

Search engine optimization (SEO) for digital marketers: exploring determinants of online search visibility for blood bank service

SEO, digital marketing and blood banks

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Abstract

Purpose – Given that online search visibility is influenced by various determinants, and that influence may vary across industries, this study aims in investigating the major predictors of online search visibility in the context of blood banks.

Design/methodology/approach – To formalize the online visibility, the authors have found theoretical foundations in activity theory, while to quantify online visibility the authors have used the search engine optimization (SEO) Index, ranking, and a number of visitors. The examined model includes ten hypotheses and was tested on data from 57 blood banks.

Findings – Results challenge shallow domain knowledge. The major predictors of online search visibility are Alternative Text Attribute (ALT) text, backlinks, robots, domain authority (DA) and bounce rate (BR). The issues are related to the number of backlinks, social score, and DA. Polarized utilization of SEO techniques is evident.

Practical implications – The methodology can be used to analyze the online search visibility of other industries or similar not-for-profit organizations. Findings in terms of individual predictors can be useful for marketers to better manage online search visibility.

Social implications – The acute blood donation problems may be to a certain degree level as the information flow between donors and blood banks will be facilitated.

Originality/value – This is the first study to analyze the blood bank context. The results provide invaluable inputs to marketers, managers, and policymakers.

Keywords Online search visibility, Search engine optimization, SEO, Blood banks, Health care

Paper type Research paper

1. Introduction

Online search technology is an essential part of one's daily life (Zineddine, 2016) and has been a major disruption in the digital era. It is being utilized for answering a range of questions,



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i.e. *coronavirus updates, healthcare providers near me*. According to [Drees \(2019\)](#), daily around 1 billion questions are being asked about healthcare on Google and The Telegraph reports that healthcare-related queries account for 7% of Google's total searches ([Murphy, 2019](#)). Individuals' shift to digital has forced organizations to focus more on improving their online visibility ([Neirotti and Raguseo, 2021](#)) and the healthcare sector is also not an exception. Online visibility is a function of digital marketing, which refers to "the extent to which a user is likely to encounter a reference to a website in his or her online environment" ([Wang and Vaughan, 2014](#), p. 292), whereby search engine optimization (SEO) may help organizations to improve online visibility. The present study focuses on understanding the factors that lead to the improvement of online visibility in healthcare specifically in the blood bank context.

The advancement of the online visibility of blood banks holds importance for healthcare practitioners. For example, World Health Organization (WHO) assesses that approximately 1% of the world population needs to donate blood to level up the demand ([World Health Organization, 2010](#)). Moreover, developing countries have on average 15 times lower donation rates than developed countries ([Abbasi et al., 2018](#)). The blood bank context offers a unique perspective for understanding determinants of online visibilities for several reasons. Neither a shortage nor excess of blood is efficient. Blood shortages may increase costs whilst excess can lead to financial losses for service providers due to the costs related to blood disposal ([Aravindakshan et al., 2015](#)). The blood banks' goal is to maintain an optimal level of collected blood within a range that prevents both shortages and excess ([Aravindakshan et al., 2015](#), p. 271). Locating a blood bank would be easy for donors and seekers only if the activities related to blood collection are centralized. In the case of decentralized collection of blood, blood banks need to try actions for improving online visibility. For example, poor visibility of blood banks in online queries may cause a mismatch in the demand-supply of blood or may result in wastage of blood. Online visibility may help to bridge the gap between blood bank service providers and blood seekers.

Literature on online visibility has been vocal on its influence on enhancing economic value (i.e. firm performance) ([Wang and Vaughan, 2014](#)) and has been silent on what leads to increment into online visibility. For example, [Wang and Xu \(2016\)](#) investigated the role of web visibility in improving firm performance in the form of improvement in asset efficiency and the form of improvement in market value. Past literature on online visibility suggests that the better the visibility greater the shareholder value ([Wang and Vaughan, 2014](#)). A stream of research also links web visibility with web traffic ([Drèze and Zufryden, 2004](#)). Overall, online visibility has been investigated from an outcome perspective through web trafficking ([Moreno and Martinez, 2013](#); [Wang and Xu, 2016](#); [Ziakis et al., 2019](#)) and has not been investigated from a determinant's perspective. To address this research gap, the present study uses measures such as SEO index, visitors, and web ranking as a proxy to online visibility and tries to explore the determinants in the healthcare service context. Accordingly, the broad research question the present study tries to answer is, how to enhance online search visibility in healthcare?

The present study tries to contribute theoretically and managerially to the online visibility literature on multiple fronts. Firstly, we use activity theory to explain how on-page, off-page, and technical determinants affect online visibility. Secondly, many industries lean on SEO methodologies to boost their online search visibility. However, there is a major gap in investigating the prosocial sphere and health sector in general. Thirdly, we use different measures of capturing online visibility: SEO index, visitors, and ranking. Those have been hardly investigated in search visibility literature. Practically, the present study provides knowledge to blood banks to improve their online search visibility and optimization. The results of our study may help blood banks to strengthen their digital communication channels and their specifics in attracting and retaining donors. Also, it can assist blood bank practitioners in optimizing blood storage and may help in avoiding wastage of blood and to timely cater information needs by improvements into online visibility.

The paper proceeds in the following way: the next section deals with tenets of activity theory and its relevance to the present study. Afterward, the literature about online search behavior and the literature on determinants of online visibility have been discussed. The subsequent section contains the methodology part, whereby the concluding part of the study contains results, discussion, and implications.

2. Related work

2.1 Online information retrieval and activity theory

The activity theory has been recognized as a framework that depicts individuals' information seeking (Xu, 2007; Pettersson, 2021). It considers individual behavior in terms of activity systems that are goal-directed (Artemeva and Freedman, 2001, p. 167). This theory observes the whole totality of elements involved in information-seeking, whereby it implies activities that capture individuals' cognitive state, actions, information retrieval systems (IRS), and documents (Pettersson, 2021). Moreover, it depicts external elements in form of IRS and retrieved documents. Importantly, it observes IRS as a dynamic element (Xu, 2007), which emphasizes its role, as all information seeking is channeled through it. Nowadays, individuals online frequently interact with IRS and present documents (Pettersson, 2021). The theory is well established and has been frequently utilized in the IRS literature (Artemeva and Freedman, 2001; Xu, 2007; Allen *et al.*, 2011), and in a similar environment (Uden *et al.*, 2008; Spais, 2010). It can be major assistance when one needs to conclude terms of actions and impact on participants, goals, and other activities (Engeström, 2000; Pettersson, 2021). To be able to manage individuals' information behavior effectively, the dominant features of the IRS, need to be understood accordingly. These can be critical tasks in sectors like health care, journalism, etc.

It is expected that as the population grows, the health information seeking behavior (HISB) will intensify (Jacobs *et al.*, 2017) and that a crucial role in the information dissemination will be upon service providers (Szmuda *et al.*, 2020) and websites (Liu, 2020). HISB influences individuals' decisions on the selection of health care service providers (Li *et al.*, 2016; Olagoke *et al.*, 2020). Jacobs *et al.* (2017) claim that health care information is one of the most searched domains online. Practically, inflating pressure on service providers to position themselves and provide comprehensive health information. Google (2020a) recently formalized this type of website as a health care information page. Rosenbaum and others (2018) contend that “digital extensions” administer over 80% of HISB online. Given the challenges when assessing the relevancy of health information sources (Yilma *et al.*, 2019), the timely distribution of health information is crucial (Li *et al.*, 2016; Liu, 2020; Olagoke *et al.*, 2020). The credibility of health care information sources and the systematic positioning of websites for specific key terms are of utmost importance for service providers (Madathil *et al.*, 2015). Wherein, failing to position websites for a particular search query may lead to unavailability or partial availability of information – with adverse long-term impact (Arlitsch *et al.*, 2013; Yilma *et al.*, 2019). Essentially, it is important to reach, acquire new clients, and retain the existing ones (Chaffey *et al.*, 2019). With the rise of the IRS, the visibility of health-related information has risen exponentially (Olagoke *et al.*, 2020). Yaya and Ghose (2018) argue that decision-makers increasingly adopt various IRS to improve health care service delivery. Yet, a hallmark problem remains to be the findability of accurate and credible sources that will respond accordingly to HISB.

2.2 Online search behavior and SEO

The majority seek information online (Vaughan, 2014; Li *et al.*, 2016; Rosenbaum *et al.*, 2018) as they search for information to make more “need-satisfying” decisions (Leonhardt *et al.*, 2020). They connect with their networks or consult some of the many IRS available. At this stage,

individuals possess low domain knowledge and proactively trigger HISB (Mladenović *et al.*, 2019). Online, HISB is based on queries that consist of a set of keywords (Yilma *et al.*, 2019) whereby individuals' information need has been transmitted to the IRS (Ma, 2018). Due to the changing search behavior (Mladenović *et al.*, 2019), health care service providers must ensure continuous visibility on the search engine result page (SERP) (Kim *et al.*, 2019), and must provide relevant answers to HISB. Importantly, the proper response to HISB can improve the overall availability of health care services and influence. Therefore, SE is the primary medium for IRS as a massive portion of the information is channeled through them (Vaughan, 2014; Baye *et al.*, 2016) - depicted with the activity theory and its behavioristic framework to recognize SE as an IRS (Spais, 2010). According to NetMarketShare (2020), Google positioned itself as the dominant SE for desktop and mobile devices, with a respective 69.3 and 94.8% market share. Zuze and Weideman (2013) claim that websites ranked first in SERP get 32.5%, while those ranked second get 17.6% of the total visitors. Whilst Petras *et al.* (2017) found that those ranked in the first five positions in SERP acquire more than 65% of visitors - confirming arguments by Yilma *et al.* (2019) and Broussard and Zhang (2013). They claim that individuals are clicking on search results on top of the page believing that those are the most relevant ones. This is a great motivator for health care service providers to embrace SE and SEO as a marketing methodology.

Weideman (2009) defined SEO as a method to improve online visibility in terms of the quantity and quality of visitors that commit themselves to the desired action. According to Özkan *et al.* (2020), more than two hundred fifty elements are assessed to rank a website in a particular manner. The problem is that the full list of determinants is kept in secrecy (Bonart *et al.*, 2020; Strzelecki, 2020; Salvi *et al.*, 2021), which led to the scarcity of SEO investigations (Nagpal and Petersen, 2020; Matošević *et al.*, 2021). As a partial remedy to the non-transparency, SEO tool providers publish studies that rely on correlation coefficients - whereby high correlation implies a strong influence on online search visibility (Mavridis and Symeonidis, 2015; MOZ, 2020) (see Table 1).

One of the major indicators of online visibility and search potential is SEO Index, a computed metric developed by the WooRank. It measures how visible and accessible the website is (Ziakis *et al.*, 2019), and formalizes its popularity. Although a wide scope of individual indicators is available (Ali and Gul, 2016), only a fraction is scholarly verified (Matošević *et al.*, 2021). Ranking on SERP is one of the crucial signals that reflect website performance (Özkan *et al.*, 2020). The number of visitors is the cornerstone indicator that is the single most observed metric (Salvi *et al.*, 2021). Essentially, good online search visibility implies a high ranking, SEO index, and a growing number of visitors over time.

2.3 Determinants of online visibility and hypotheses development

Hereby, we focus on the determinants as documented in previous studies (Moreno and Martinez, 2013; Giomelakis and Veglis, 2016; Krstić and Masliković, 2019; Ziakis *et al.*, 2019; Nagpal and Petersen, 2020) and indicated by the industry leaders (Searchmetrics, 2019; SEMrush, 2020; MOZ, 2020). Determinants are categorized into three groups that quantify various aspects of online searchability and findability:

- (1) On-page determinants - ALT Text, URL, and Bounce Rate (BR);
- (2) Off-page determinants - backlinks, social score, and domain authority (DA) and
- (3) Technical determinants - speed score, mobile-friendliness, Sitemap and robots.

2.3.1 *ALT text.* While algorithms and crawlers' functionality significantly improved over the last years, they are still not capable of visualizing what the appearance of an image is (Zhang and Cabage, 2017). Therefore, webmasters incorporate ALT text, to increase website

Authors	Focus	Findings
Wang and Vaughan (2014)	To analyze and test the business value of online search visibility	Major findings indicate a positive relationship between online visibility and shareholder value
Wang and Xu (2016)	Implications of online visibility on firm heterogeneity whereby authors analyze the value creation process of firm web visibility	Visibility is a significant determinant of a firm's overall performance
Serrano-Cinca and Muñoz-Soro (2019)	To investigate if municipal's websites are ranking high in SERP	Mixed findings, with inconclusive results. The authors proposed a set of indicators to follow in terms of online search visibility
Ziakis <i>et al.</i> (2019)	Reviewed the ranking factors that affect the ranking of websites	Major factors influencing ranking are SSL certificate, URL structure, and backlinks
Kostagiolas <i>et al.</i> (2020)	Investigation of online visibility of five large publishers of scientific work	More studies are needed to understand the relations between the publishing industry and online search visibility
Strzelecki (2020)	Why Google is decreasing the visibility of websites that present health information?	SE decreases visibility is that they do not meet high-ranking criteria
Neirotti and Raguseo (2021)	To what extent online visibility affects the performance of hotels primarily through user-generated reviews?	Online search visibility has a positive effect on profitability
This study	To investigate the critical determinants of search visibility of health care service providers and success factors	Major predictors of online search visibility are ALT text, backlinks, robots, domain authority (DA), and bounce rate (BR). Issues are related to the number of backlinks, social score, and DA. Polarized utilization of SEO techniques is evident

Source(s): Authors

Table 1. Relevant studies focusing on online search visibility

accessibility and appeal for SE. If SE incorrectly interprets the images, websites may be ranked for inappropriate keywords or not ranked completely (Krstić and Masliković, 2019). Another benefit of having ALT Text is that it will be displayed instead of an image if for some reason files cannot be loaded and displayed (Aswani *et al.*, 2018). This is very important for visually impaired individuals, as the browser can read what the image is representing. Thus, we posit:

H1. The existence of ALT Text positively affects the SEO Index, ranking, and a number of visitors.

2.3.2 *Uniform resource locator (URL)*. According to Strzelecki (2020), URL is the first thing that is noted by SE and visitors. To provide more information about web pages, URLs should be composed in a way to include relevant keywords. URL must remain meaningful to visitors, crawlers, and SE (Zhang and Cabage, 2017). Therefore, one of the essential SEO approaches is the composition of URL in such a way as to unequivocally direct attention toward important keywords (Google, 2020b). Therefore, we hypothesize:

H2. The inclusion of keywords in URLs positively affects SEO Index, ranking, and the number of visitors.

2.3.3 *Bounce rate (BR)*. According to Zhang and Cabage (2017), one of the metrics that should be observed to capture visitors' engagement is the BR. Giomelakis and Veglis (2016) believe that this interaction metric plays a significant role in organic search results as it measures,

single-page visits. BR captures if visitors spend some time and engage with the website (hereby of blood banks), or leave without any traceable commitments (Enge *et al.*, 2015). It is to assume that if the BR is high, the website is not informative enough. This can have negative ramifications; therefore, we propose:

H3. High BR is negatively related to SEO Index, ranking, and the number of visitors.

2.3.4 *Backlinks*. Ziakis *et al.* (2019) claimed that backlinks are significant for SEO. They believe that the structure and quality of backlinks affect ranking and number of visitors significantly and that utmost attention should be dedicated to long-term backlink management. Earlier, Zineddine (2016) argues that links from other web places serve to upvote the value of the websites – presenting one of the basic requirements for a website to be ranked high in SERP. Nowadays, SE filters fraudulent backlinks to ensure reliability (Luh *et al.*, 2016). Failing to structure backlinks properly can affect negatively inbound traffic through adverse ranking, SEO Index, and the total number of visitors (Berman and Katona, 2013). Therefore:

H4. Higher number of backlinks is positively related to SEO Index, ranking, and the number of visitors.

2.3.5 *Social score*. To generate additional inbound traffic, SE calculates Social Score (Ziakis *et al.*, 2019). Recently, presence on social media has become a necessity and a channel that is proactively exploited to communicate with audiences (Mladenović *et al.*, 2019). Korzynski and Paniagua (2016) believe that Social Score is one of the most significant ranking factors. By observing social interactions, SE can leverage their well-established positions (Krstić and Masliković, 2019) and harvest vast data they possess to deliver relevant SERP (Mavridis and Symeonidis, 2015), directly impacting SEO Index, ranking, and the number of visitors.

H5. Higher Social Score is positively related to SEO Index, ranking, and the number of visitors.

2.3.6 *Domain authority (DA)*. DA is a single score computed by MOZ, and it predicts how high the website will appear in SERP. DA incorporates several elements (MOZ, 2015) and is displayed on a logarithmic scale (from 1 to 100). It is expected that websites with a remarkable number of backlinks score higher, whilst less known tend to have lower DA scores (Serrano-Cinca and Muñoz-Soro, 2019; Patel, 2020). Yet, it should primarily serve to compare websites, as there is no acceptable or non-acceptable DA. Therefore, we posit:

H6. Higher DA is positively related to the SEO Index, ranking, and the number of visitors.

2.3.7 *Speed score*. An important element that impacts ranking in SERP is site speed (Enge *et al.*, 2015; Schubert, 2016) which measures websites' download speed. This determinant emerged out of the stronger inception of technology in HISB. It strongly correlates with the user experience (UX), whereby longer loading times tend to have higher BR and modest visitor engagements (Shahzad *et al.*, 2018). Consequently, we hypothesize:

H7. The higher the speed score, the higher the SEO Index, ranking and the number of visitors is to expect.

2.3.8 *Mobile-friendliness*. SE continuously measures how mobile-friendly are websites (Krstić and Masliković, 2019). 94% of the individuals engage in HISB on mobile devices (Strzelecki and Rutecka, 2020). Somewhere, the number of phones has surpassed the number of personal computers (Drivas *et al.*, 2020). Since 2015, Google includes mobile-friendliness as part of the assessment, implying that poor mobile experience will result in modest-to-poor (Schubert, 2016; Dror *et al.*, 2020). From the client's perspective, it may be difficult to browse such websites, which translates into high BR (Aswani *et al.*, 2018). Hypothetically:

H8. Mobile-friendly websites, have a better SEO Index, ranking, and a higher number of visitors.

2.3.9 Sitemap. Sitemaps are outlines of websites and they make navigation between pages more convenient (Zineddine, 2016). Besides, sitemaps communicate changes in websites' structure (Serrano-Cinca and Muñoz-Soro, 2019) and assist SE to index all pages. To achieve a high ranking in SERP, the website must have a sitemap. Improperly defined sitemaps may result in the exclusion of important sections of the website (Ziakis *et al.*, 2019) – which consequently results in the following hypothesis:

H9. The existence of sitemaps positively affects the SEO Index, ranking, and the number of visitors.

2.3.10 Robots. The purpose of robots is to communicate to SE how to engage with websites' content (Scott, 2015), and indicate which sections of websites are not to be indexed (Ziakis *et al.*, 2019). Practically, robots have multilayered utilization: (1) prevention of duplicate content, (2) keeping sections of a website private, (3) specifying the sitemap location, (4) preventing SE from indexing, (Thakur *et al.*, 2011) etc. It is critical to configure this file properly (Zineddine, 2016), otherwise, the website may not get indexed. On these grounds, we hypothesize:

H10. The existence of robots positively affects the SEO Index, ranking, and the number of visitors.

3. Methodology

The dataset is based on real-life interactions or clickstream data (Nguyen *et al.*, 2018) from third-party providers. Clickstream data can be defined as electronic records or logs of each online user to a web estate (Bucklin and Sismeiro, 2003). Given their scope, quantity, and real-time accumulation, clickstream data are considered highly reliable sources for further analysis of online user behavior (Kumar *et al.*, 2019). To date, clickstream data have been used in multiple studies to understand various aspects of consumer-user online behavior. For instance, purchase intention online (Bucklin and Sismeiro, 2003), Internet portal selection (Goldfarb, 2014), exposure to various online advertising (Rutz *et al.*, 2012), online information retrieval and search behavior (Johnson *et al.*, 2004), user engagement in social media communities (Kumar *et al.*, 2019), etc. Considering that SE can obtain personalized and access data effortlessly, we have used several access locations whilst browsing. Additionally, we switched off Google Personal Results and we have continuously been deleting cookies. These approaches are suggested by Google (2020b) and literature (Ziakis *et al.*, 2019). We have checked if blood banks have mobile applications – as those are separate acquisition channels that can affect online visibility (Schubert, 2016). There are no registered applications. As sponsored visitors may influence online visibility (Nagpal and Petersen, 2020), we reviewed if blood banks have had advertising campaigns before and during the observed period. There was no proof of search engine marketing at the time.

3.1 Design and procedure

To investigate the online visibility of blood banks' websites, the analysis of determinants is divided into three groups: (1) on-page, (2) off-page, and (3) technical. The first group includes variables that are related to web page management and are internally managed and controlled. Off-page determinants reflect elements that are relevant for search visibility, yet not under management's direct control. The last group implies various technical aspects of a website so that it gets a better overall position in SERP. We have primarily based our list of

variables based on the [Searchmetrics \(2019\)](#) list of determinants of search visibility applicable to the health sector. To perform the analyses and determine the significance of the determinants, the following variables have been operationalized ([Table 2](#)).

The raw data were collected during the second part of 2020 and statistical analyses were performed to verify the predictive power of independent variables. We sourced data from renowned third-party providers that are industry leaders (Google, SemRush, MOZ, Woorank, etc.). Although in diverse contexts, a similar approach to retrieving clickstream data was taken by an array of other scholars ([Zuze and Weideman, 2013](#); [Giomelakis and Veglis, 2016](#); [Krstić and Masliković, 2019](#); [Drivas et al., 2020](#); [Aswani et al., 2018](#); [Serrano-Cinca and Muñoz-Soro, 2019](#); [Kostagiolas et al., 2020](#); etc.). In general, retrieving of clickstream data is empirically verified on a substantial number of occasions ([Li et al., 2020](#)) and the results tend to be robust and reliable ([Kumar et al., 2019](#)).

Structural equation modeling (SEM) was performed as it was suitable given the present research design, data set, and sample size. As per [Fornell and Bookstein \(1982\)](#), SEM is a suitable statistical approach for small samples with many quantified variables and constructs. [Hair et al. \(2019\)](#) claim that SEM is a reliable approach that provides robust results in the case of archival data when one of the research goals is to better understand the “increasing complexity” of an observed phenomenon, and when there are distribution issues of data (e.g. lack of normality due to sample size). Moreover, SEM is already used in similar attempts to decipher the role of SEO in firms’ activities (see [Aryshandy et al., 2021](#)).

3.2 Sample and research context

To investigate major determinants of online search visibility, blood banks’ websites have been cross-examined. Blood banks have been selected as their continuous operation implies that they must ensure (1) continuous acquisition of new donors; (2) conversion of trial donors to loyal donors and (3) high retention rates ([Newman and Pyne, 1997](#)). Since websites present important acquisition and retention channels, blood banks are under pressure to ensure long-term positioning in a digital environment ([Chaffey et al., 2019](#)). Websites positioned themselves as a conjunction between health care service providers and individuals eager to take on their services, or simply being involved in HHSB. Fifty-seven blood banks have been identified, with their websites ([Společnost pro transfuzní lékařství ČLS JEP, 2020](#)). The context of Czechia has been chosen as it experiences a permanent long-term deficit in blood supply ([Czech Red Cross, 2020](#)). It is assumed that blood banks will invest resources to acquire new donors and to keep the existing ones –similarly to the commercial entities ([Sa Vinhas and Bowman, 2019](#)). In terms of Internet access, around 88% of the population has access to high-speed Internet ([CZSO, 2021](#)).

4. Results and data analysis

SEM indicates adequate model fit ($\chi^2 = 299.22$, $df = 88$, $\chi^2/df = 2.103$, $p < 0.001$, GFI = 0.91, AGFI = 0.84, CFI = 0.89 and RMSEA = 0.051). Yet, the results are of mixed nature ([Table 3](#)).

Blood banks’ websites scored high in terms of mobile-friendliness, robots.txt, and BR. Websites are mostly readable, mobile-friendly, and they have defined robot files to assure proper indexing. In comparison to industry benchmarks, the observed sample indicated lower BR implying that visitors engage more with the website. However, improvements are possible when it comes to ALT Text, URL, sitemaps, and the speed score. There are major variations of these four on a national level. Blood banks in metropolitan areas perform better in comparison to smaller ones. The centralization of expertise is evident, which arises as one of the major concerns for the future. The biggest issues are reported in terms of off-site determinants (backlinks, Social Score, and DA). As most blood banks score low on these

Variable	Measurement	Remark	Tool	Definition	
Dependent	SEO Index	1–100	1–30 - poor; 31–60 - good; 61–80 - very good; above 81 – excellent	Woorank	A relative number used to quantify the overall performance of a webpage
	Visitors ^a	–	–	SimilarWeb	A nominal number of visitors to a respective website
	Ranking ^b	–	–	Rank Chequer	Nominal position in SERP
On-Page	ALT Text	0; 1	0 – no; 1 – yes	Woorank	Indicates how content (images, graphics, etc.) relates to a webpage or document
	URL	0; 1	0 – no; 1 – yes	SEO Review Tool	It is the exact web address of an individual web estate
	BR ^b	1–100	–	SimilarWeb	Percentage of users that departs the website after only engaging with a single webpage
Off-Page	Backlinks	–	–	Woorank	A link from one website to another website
	Social Score	1–100	–	SEO Review Tool	Social signals (e.g. shares, likes, comments, etc.) indicate to SE that the content or website is credible
	DA	1–100	–	MOZ	It predicts how likely is that website will be ranked favorably in SERP
Technical	Speed Score	1–100	–	Google Speed Test	Reports the performance and speed of loading of web pages or websites
	Mobile-Friendliness	0; 1	0 – no; 1 – yes	Google Mobile-Friendly test	The performance of a webpage or website on mobile devices
	Sitemap	0; 1	0 – no; 1 – yes	Woorank	A file that provides essential information on the website's structure
	Robots	0; 1	0 – no; 1 – yes	Woorank	A text file consisting of instructions for SE crawlers (e.g. which webpages should and should not be indexed)

Note(s): ^a Higher value indicates better performance and ^b lower values indicate better performance
Source(s): Authors

Table 2. Overview of used variables

scales, it unfavorably affects the ranking, SEO Index, and several website visitors. Moreover, there is a widely spread trend not to act proactively on social media (modest Social Score). There seems to be not enough high-quality content that would enhance social media engagement and influence DA. Off-page determinants are reportedly the most crucial

Determinant	Relationship From → To	Unstd	Model	Std
On-Page	ALT text → SEO Index	0.41**		0.33
	ALT text → Visitors	0.32**		0.19
	ALT text → Ranking	0.18*		0.13
	URL → SEO Index	0.16		0.12
	URL → Visitors	0.08		0.03
	URL → Ranking	0.06		0.21
	BR → SEO Index	0.39*		0.36
	BR → Visitors	0.33*		0.34
	BR → Ranking	0.41**		0.39
	Off-Page	Backlinks → SEO Index	0.25*	
Backlinks → Visitors		0.29*		0.26
Backlinks → Ranking		0.22*		0.17
Social Score → SEO Index		0.17		0.14
Social Score → Visitors		0.25**		0.01
Social Score → Ranking		0.29*		0.31
DA → SEO Index		0.34**		0.33
DA → Visitors		0.22**		0.23
DA → Ranking		0.44**		0.35
Technical		Speed Score → SEO Index	0.11	
	Speed Score → Visitors	0.25*		0.12
	Speed Score → Ranking	0.33**		0.29
	Mobile-friendliness → SEO Index	0.11		0.12
	Mobile-friendliness → Visitors	0.15		0.09
	Mobile-friendliness → Ranking	0.34**		0.30
	XML → SEO Index	0.04		0.06
	XML → Visitors	0.22*		0.24
	XML → Ranking	0.46**		0.36
	Robots → SEO Index	0.35**		0.31
Robots → Visitors	0.25*		0.19	
Robots → Ranking	0.39*		0.37	
<i>Goodness-of-fit indices χ^2 (df)</i>			299.22 (88)**	
Goodness-of-fit index (GFI)			0.91	
Adjusted GFI (AGFI)			0.81	
Comparative fit index (CFI)			0.89	
Root Mean Square of Approximation (RMSEA)			0.051	

Table 3.
Parameter estimates
and model statistics

Note(s): Unstd = Unstandardized Coefficient; Std = Standardized Coefficient; ^a $p < 0.1$; * $p < 0.05$; ** $p < 0.01$; all other coefficients are not significant, $p > 0.1$

Source(s): Authors

category that needs urgent and competent attention. Lastly, blood banks greatly fail to activate, inspire, and create a community around ideas, goals, and activities – which can be one of the ways to engage with clients.

5. Discussion

The present findings challenge fragmented knowledge on determinants of the online search visibility – whereby most of the expected theoretical directions are not supported by the model. This implies that blood banks must approach cautiously the problem of online search visibility as there are evident sectoral specifics. The potential reason for such discrepancies can lie in SE algorithms' that consider and weigh a different set of determinants for SERP (Strzelecki, 2020).

In terms of on-page determinants, data about ALT Text and URL are collected for all blood banks' websites. Information on BR was available for only seventeen blood banks. The rest of the blood banks' websites are not indexed (as per SimilarWeb and WooRank). This can happen due to a lack of backlinks and original content, and low DA (Patel, 2020). Therefore, visitors' engagement rate decreases with adverse effects on BR. Based on analyzed data, 65% of blood banks incorporated ALT Text, whilst approximately 60% included variations of keywords in their URL. This indicates that management is aware of the necessity to accommodate visitors' information needs in terms of keywords (Zhang and Cabage, 2017). Blood banks score well in terms of BR (48%), which implies that visitors engage and consider websites informative. Indeed, the reported BR is lower than the health industry average which is 55% (Patel, 2020). Results supported the predicted direction of effect of ALT and BR on SEO Index, ranking, and visitors, whereby this aligned with the previous studies (Zhang and Cabage, 2017; Krstić and Masliković, 2019). However, URL does not have a significant impact on the observed variables. The cause can lay in the altering nature of algorithms – which is impossible to fully decipher (Matošević *et al.*, 2021). Another issue may be the “stuffing” of keywords in URL (Zuze and Weideman, 2013) and failure to set up the appropriate structure (Krstić and Masliković, 2019) – which canceled the positive effect of having keywords in the URL. Webpages duplicates can be seen as an additional issue, as they adversely impact search (Ma, 2018). Altogether, numerous research streams emerged anchored in the present outputs.

The findings in terms of off-page determinants are diverse, whereby variations in websites' scores are indisputable (backlinks, Social Score, and DA). The lack of strategic focus to achieve a higher number of backlinks, social score, and DA – is, evident. Accidental orientation combined with a potential lack of expertise led to an impoverished performance in terms of search visibility. More critical is the lack of awareness that off-page determinants may contribute to websites' visibility (Mavridis and Symeonidis, 2015) which illustrates a need for a major shift. Besides a thorough review of their SEO methodologies, blood banks must integrate these across an organization so that involved personnel is aware of their significance in the acquisition and retention of clients/donors (Arlitsch *et al.*, 2013). To improve performance in terms of off-page determinants, blood banks must increase the number of backlinks and aim to increase engagement with the produced content.

Although results reported that social score does not affect online visibility, the number of backlinks and DA are found to have a major role in determining the key metrics of online visibility – hereby confirming inputs from the literature (Ziakis *et al.*, 2019). Yet, the present results collide with the findings of Korzynski and Paniagua (2016), who contend the relation between social score and number of visits and ranking. This can be attributed to how various sectors engage with their customers on social media (Kumar *et al.*, 2019). Secondly, the volatile nature of SE algorithms makes a solid argument in explaining this case (Mavridis and Symeonidis, 2015). Lastly, the differences may be anchored in cultural contexts given its strong implication for consumer engagement and behavior on social media (Szmuda *et al.*, 2020).

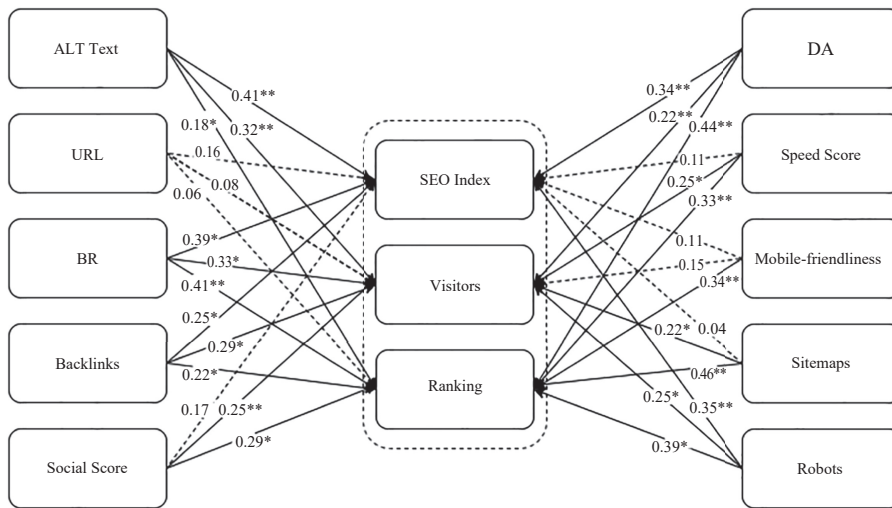
Technically, blood banks perform well in terms of speed needed for the website to load, mobile-friendliness, the existence of sitemaps, and robots. Concerns are mainly related to the loading speed, sitemaps, UX, and visitors' engagement. Websites must be properly structured and not overloaded with content (MOZ, 2020). Otherwise, clients may leave without covering their information needs. A possible explanation for modest site technical performance is a non-optimized image, no-cache policy, JavaScript not properly set, website not indexed, (Karyotakis *et al.*, 2019) etc. Moreover, failing to have sitemaps can have severe consequences on website visibility and visitors' engagement (Zineddine, 2016). As the process of sitemap installation is straightforward, one may speculate that the lack of them can be the result of negligence. On a positive note, most blood banks' websites are mobile-friendly and over 80% of them have included robot files to assist crawlers and indexing. Yet, results indicate that only robots have a direct influence on visitors, ranking,

and SEO Index. The rest of the observed relations are partially supported (Table 3). Still, Hair *et al.* (2019) believe that this may be due to the sample size, where outliers in models can significantly influence the results. Tabachnick *et al.* (2007) believe that since only a fraction of determinants is included in the model, it may result in distorted outputs. The solution would be to include the full list of determinants - which is a challenge given the difficulties to quantify them (Moreno and Martinez, 2013).

5.1 Theoretical and managerial implications

Given that the literature openly emphasizes the importance of SEO for organizations nowadays (Salvi *et al.*, 2021), the present study is the first one to investigate SEO determinants in the context of blood banks, HISB and IRS. By providing empirical evidence, we contribute to the multiple research domains (activity theory, blood banks, HISB, and online search visibility). Results are counterintuitive – which indicates sectoral inconsistencies that must be accounted for. Online visibility determinants must not be taken uniformly. Secondly, by focusing on blood banks, we contributed to decoding the complicated methodology of SEO and its relationship with the online HISB. This can be important in responding to HISB and emergencies – by understanding the keywords one is looking for. Lastly, this study contributes to the extended understanding of activity theory in terms of major factors influencing IRS operation. Essentially, the results contribute to understanding the complex methodology behind SE by shedding light on the dominant determinants in the health care sector. This can be a major input to the literature as the overall knowledge on the topic is very shallow (Ziakis *et al.*, 2019).

The present study has practical contributions as well, whereby the findings emphasize the need for strategic implementation of SEO and pinpoint critical areas that need urgent action (e.g. off-page determinants). For instance, blood banks must invest in the production of relevant content (advice, social testimonies, video instructions, etc.) and strive to increase the number of backlinks from relevant sources (e.g. by link exchange and blog articles) (Serrano-Cinca and Muñoz-Soro, 2019). This is a demanding task, yet the keyword analyses indicated several subtopics that are continuously searched online (where to donate blood, how to donate blood, frequency of donation, risks associated with donations, benefits of donations, etc.). Each keyword/phrase is a venue marketer should attend and fill out the information gap that exists. Secondly, ultimately blood banks must decrease the BR. Given that some blood banks have BR of over 70%, it indicates acute issues with the information richness and authority of the websites (Zhang and Cabage, 2017). Blood banks must implement an information architecture that is consistent with information needs and HISB – for instance by implementing detailed keyword analysis and determining what information gaps remain uncovered. Essentially, marketers should perform A/B testing or multivariate testing (De Andrés *et al.*, 2010) to empirically verify what website design fulfills the information needs of visitors in the most effective manner. Additionally, blood banks should aim to make website design as “clean” as possible in terms that only concise information is included. This is a proven method to increase visitor engagement (Sa Vinhas and Bowman, 2019) and decrease BR. Contrary to predictions (Krstić and Masliković, 2019; Strzelecki, 2020), most technical determinants do not influence SEO index, ranking, and visitors. This is important as it indicates that although blood banks perform, this does not result in significant potential of acquiring new donors and/or help in retaining the existing ones. Therefore, blood banks should focus more on elements that are empirically verified to deliver conversions (Figure 1). In general, blood banks must be aligned with a long-term objective to provide smooth service to donors and potential donors, as this directly implicates their credibility and reliability. Lastly, to efficiently manage online search visibility and SEO activities, blood banks must



Note(s): Dashed lines represent insignificance

Source(s): Authors

Figure 1. Model statistics and loadings

implement dashboards to control for critical performance indicators (Nagpal and Petersen, 2020) and proactively act on reported deviations (BR, incoming traffic, the structure of the traffic, etc.). Currently, it seems that most blood banks do not have systematic measurement and evaluation systems implemented. In case the evaluation is missing, there is a low chance of long-term success in donor acquisition and retention. As a general remark, blood banks must accept a user-oriented approach in their SEO and donors' acquisition or retention activities. Marketers must decipher how donors and potential donors retrieve information online, establish patterns and create keywords databases, etc. – in short to precisely define the profile of the donor.

The present study has a major societal implication, as it uncovers a potential centralization of expertise and resources by several metropolitan blood banks. Authorities must ensure the equal flow of information and resources to all blood banks and align their resource intake for the matter. Otherwise, the long-term deficit of blood in some regions can backfire and put additional pressure on the already over-stretched blood collection system.

5.2 Limitations and research directions

One of the major study limitations is the sample size ($N = 57$) which should be addressed to increase the generalizability. SE constantly modifies algorithms to present the most relevant SERP. In the case of replication, an updated collection of SEO determinants must be considered. As the data originated from third parties, authors were facing restrictions in terms of type and quantity of available data. It is recommended to use premium platforms (SEMrush, Alexa) to retrieve data, as the reliability will be improved. Topically, future studies can address a wider spectrum of SEO determinants, replicate this design in another sector, investigate why mobile-friendliness is not a significant determinant, the relation of social media to SEO, incorporate experimental design to capture casual relationships, etc.

6. Conclusion

The present study investigates the major online visibility determinants of blood banks. It is theoretically anchored in activity theory whereby IRS is recognized as a major cross-point in the individual IR and HISB. It relies on fragmented SEO and HISB literature which lacks more empirical insights. Fifty-seven blood banks in Czechia have been analyzed using the spectrum of available tools. The scope of investigation included on-page, off-page, and technical SEO determinants. The results greatly challenge previous knowledge that mainly originated in commercial sectors. Blood banks essentially have a modest online visibility, with several exceptions that are related to those providers located in metropolitan areas. Generally, a major shift is needed to ensure that blood banks and authorities implement and maintain SEO methodologies in the long run. To harvest benefits in terms of client acquisition and retention, SEO must be a strategic marketing orientation. The major concern on a macro level is the evident centralization of SEO expertise to only a few blood banks on a national level. Dispersion of knowledge and resources related to the application of SEO methodology in the health care sector is necessary to achieve synergy, increase the number, and increase the retention rates of clients (resp. blood donors).

In terms of the critical spheres of blood banks' online search visibility, several determinants emerged. Blood banks poorly manage off-page factors (backlinks, social score, and DA) as they are on average low. There is an urgent need to accommodate this as off-page factors indeed influence online search visibility (backlinks and DA). The space for improvements exists when it comes to ALT Text, URL, sitemaps, and loading speed of websites. Lastly, Czech blood banks' websites perform well in terms of technical ranking factors. As for the predicted effect on SEO Index, ranking and number of visitors, and major determinants, mixed results are present. Hypotheses concerning ALT Text, BR, backlinks, robots, and DA are supported by the models. Mixed results are obtained in terms of URL, social score, speed score, mobile-friendliness, and sitemaps. Further studies would be needed to investigate more profoundly the nature of relations and eventual deviations from the accumulated knowledge and enhance generalization.

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