. Below, we will focus on 15 on-page SEO techniques and technologies recommended by Webmaster guidelines in the Google Search Central documentation [2].

2.1.1. Descriptive Title Elements

The title tag (<title>) is an essential aspect of a website, according to the World Wide Web Consortium (W3C). The web page's title is a mix of words and phrases that describe the page's content [9]. Search engines will include a website in their results if its title is clear and descriptive [2]. With the title information, users may make an informed decision about which results they should click on.

The title tag should have a specific length size to positively affect both web users' experience and search engines. According to the industry standard, no more than 78 characters should be used in the title [10]. There are many cases where the title tag is misleading for ranking purposes including keyword stuffing techniques. In these cases, search engines replace the search result title with a tag considered more relevant to the content of the web page [2]. Using keywords that are towards the beginning of the title tag may have a significant impact on search engine results, according to Moz's research and experience [11].

2.1.2. URL Structure

URL is a human-readable string of text that identifies the hierarchy of files on a web server. Each URL comprises three parts and specifically by the access protocol, the domain name, and the path [12].

This ranking factor helps search engines to determine whether to connect to the content of a website and its URL or not [5,6]. It is much easier for both search engines and site users to realize the content of a well-formatted URL [13]. Concise, brief and understandable URLs are essential for search engine optimization (SEO). URL should be consisted of words, hyphens, and slashes [3,8]. In contrast to past popular belief, URLs including ampersand symbols, numerals, terms, and question marks are not considered SEO friendly [14].

In order to be rendered in all browsers and be indexed by search engines, a URL must be less than 2083 characters long, according to Moz SEO learning center [15].

2.1.3. Image Optimization and Alternative Tags

The file size of the images used on a website affects its loading speed. Although Internet speeds have improved in recent years, it is still difficult for end users to view an image with a file size of more than 100 kb [6]. Compression techniques and formats are used to comply with this direction, such as Google's new WebP image format, which provides up to 26% more efficient lossless compression in original images [16].

In addition to the file size, a key role in SEO has the alternative (ALT) attribute in image tags (alt tags). Even though search engines utilize computer vision and machine learning algorithms to evaluate images' content, there are several instances in which these systems fail [17]. Search engine bots and humans with visual impairments may benefit from an image's alt tag description [2,18,19]. The SEO score may be improved by incorporating images within the text and adding relevant keywords to the alt tag [8].

Furthermore, images' filenames have a significant impact on SEO. Image file names can be optimized for search engines the same way as the URL structure.

2.1.4. HREF Alternative Title Tags

Internal and external links may be found on every page. In many cases, when users spot a link on a website, they hover their mouse over it before clicking. They probably want to know in advance where this link points to before click on it. The same happens to search engines too, i.e., search engines prefer to know about the landing page's content of the redirection link [20]. As a result, the title tag is essential for website's internal and external linking and structure to be understood by both users and search engines.

2.1.5. Descriptive Meta Tags

The meta description tag follows the title tag in the head container [9]. The title of the page, the URL, and the meta description may all be seen by searching and then clicking on

one of the search results. Meta description consists of content's related simple sentences, which search engines utilize to create an abstract of the web page [4]. What visitors will discover on this page is described in the meta description [8]. SEO specialists optimize meta description to ensure that the listing is relative with the website's content [20]. It should not be more than 350 characters in length, and it must be at least 51 characters long [6]. A meta description including the target keyword might boost SEO results [17]. Websites enriched with metadata are rated higher in search results, than those without metadata [1]. Even when the meta description tag is present on a web page, the description shown on SERPs may differ from website's meta description. Search engines, and mostly Google, usually characterize the meta description as a non-representative factor, because it is often misleading [21].

2.1.6. Heading Tags

As specified by the World Wide Web Consortium (W3C), HTML has six levels of heading tags, with H1 being the highest level (most significant) and H6 being the lowest one [22]. Using header tags to draw attention to the essential portions of a piece of content is recommended by the Google Central Blog [2]. Heading labels usually describe website's highlights and this is the reason that search engines place greater importance on heading names than on the rest of the content [9]. Screen readers may also use heading tags as a valuable route for visually impaired people. When a web crawler scans a web page, it pays particular attention to the H1 and H2 tags. H1 and H2 subheadings should include the primary keyword, and their length should range between 10 and 13 words for SEO reasons [13]. In SERPs, the search engines may bypass the website's title tag and substitute it by the H1 one.

2.1.7. Minify Resources (HTML, CSS, and JavaScript)

Code comments, formatting, shorter variables and function names, as well as other unnecessary data are all examples of minification process. This data may be removed without impacting how the browser processes the actual resource [2]. All files on a website, apart from images, should be as light as possible to improve page loading speed and user experience (UX), as mentioned in Section 2.1.3 [6]. Websites' loading speed and SEO results may be enhanced by minifying files such as Javascript (.js), Cascading Style Sheets (.css), and HyperText Markup Language (.html). Minification has been demonstrated to reduce loading time by up to 16% and reduce the file size by up to 70% [23]. In addition to speeding up a website, minification may also improve its security. Short and meaningless names for variables and functions are used during minification to make JS code hardly readable by humans [24].

2.1.8. Sitemaps and RSS Feed

In a sitemap file, the webmaster provides a list of all of a website's pages and how they are all linked together. In order to properly index websites, search engines need to know which pages are the most significant, how often they are updated, and whether any other language versions of those pages exist or not [20]. For large websites, with over 500 pages, it is critical to provide sitemaps to web crawlers and notify them in advance about their backbones [3,20]. Sitemaps may be in RSS or plain text, while XML is the most often supported format by search engines and, in particular, by Google. Search engines encourage web admins to submit their sitemaps by using sitemap submission tools in order to speed up the indexing of their websites [3].

A website's search engine visibility may also be improved by using an RSS feed [5]. In most cases, RSS feeds are developed to notify visitors when new information is published [25]. RSS feeds are also used to provide a more dynamic depiction of the website's internal links, as well as by search algorithms to promptly identify new content posted to the website [2].

2.1.9. Robots.txt

Robots exclusion protocol, or robots.txt, is a list of URLs that should not be accessible by search engine crawlers [2]. For example, web crawlers should not be able to access the admin panels of websites built with content management systems and several other pages on a website. By creating a list of URLs in the robots.txt, file we indicate that either the web access to this list or its indexing in the search results is not allowed. However, there are several search engine indexers which violate the robots.txt protocol [26].

2.1.10. Mobile-Friendliness

Mobile devices are used by about half of online users, while two out of three of them are finally coming to a purchase [26]. Smartphones have overtaken personal desktops in several countries [2]. Having a mobile-friendly website has become more critical as the number of people using mobile devices grows [2]. Aligned with this, Google has created the mobile-friendly test tool, which evaluates all the components of a website to define it as a mobile-friendly one or not [27]. Bootstrap, Materialise, Bulma, UIKIT and other design CSS frameworks provide a wide range of ready-made design templates based on responsive web techniques for content provision to any device [14].

2.1.11. Website Speed

Website loading speed is an essential factor to rank higher in the SERPs [28]. Search engines consider page speed as one of the key elements of a website. Google Lighthouse, Pingdom, GTMetrix, and SiteAnalyzer, to name a few, are some indicative available tools used for websites' speed testing purposes [29].

Google's Lighthouse and PageSpeed Insights tools help web admins in monitoring and optimizing the speed of their websites. Data from a website is used to provide a performance rating and an estimation of potential savings. Lighthouse uses lab data to assess the performance of a single device under a defined set of network settings. In contrast, PageSpeed uses both lab and field data to determine a website's performance under a wide range of devices in real-world conditions. According to the website's performance score, the webmaster may proceed with recommended modifications to improve the website's performance. Similar strategies are used by the Pingdom tool [30].

2.1.12. Add Security with HTTPS

Internet communication protocols such as HTTPS (Hypertext Transfer Protocol Secure) ensure the integrity and privacy of data sent between user's browser and a web server. Users expect a secure and private online experience during their navigation in a website [2]. Websites with SSL certificates are ranked higher on search engine results pages, due to their increased security [29]. The Google Chrome browser informs users when the visited website does not provide an SSL certificate (as a non-secure destination) to underline the necessity of SSL certificates [31].

2.1.13. Accelerated Mobile Pages (AMP)

Mobile phone users are about 7.26 billion today [32]. Google launched the Accelerated Mobile Project (AMP) in order to improve mobile browsing experience [33]. To this direction, Google identifies the pages that follow the AMP standards and keeps a cached copy of their source code on Google's web servers [34]. Cached copy of the AMP page from Google's servers is sent to mobile users when they click on an AMP result in Google's search results [2]. Consequently, mobile users obtain requested data right away, with no additional network delay. Web pages that follow the AMP standards rank higher in mobile SERPs [33]. Although AMP technology is effective for both search engine rankings and web page performance, achieving the AMP standards is a demanding task [35,36].

2.1.14. Structured Data and Rich Snippets

An open-source group called Schema.org aims to create and promote structured data schemas on the Internet, on websites, in emails, and elsewhere [37,38]. Structured data is a standardized format for providing information about a page and classifying the page content [2]. The Schema.org vocabulary may be utilized with RDFa, Microdata, and JSON-LD [14]. Semantic annotations may be used to add schema markups to a website's HTML source code, which search engines can then parse to offer users more relevant search results [39]. This is the main reason that major search engines support the use of markup formats [40]. To this direction, websites that use rich snippets, such as the price and the availability of a product, are rewarded by Google for using structured data [6].

2.1.15. Open Graph Protocol (OGP)

OGP is also a kind of structured data created by Facebook to integrate external material into the social networking platform [41]. Using the OGP, every web page may become a social graph object. For instance, OGP may be utilized on Facebook to enable any web page to operate in the same way as any other object on Facebook [41]. When a URL is posted on social media, social media bots visit the website and search for three essential parts: the title, the picture, and a summary of the content.

By using OGP to pre-mark these components makes it simpler for social media bots to obtain the results they search for. OGP, like any other structured data format, provides richer results and it is numbered among the decisive factors for search engine and social media end-users regarding clicking on and visiting a website, or not [14].

2.2. Off-Page SEO Techniques

A website's ranking is also affected by variables known as off-page factors, which are independent of the page's content and are based on a variety of external influences [1,29]. Creating backlinks to the targeted website from high-ranking websites is a crucial component of off-page SEO [3]. The volume and the quality of backlinks to the owner's website are most important in off-page SEO. For example, ranking could be affected by the provision of helpful and remarkable content that people want to link to. Consequently, search engines treated backlinks as "up-votes," giving sites with more links a boost in the rankings [1]. There are more than 12 off-page tactics that can impact a website's visibility and SERP ranking. Guest posts, profile backlinks, Q&A, and comment backlinks are some of the fundamental approaches [8]. According to Google's creators in their 1998 article, anchored links are connections to a website containing the destination website's goal term. Anchors often provide more accurate descriptions of Web pages than the pages themselves [42]. The website must incorporate the target keyword on both on-page and off-page SEO techniques to appear higher in SERPs [1]. While using off-page SEO techniques are beneficial for website ranking, search engines advise web admins that any effort to influence website's search engine rankings by establishing backlinks may be a criterion for degrading or removing the website from the SERPs [6].

3. Materials and Methods

The purpose of this paper is to propose an innovative methodology for implementing an efficient framework for comprehending the strong correlation between search engine optimization and web traffic, thereby providing valuable insights for hotels' websites. We followed seven research steps to achieve the desired outcomes.

1. Problem Formulation and Research Hypotheses. In this stage, we clearly define the necessity of earning more organic traffic using SEO techniques along with five hypotheses that must be confirmed from our descriptive analysis.
2. Data Retrieval. In this stage, we describe the software developed for the purpose of this paper, and the external APIs used to collect additional information regarding our dataset.

3. Data Normalization and Limitations. In this stage, we divide our dataset into three groups (Metrics, SEO Techniques, and Web Traffic) facilitating the descriptive analysis that follows. Each group is analyzed using different procedures depending on its type. Metrics and SEO Techniques were analyzed against the dependent variable Web Traffic.
4. Descriptive Statistics. Using the SPSS software, we perform descriptive analysis on our dataset.
5. Inferential Statistics
    a. T-Tests on SEO Techniques. In this stage, we perform independent t-tests on each SEO technique by using the SPSS software.
    b. ANOVA, Coefficients and Scatterplots on SEO Metrics. In this stage, independent ANOVA, Coefficients and Scatterplots performed on each SEO Metric by using the SPSS software.
6. Understand cause-and-effect relationship of SEO Techniques and Web Traffic. In this stage, we conclude that the majority of SEO Techniques positively affect web traffic.
7. Understand cause-and-effect relationship of SEO Metrics and Web Traffic. In this stage, we conclude that the majority of SEO Metrics positively affect web traffic.

3.1. Websites' Traffic Sources and Key Performance Indicators

Hotels' online presence and bookings are directly affected by various factors that should be analyzed and factored into our estimation. To obtain a more detailed picture of the hotels' online presence, we use their organic web traffic sources, which indicate the primary traffic source to their websites. As mentioned in Section 1, organic traffic is the traffic generated by users who use search engines (e.g., Google, Yahoo, etc.). It is an unpaid form of web traffic that plays a significant role in business success. Most websites rely on organic traffic results, which account for more than 60% of total website traffic [43]. As an unpaid source of traffic, organic traffic offers numerous benefits to businesses, including a lower initial investment than PPC campaigns, long-lasting results that can be enhanced year after year with the appropriate effort, and a significant increase in brand awareness [44].

Organic keywords, backlinks, website speed, and domain authority (DA) are four additional metrics that search engines consider when evaluating a website before ranking it in the SERPs [45,46]. Organic keywords are those for which websites are ranked in search engines' organic SERPs [47]. Backlinks are links from third-party websites to the target page that endorse that page [1]. Website speed is the time it takes for a web page to fully download and load from the webserver to the user's browser and it is measured in seconds. Domain authority (DA) is a Moz-developed search engine ranking score that forecasts a website's strength and its ability to rank in SERPs. The domain authority score is a numeric value between 1 and 100, with higher values indicating a greater likelihood of ranking [48]. Domain authority is not a metric that search engines can see. It attempts to mimic how search engines rank web pages. In the majority of cases, the domain authority score is indicative. The domain authority (DA) is critical when comparing it to other websites. Websites with a higher domain authority (DA) are more likely to appear higher in SERPs than those with a lower domain authority (DA).

Table 1 summarizes the web traffic metrics proposed as key performance indicators (KPIs) in this paper.

A performance indicator, also known as a key performance indicator (KPI), is a type of performance measurement that assesses a business's success in specific activities that it manages [47,49]. Table 1 contains the KPIs examined in this paper in addition to the web metrics. Monthly traffic analysis is beneficial for exporting more accurate results about a website's traffic and ranking performance.

Table 1. Description of the examined web analytics metrics and suggested KPIs and Performance Measurements.

KPIs (Unit)	Description
Organic Traffic/Month (number of organic visitors per month)	Organic search refers to the non-paid search results from a search engine. These results cannot be bought or influenced by advertisers, so they are the ones the search engine considers most relevant to the user's search query [50]. Organic traffic is described by the number of unique visitors per unit of time resulting from users' queries on search engines.
Domain Authority—DA (score in the range [0–100], integer)	DA score can be used when comparing websites or tracking the "ranking strength" of a website over time [48]. Websites with higher DA are more likely to rank higher in SERPs than those with lower DA. Search engines do not use the DA metric to rank web pages to the search results. DA is a simulation metric made by Moz's SEO experts to model search engines' algorithms behavior [6,11].
Website Speed (seconds)	Website speed refers to how quickly a browser can load fully functional web pages from a given website.
Organic Keywords (number of keywords)	Organic keywords are keywords used in SEO to attract "free" traffic. When a user types a keyword on the search engines, it returns as a result websites which rank for this specific keyword [51]. SEO experts are constantly trying to detect high-traffic keywords that users prefer to search on search engines. The keywords are selected based on the website's niche. By creating landing pages, and using copywriting and on-page SEO techniques, SEO experts attempt to rank the website to specific keyword queries on search results. The more keywords rank for, the higher organic traffic received. SEO software tools, such as Ubersuggest [52], are used by SEO experts to monitor in which exactly keywords the website is ranking for and in which specific ranking position.
Backlinks (number of backlinks)	Backlinks are links that the considered page receives from other page(s). According to Google's founders, anchored links are links to a website containing the target keyword of the destination website. Anchors often provide more accurate descriptions of Web pages than the pages themselves [42]. Backlinks help secure a higher SERP ranking [26]. Backlinks affect mostly the position of a website followed by relevant content [5].

3.2. Sample Selection, Data Retrieval

We obtained data for this paper from Google Maps and the Google Maps API [53]. The sample consists of 309 Greek hotels' websites which have user ratings greater than three out of five stars. For the above hotels' firms, data were collected concerning their websites' organic traffic, website speed, number of organic keywords, reviews, and their domain authority. Sample considered as representative providing with knowledge about the search engine optimization applied by hotels as well as how this translated into traffic. Monthly data collection from hotels websites allowed for a more precise examination and comprehension of web metrics variance. The testing period has been extended to 12 months, with specific dates between February 2021 and February 2022. Because this period corresponds to the COVID-19 transportation restrictions, the results will provide a clear picture of the decline in bookings during this period.

We developed a PHP-based web crawler tool to collect the sample that extracted information about each hotel listed on Google Maps website, including its legal name, and Website [7,53]. Following data extraction, we stored the entire dataset in a MySQL database, later used to perform SEO checks [7].

The software tool created for the purpose of this article draws the dataset from Google Maps API and stores each result in a MySQL database. It then traverses the dataset and, using cURL, extracts the source code from each hotel's website. The cURL project is computer software that includes both a library (libcurl) and a command-line tool (curl) for data transfer over a variety of network protocols [54]. Each of the fifteen SEO techniques discussed in Section 2 has its function that searches the source code of the targeted website

to determine whether the SEO Technique has been applied. Finally, the database is updated with the results of the checks. Figure 1 illustrates the generated code and its primary functions in detail.

```
require ('seo-techniques-functions.php'); // ToDo! Get SEO techniques' functions
$retrieve = retrieve_data_from_google_maps(); /* ToDo! Retrieve data from Google
Maps API */
$websites = create_dataset_array($retrieve); /* ToDo! Create an array with our da-
taset */
foreach($websites AS $id => $website) { // ToDo! Run through our dataset
    $curl_results = do_curl_website($website); // ToDo! Do curl on current website
    $seo_checks = do_seo_checks($curl_results); /* ToDo! Do SEO checks using the
getElementsByTagName */
```

Figure 1. PHP-based SEO software.

To supplement our research and to validate our findings, we used four third-party API tools: the Mobile-Friendly Test Tool API, the PageSpeed Insights API, the Mozscape API, and the Ubersuggest Traffic Analytic tool. Each of these tools obtains the URL of the website and returns results based on its measurements.

- The Google-created Mobile-Friendly Test Tool API validates a URL against responsive techniques. It returns a list of any mobile usability issues that may affect a user visiting the page on a mobile device [55].
- Google's PageSpeed Insights API analyses the performance of a web page and provides recommendations on how to improve various aspects of the page's performance, including page speed, accessibility, and SEO [56].
- The Mozscape API, developed by MOZ, accepts a website's URL as an input and returns accurate metrics such as Domain Authority [48].
- Ubersuggest, developed by Neil Patel, retrieves and returns a 360-degree view of any website's metrics and its sources [52].

After completing SEO audits on 309 hotels' websites, the exported data was imported into IBM SPSS 27. IBM SPSS 27 is one of the most widely used statistical software for ad hoc analysis, hypothesis testing, and predictive analytics. IBM SPSS Statistics is used by organizations to comprehend data, analyze trends, forecast, and plan to validate assumptions and reach accurate conclusions [57]. A descriptive analysis of various correlations confirmed the following research hypotheses. Finally, a fuzzy cognitive map (FCM) was created to visualize the relationship between SEO techniques, traffic, and backlinks, demonstrating the direct correlation between SEO techniques and traffic and, thus, with hotels' bookings and sustainability.

3.3. Problem Formulation and Research Hypotheses

Increased competition, the COVID-19 era, and global travel restrictions tend to increase businesses' efforts to be more efficient in their digital marketing campaigns. Hotels make extensive use of every available tool, from copywriting to email marketing, social media marketing, and search engine optimization, to reach out to potential customers in various ways. By understanding the consumer habits of their audience, hotel marketing agents develop marketing strategies to target this audience more effectively.

Hotels' websites are the primary source of bookings, and companies devote resources to organizing and optimizing the efficiency and effectiveness of their websites. Their position on the search engine results pages (SERPs) plays a crucial role in gaining organic visitors. The web page title, meta description, and even the rich results must all be applied

with care to earn the coveted click. The content, user interface, and website speed work together to pique the visitor's interest and convert them into loyal customers. Given that hotel websites' primary objective is traffic and conversion to clients, we define five hypotheses and attempt to confirm them to expand practical knowledge about the significance and impact of search engine optimization on hotel websites traffic.

Hypothesis 1 (H1). *SEO techniques affect the amount of traffic that hotels' websites receive*.

The primary objective of this paper is to determine whether search engine optimization has an impact on the amount of traffic that hotels' websites receive. By deciding which SEO techniques hotels have implemented on their websites and comparing the results to the increase in traffic, we can gain valuable insight into the potential benefits of SEO techniques. As mentioned in Section 3.2, a dataset was selected from Google Maps consisting of 309 Greek hotels' websites, which have user ratings greater than three out of five stars. Scanning and performing SEO tests on each website source code, using our own developed software [7], we gather information regarding the SEO techniques each website has implemented. Using third-party software tools described in Section 3.2, we scan each website, gathering information concerning their domain authority, website speed, organic keywords, organic traffic, and backlinks. All the data collected is stored in an excel sheet. Using the IBM SPSS 27 software, a descriptive analysis was conducted in order to find connections/patterns between SEO techniques used by websites and their organic traffic. The ultimate goal of this research is to uncover which SEO techniques used by Greek hotels have a more positive effect on organic traffic, assuming that the websites with the highest organic traffic have applied the appropriate SEO techniques in their source code.

Hypothesis 2 (H2). *On-page SEO techniques affect the ranking of a hotel's website*.

Hypothesis 2 is a segment of Hypothesis 1, targeting the on-page SEO techniques. Our second hypothesis is based on the effects of on-page SEO techniques on website ranking. Multiple keyword targeting and on-page SEO techniques are assumed to increase organic results.

Hypothesis 3 (H3) *Off-Page SEO techniques—backlinks affect the ranking of a hotel's website*.

Hypothesis 3 is a segment of Hypothesis 1, targeting the off-page SEO techniques. Hypothesis 3 examines off-page SEO techniques and their effect on the traffic to hotel websites. We assume that creating backlinks to third-party websites will boost a website's domain authority, which will result in higher rankings in the SERPs.

Hypothesis 4 (H4). *Hotels' organic keywords affect their website's ranking*.

We assume in Hypothesis 4 that organic keywords are valuable for the hotels' website, resulting in higher SERP rankings and increased web traffic.

Hypothesis 5 (H5). *Hotels' backlinks affect their domain authority*.

We assume in Hypothesis 5 that backlinks are intrinsically linked to domain authority.

4. Results

4.1. Data Normalization

In this section we examine the collected data. As mentioned in Section 3.2, our tool performed SEO checks on 309 websites. The results were stored in excel so that we can use them in further data analysis [58].

Collected data are separated into three Groups.

1. Group 1: Metrics are checks performed by third-party tools and are not SEO techniques. The contents of the Metrics Group are as follows: DA (integer 0 to 100), speed_test (decimal), number of keywords (integer), and number of backlinks (integer).
2. Group 2: SEO Techniques are checks performed by our tool regarding the existence (or not) of SEO techniques on each website of the dataset. All metrics returned 1 if the SEO technique has been applied to the website, 0 otherwise. The contents of the SEO Techniques Group are as follows: images_alt, links_title, rss, sitemap, robots, heading1, heading2, web_ssl, meta_description, opengraph, url_seo_friendly, amp, minified_css, minified_js, title, structured_data, and responsive_test.
    - To extend the results of our research, by giving readers additional insights related to SEO, we introduce two variables which are not SEO techniques but can be treated statistically in the same way. The first variable is the well-known opensource CMS WordPress. We present this variable to identify if WordPress CMS can provide better results regarding SEO and organic traffic than other web platforms. The second variable is the Yoast SEO plugin. Yoast SEO plugin is a WordPress extension that uses advanced suggestion tools to help website's administrator improve website's content and structure proposing changes such as keyword targeting, internal linking, structured data, sitemap, etc. We present this variable to determine if the Yoast SEO plugin can deliver better results regarding SEO and organic traffic if installed in a WordPress CMS. In Group 2, two more parameters are added, «is_yoast» and «is_wp», with a value of 1 for those websites that use them and a value of 0 for those websites that do not use them.
3. Group 3: Web Traffic (organic traffic) are the monthly statistical data collected for each website. All web traffic data are integers and refer to websites' data for the last twelve months. The contents of the Web Traffic Group are as follows: traffic_1, traffic_2, traffic_3, traffic_4, traffic_5, traffic_6, traffic_7, traffic_8, traffic_9, traffic_10, traffic_11, and traffic_12.

4.2. Limitations

During the examination of the responsive_test technique, it was found that the Mobile-Friendly Test Tool API created by Google considers non-responsive those pages that have even one non-responsive element. Manual checks revealed that these specific websites partially adopt responsive techniques and have several elements in their source code that are non-responsive. These pages are marked with the number 0 which means that they do not follow that specific SEO technique. Additionally, in 22 out of the 309 websites, the speed measurements were performed manually with the tool Pingdom website speed test by Solar Winds, because the PageSpeed Insights API by Google could not operate speed test on these pages.

During the AMP and Sitemap SEO technique tests found that none of the websites have been applied these techniques, although they are suggested by Google on Webmaster Guidelines [2]. Consequently, t-tests cannot be performed on these techniques excluding them from our final results.

We collected the monthly organic traffic for 12 months to have a more representative view of the website traffic. For the data analysis that follows, we calculated the mean value of 12 months of organic traffic for each website and saved it in a new column called Web Traffic. All the following comparisons regarding web traffic refer to the mean value of organic traffic for each website.

Raw data collected from multiple websites do not convey any significant trends or the behavior of the individuals before the corresponding analysis. Data analysis refers to the process of converting the raw data into meaningful information, using the mathematical, statistical, or computational algorithms for better comprehension [59]. For the quantitative data analysis, some major steps need to be considered to firmly execute the assessment and generate the intended results. The procedure consists of two major steps: (1) reviewing

the data by descriptive analysis and (2) conducting inferential and descriptive statistics to answer the research questions [60]. The study is presented in the following sections of the chapter and each section is intended to answer the research questions as the analysis must be aligned with the research objectives.

4.3. Descriptive Statistics

Descriptive analysis helps to describe, demonstrate or summarize the collected data in a constructive manner so that the trends and patterns can be easily observed and analyzed [61]. Mean, median, mode, standard deviation, skewness, and kurtosis are some of the important measures. Mean, median and mode measure the central tendency of the variable to typify the whole set of data [62]. Similarly, skewness is the measure of the degree of lopsidedness in the distribution on the frequency, and kurtosis is the measure of the degree of tailedness in the frequency distribution [63]. Standard deviation measures the risks, volatility, scatteredness, or variability in the data [64]. Table 2 indicates that the maximum web traffic, domain authority, speed test, keywords and backlinks of this study are 1,058,500, 90, 15.4, 2,898,545 and 32,965,989, respectively. The values of skewness or kurtosis within −1.5 and +1.5 are considered right skewed distribution of the data [65].

Table 2. Descriptive statistics on SEO metrics.

	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Web Traffic	309	2	1,058,500.00	7939.3091	69,130.01356	13.320	0.139	188.769	0.276
Domain Authority	309	3	90	28.81	11.472	0.907	0.139	4.153	0.276
Website Speed	309	0.4	15.4	3.501	2.5462	1.781	0.139	3.589	0.276
Organic Keywords	309	0	2,898,545	27,009.03	263,236.714	10.153	0.139	102.411	0.276
Backlinks	309	3	32,965,989.00	218,197.9773	2,315,388.35	12.246	0.139	157.348	0.276

4.4. Inferential Statistics

Inferential statistics refers to the procedure of using data analysis to infer attributes of an underlying probability distribution. Inferential statistics deal with the information acquired from the sample of the population to draw conclusive statements about the entire population [66]. Inferential statistics make use of statistical models to compare the sample data to that of earlier studies. It varies from descriptive statistics in that it allows one to draw conclusions based on extrapolations rather than merely reporting the data that has been seen, like descriptive statistics does [67]. From our hypotheses, we assume that SEO Metrics and SEO Techniques are positively affecting the dependent variable Web Traffic. Using inferential statistics, we compare each SEO metric and technique against the web traffic and—without loss of generality—we extend the corresponding conclusion to the larger population.

4.4.1. Impact of SEO Techniques Group on the Web Traffic

At this point, 15 different t-tests were performed for each one of the 15 SEO techniques (Group 2) using the SPSS 27 software by IBM. After this, the t-tests mean values observed. The mean value is equal to the sum of all the values in the data set divided by the total number of values. The "YES" mean reflects the average web traffic from the websites that applied the technique. The "NO" mean reflects the average web traffic from the websites that have not applied the technique. If the "YES" mean is greater than "NO" mean the websites which have implemented this technique in their source code have greater traffic and the technique is valuable for the website. Another component to consider when comparing Yes or No is the *p*-value. In statistics, the *p*-value is the probability of obtaining results at least as extreme as the observed results of a statistical hypothesis test, assuming that the null hypothesis is correct. The *p*-value is used as an alternative to rejection points to provide the smallest level of significance at which the null hypothesis

would be rejected. A smaller p-value means that there is stronger evidence in favor of the alternative hypothesis [68]. A p-value less than 0.05 (typically ≤ 0.05) is statistically significant. A p-value higher than 0.05 (>0.05) is not statistically significant and indicates strong evidence for the null hypothesis [69]. The results from 2 of 15 t-tests are presented in detail below, and the rest are presented briefly in Table 3 for the sake of brevity.

Table 3. Independent t-test on the meta description technique.

Technique	Mean (Number of Visitors per Month)		Standard Deviation (Number of Visitors per Month)		t-Value	*p*-Value
	Yes (n = 193)	No (n = 116)	Yes (n = 193)	No (n = 116)		
Meta Description	8739.23	6608.39	77,063.28	53,677.81	−0.262	0.02

Impact of meta description technique on the web traffic

H0. *There is no difference in websites traffic due to the meta description technique (null hypothesis).*

H1. *There is a difference in websites traffic due to the meta description technique.*

In this study, an independent samples t-test is applied to draw a comparison of the mean web traffic between websites that implement meta description technique (n = 193) and websites that did not implement the meta description technique (n = 116) (Table 4). The t-test was statistically significant, with the mean web traffic of meta description technique-implemented websites (M = 8739.23, SD = 77,063.28) being higher than the meta description technique unimplemented websites: (M = 6608.39, SD = 53,677.81), t = −0.260, $p < 0.05$, two-tailed. Therefore, the null hypothesis, H0, which states that there is no difference in websites traffic due to the meta description technique, can be rejected. Consequently, it can be concluded that websites which have implemented the meta description technique have greater traffic, and by extension, this technique is valuable for the websites.

Table 4. Independent t-test on the Robots.txt technique.

Technique	Mean (Number of Visitors per Month)		Standard Deviation (Number of Visitors per Month)		t-Value	*p*-Value
	Yes (n = 196)	No (n = 131)	Yes (n = 196)	No (n = 131)		
Robots.txt	6094.49	11,139.16	42,905.73	99,602.74	0.617	0.04

Impact of Robots.txt technique on the web traffic

H0. *There is no difference in websites traffic due to the Robots.txt technique (null hypothesis).*

H1. *There is a difference in websites traffic due to the Robots.txt technique.*

In this study, an independent samples t-test is applied to draw a comparison of the mean web traffic between websites that implement the Robots.txt technique (n = 196) and websites that did not implement the Robots.txt technique (n = 131). The t-test was statistically significant, with the mean web traffic of robot technique-implemented websites (M = 6094.49, SD = 42,905.73) being lower than the robot technique unimplemented websites: (M = 11,139.16, SD = 99,602.74), t = 0.617, $p < 0.05$, two-tailed. Therefore, the null hypothesis that there is no difference in websites traffic due to the robot technique was rejected. Therefore, it can be concluded that websites that have implemented Robots.txt technique have failed to reach more web traffic and the null hypothesis H0 cannot be rejected.

Table 5 presents the 15 t-tests performed for the 15 corresponding SEO techniques. In the last column of Table 5, the SEO techniques that resulted in providing a positive impact on the traffic are marked as 1, while the techniques that do not have a significant contribution to the traffic are marked as 0. At the end of Table 5, two more t-tests were

performed regarding WordPress CMS and Yoast SEO against the dependent variable Web Traffic.

4.4.2. Impact of SEO Metrics Group on the Web Traffic

Regression is a statistical technique to formulate the model and analyze the relationship between the dependent and independent variables. It aims to study the degree of relationship between two or more variables. This is achieved with the help of hypothesis testing.

In this part of our research, three different tests, one-way analyses of variance (ANOVA), coefficients and scatterplots, were performed for each of the four Metrics (Group 1) using the SPSS 27 software by IBM. After the analysis, it is intended to determine the relationship between Metrics and Web Traffic.

The one-way ANOVA is used to determine whether there are any statistically significant differences between the means of two or more independent (unrelated) groups, or not. Unstandardized coefficients indicate how much the dependent variable varies with an independent variable when all other independent variables are held constant. A simple scatterplot can be used to (a) determine whether a relationship is linear, (b) detect outliers and (c) graphically present a relationship between two continuous variables [70].

The null and alternate hypotheses remain the same as the Techniques.

H0: *[Metric] doesn't have positive impact on the web traffic.*

H1: *[Metric] has a positive impact on the web traffics.*

The model summary table reports the strength of the relationship between the model and the dependent variable (Table 6).

- Domain Authority: The regression model summary has been explained by 16.7% in variability of the web traffic, $R^2 = 0.167$, adjusted $R^2 = 0.165$.
- Website Speed: The regression model summary has been explained by only 0.1% in variability of the web traffic, $R^2 = 0.001$, adjusted $R^2 = -0.002$.
- Keywords: The regression model summary has been explained by 72.7% in variability of the web traffic, $R^2 = 0.727$, adjusted $R^2 = 0.726$.
- Backlinks: The regression model summary has been explained by 45.2% in the variability of the web traffic, $R^2 = 0.452$, adjusted $R^2 = 0.450$.

The ANOVA table represents the overall significance of the model, which is determined by the web traffic (Table 7). The F ratio is the ratio of two mean square values. Degrees of freedom (df) of error has been calculated by Total sample (n = 309)–2 = 307 and total degrees of freedom (df) has been calculated by Total sample (n = 309)–1 = 308.

- Domain Authority: The result shows F (1, 307) = 61.738, $p < 0.05$, which suggests the model is highly significant. Therefore, the independent variable in this model is related to the dependent variable.
- Website Speed: The result shows F (1, 307) = 0.420, $p > 0.05$, which suggests the model is not statistically significant. Therefore, the independent variable in this is not related to the dependent variable.
- Keywords: The result shows F (1, 307) = 816.754, $p < 0.05$, which suggests the model is highly significant. Therefore, the independent variable in this is related to the dependent variable.
- Backlinks: The result shows F (1, 307) = 252.759, $p < 0.05$, which suggests the model is highly significant. Therefore, the independent variable in this model is related to the dependent variable.

Table 5. T-test on 15 SEO Techniques.

Technique	Mean (Number of Visitors per Month)		Standard Deviation (Number of Visitors per Month)		t-Value	*p*-Value	Valuable
	Yes	No	Yes	No			
Meta Description	8739.23	6608.39	77,063.28	53,677.81	−0.262	0.02	1
Image Alt	16,867.69	1791.89	107,719.97	4978.16	−1.892	0.03	1
SEO friendly URL	7964.38	215.42	69,241.10	0	−0.112	0.01	1
Minified CSS	19,867.59	2315.97	121,203.18	7434.48	−2.094	0.00	1
Title	10,237.10	1883.92	81,027.66	6470.74	−0.948	0.00	1
Structured data	13,017.17	5092.62	101,275.80	41,495.26	−0.967	0.00	1
Responsive	11,117.37	1764.77	84,892.54	5268.46	−1.127	0.02	1
Heading1	9941.26	4105.36	84,441.15	16,683.35	−0.704	0.04	1
Heading2	9711.04	6061.27	84,777.06	47,439.21	−0.463	0.00	1
SSL	8324.65	386.56	70,855.70	563.44	−0.433	0.01	1
Open graph	9066.93	6680.37	83,100.83	49,322.96	−0.303	0.02	1
Link Title	11,925.11	6877.51	71,897.13	68,486.96	−0.522	0.00	1
RSS	29,721.21	2690.65	154,236.56	11,543.47	−2.74	0.00	1
Robots	6094.49	11,139.16	42,905.73	99,602.74	0.617	0.04	0
Minified JS	23,685.24	2251.34	132,989.81	7181.28	−2.425	0.00	1
Is WordPress	2697.31	13,568.29	12,955.12	98,506.26	1.383	0.168	0
Is Yoast	2762.92	9511.88	7731.00	78,792.80	0.725	0.469	0

Table 6. Model Summary. Strength of the relationship between the model and the dependent variable.

Metric	Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
Domain Authority	1	0.409	0.167	0.165	63,180.47283
Website Speed	1	0.037	0.001	−0.002	69,195.23812
Organic Keywords	1	0.853	0.727	0.726	36,191.48936
Backlinks	1	0.672	0.452	0.450	51,279.24795

The coefficient table represents how much the dependent variable is expected to increase when that independent variable increases by one, holding all the other independent variables constant [71] (Table 8). When interpreting the coefficient table, the B variable is important, representing the increase in the dependent variable as soon as the independent increases by one unit. On the other hand, the beta variable compares the strength of the effect of each individual independent variable to the dependent variable. The higher the value of the beta coefficient, the stronger the effect, based on absolute numbers [72].

- Domain authority: When the beta value of domain authority is increased by one-unit, web traffic will have increased by 2465.645 visitors per month. Therefore, domain authority does not have a positive impact on the web traffic null hypothesis is rejected. It can be concluded that the domain authority scores have a significant positive effect on the web traffic.

- Website speed: Since the *p* value of the following table is greater than 0.05, the impact of speed is not statistically significant. Therefore, the null hypothesis that speed test does not have a positive impact on the web traffic is true and can't be rejected.
- Keywords: When the beta value of keywords is increased by one-unit, the web traffic increases by 0.224 visitors per month. Therefore, keywords do not have a positive impact on the web traffic, and thus, the null hypothesis is rejected. It can be concluded that the keywords have a significant positive effect on the web traffic.
- Backlinks: When the beta value of backlinks is increased by one-unit, the web traffic increases by 0.020 visitors per month. Therefore, backlinks do not have a positive impact on the web traffic, and thus, the null hypothesis is rejected. It can be concluded that the backlinks have a significant positive effect on the web traffic.

Table 7. ANOVA results. Overall significance of the model.

Model		Sum of Squares	df	Mean Square	F	*p*-Value
Domain Authority	Regression	246,445,253,450.713	1	246,445,253,450.713	61.738	0.000
	Residual	1,225,474,049,215.856	307	3,991,772,147.283		
	Total	1,471,919,302,666.569	308			
Website Speed	Regression	2,009,142,195.171	1	2,009,142,195.171	0.420	0.518
	Residual	1,469,910,160,471.398	307	4,787,980,978.734		
	Total	1,471,919,302,666.569	308			
Organic Keywords	Regression	1,069,803,364,626.086	1	1,069,803,364,626.086	816.754	0.000
	Residual	402,115,938,040.483	307	1,309,823,902.412		
	Total	1,471,919,302,666.569	308			
Backlinks	Regression	664,643,992,835.479	1	664,643,992,835.479	252.759	0.000
	Residual	807,275,309,831.090	307	2,629,561,269.808		
	Total	1,471,919,302,666.569	308			

Table 8. Coefficient results. Results show how much dependent variable is expected to increase when that independent variable increases by one.

Model	B	Std. Error	Beta	t	*p*-Value
(Constant)	63,093.600	9728.574		6.485	0.000
Domain Authority	2465.645	313.800	0.409	7.857	0.000
(Constant)	4427.210	6700.015		0.661	0.509
Website Speed	1003.086	1548.492	0.037	0.648	0.518
(Constant)	1892.320	2069.706		0.914	0.361
Organic Keywords	0.224	0.008	0.853	28.579	0.000
(Constant)	3561.608	2930.141		1.216	0.225
Backlinks	0.020	0.001	0.672	15.898	0.000

Scatterplots are essential for identifying trends and patterns. In a scatterplot, each observation (or point) has two coordinates [73]. The strength of the link between the variables is determined by calculating the correlation coefficient. The plot shows the first variable's value on the X axis and the second variable's value on the Y axis for each data point [74]. The relationship between two quantitative variables is shown in a scatter plot (Figure 2).

- Domain Authority: The following graph indicates the coordinates of domain authority and web traffic, since the web traffic has been gradually increased because of the increase in DA scores, a indicating linear relationship between domain authority and the web traffic.
- Keywords: The following graph indicates that the more keywords that have been used in the website, the more traffic it will get. Therefore, there is a strong positive linear relationship between keywords and web traffic.

- Website speed: The following shows the relationship between speed test and web traffic. It shows that the increase in speed test does not result in a proportional increase or decrease in the web traffic. Therefore, there is a constant and nonlinear relationship between these two variables.
- Backlinks: Like keywords, the following graph indicates the more backlinks that have been used in the website, the more traffic it will get. Therefore, it can be concluded that there is a strong positive linear relationship between keywords and web traffic.

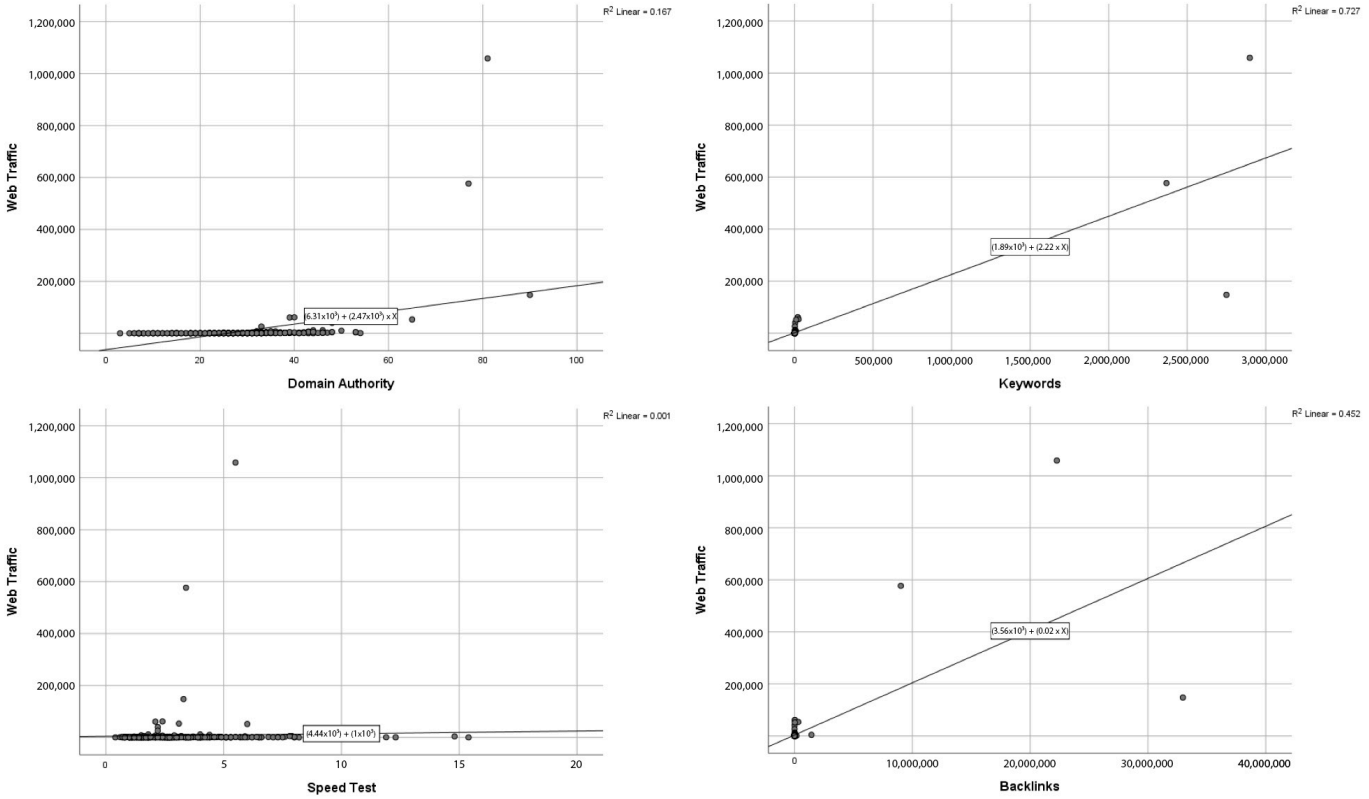

Figure 2. Scatterplot of each Metric by web traffic.

We used exactly the same data analysis methodology as the SEO metrics to identify the correlation between backlinks and domain authority. The findings of the regression model have found that backlinks have a strong connection with domain authority. When the beta value of backlinks is increased by one unit, on average, the domain authority will increase by 2.214 units.

4.5. Diagnostic Exploratory Model Development

Results of the t-tests on SEO Techniques and of the ANOVA, coefficients and scatterplots on SEO Metrics present significant relationships with the Web Traffic. Thus, we aim to provide additional insights to marketing strategists over the impact of SEO Techniques and Metrics usage on hotels' websites, in favor of their digital marketing strategy. Therefore, we deployed fuzzy cognitive mapping (FCM), which will implement selected web metrics of both SEO Techniques and Metrics depicting the relationships to Web Metrics, so as to obtain a more adaptive model for process assessment. Fuzzy cognitive mapping deploys a descriptive and consolidated stochastic classification methodology, mainly used to represent the correlations between hotels' web metrics [75]. We use the orange color to mark the SEO Techniques, green color to mark the SEO Metrics, and blue color to mark the hotels' Web Traffic. Blue arrows in Figure 3 illustrate variables with positive relations with Web Traffic, and black arrows illustrate variables with neutral relations with Web

Traffic. Development of the FCM has been conducted via the Mental Modeler cloud-based application [76].

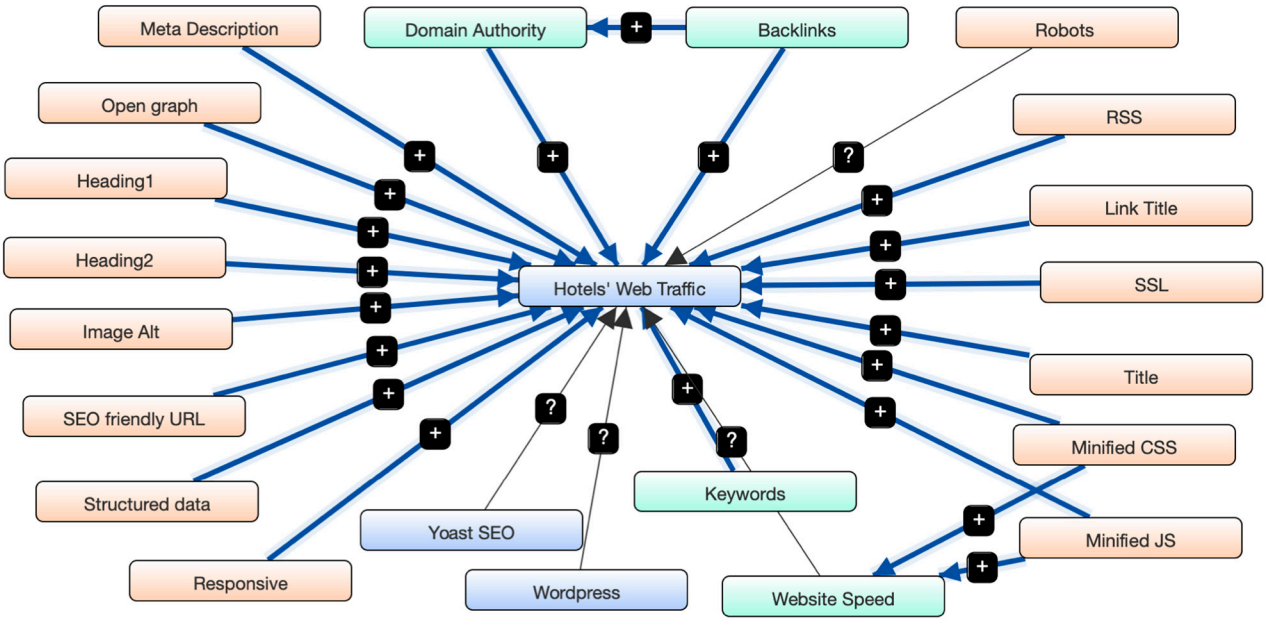

Figure 3. Using fuzzy cognitive map to locate the correlations between SEO Techniques/Metrics and Web Traffic.

Fuzzy cognitive maps are fuzzy graph structures that represent causal reasoning. Exploratory modelling implementation is vital when digital marketing agencies need to make a decision or a digital marketing plan [77].

As we notice in Figure 3, most of the SEO Techniques and Metrics positively affect Web Traffic. Some of them have a relationship with each other, such as Backlinks and DA.

5. Discussion

The primary objective of this paper is to develop a precise methodology grounded in a pioneering context, to provide actionable insights into the use of search engine optimization and its contribution to the growth of hotels' web traffic and sustainability. We retrieve hotel data from Google Maps API using a tool we developed. We performed SEO checks on each hotel's website (309 in total), evaluating the SEO techniques implemented in their source code. We also collected data for each hotel's website using four SEO third-party APIs, including 12-month web traffic, domain authority, website speed, and organic keywords. The average domain authority of our dataset's hotels' websites is 28, the average page load time is 3.5 s, and the average monthly web traffic is 7939 users.

We used descriptive analysis and t-tests to determine the relative contribution of each technique and metric to hotel web traffic.

Figure 4 illustrates the adoption rates of SEO techniques and hotel websites. The majority of hotels' websites implemented SEO techniques such as SEO-friendly URLs (99.68%), SSL certificates (95.15%), title tag (72.49%), and Heading 1 (65.70%). As previously stated, the AMP and Sitemap SEO technique tests revealed that none of the hotels' websites utilized these techniques, even though Google recommends them in its Webmaster Guidelines [3]. The descriptive analysis also uncovered that hotel websites that are based on the open-source CMS WordPress (51.78% of our dataset) do not present more organic traffic than other websites. Additionally, the websites that use the Yoast SEO plugin (23.30% of our dataset) do not show more organic traffic than the other websites, which is in contrast to the so-called plugin that promotes SEO.

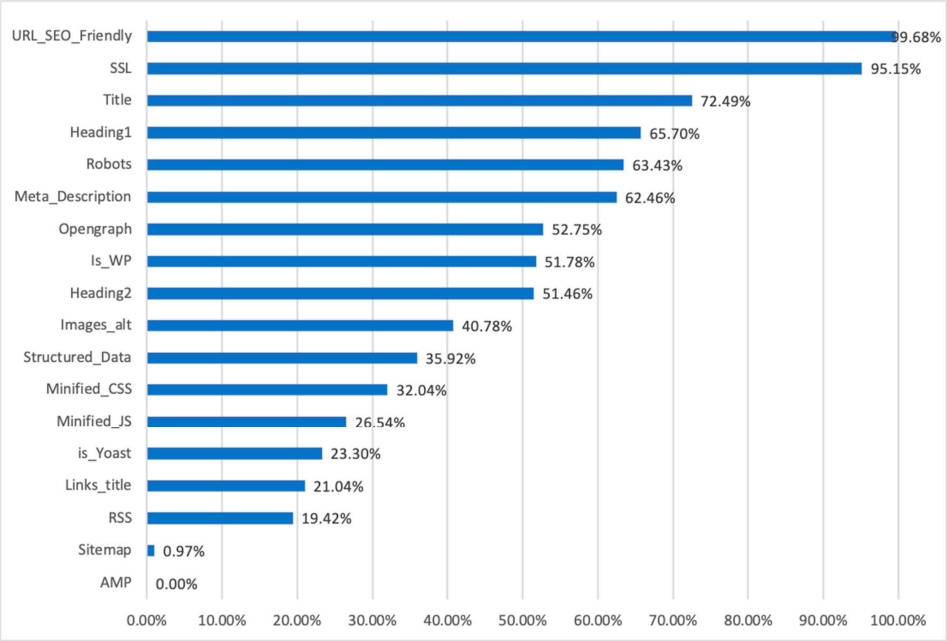

Figure 4. SEO Techniques adoption percentage.

Section 4 confirms the research hypotheses listed in Section 3.3 by conducting descriptive, regression, and t-test analysis. Our study demonstrates that on-page SEO has a sizable impact on the hotels' website traffic. The same is true for off-page SEO, where we confirm that backlinks affect hotels' websites. More precisely, increasing the beta value of backlinks by one unit results in an increase in web traffic of 0.020 visitors per month. When the beta value of keywords is increased by one unit, the hotels' web traffic increases by 0.224 visitors per month. On the contrary, despite being mentioned as a critical SEO factor in Section 2.1.11, website speed appears not to affect hotels' web traffic. Additionally, our analysis revealed a strong correlation between backlinks and domain authority.

6. Conclusions

Travel restrictions and decline during the COVID-19 era have compelled hotel companies to develop new digital marketing strategies to compete with rising competition. The majority of hotels have invested in search engine optimization to improve their websites' rankings on search engine results pages (SERPs) and, as a result, their organic traffic.

This study aims to ascertain the SEO strategies used by hotels' websites. We scan each website's source code, mining the corresponding SEO techniques used by hotels, using our own-developed tool. Simultaneously, we collect valuable time-accurate data from four third-party APIs, including domain authority, organic keywords, backlinks, and 12-month web traffic. Meanwhile, through our data analysis, we determine the most widely used SEO techniques and the impact on the traffic to hotels' websites. We conclude that SEO techniques and metrics strongly correlate with web traffic, which results in increased conversions and bookings for hotels.

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Conflicts of Interest: The authors declare no conflict of interest.

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