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# CONTRIBUTIONS OF SEARCH ENGINE OPTIMIZATION TECHNIQUES TO INFORMATION FINDABILITY

## Contribuições das técnicas de search engine optimization para encontrabilidade da informação

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## ABSTRACT

**Objective:** To demonstrate the contributions of Search Engine Optimization techniques to Information Findability in digital information environments.
**Method:** Bibliographic research on Search Engine Optimization techniques and Information Findability in the field of Information Science was used as the methodology with a qualitative approach.
**Result:** The results indicate that Search Engine Optimization techniques play a significant role in the capacity to find information on the Web, optimizing the attributes that favor the visibility of content in search results.
**Conclusions:** It was concluded that, with the use of Search Engine Optimization techniques and technologies together with the attributes of Information Findability, it is possible not only to improve IF in digital environments but also to increase relevance and authority in the online environment, allowing users to easily find the information they need, thus contributing to the effectiveness of information systems.
**KEYWORDS:** Search Engine Optimization. Information Findability. SEO.

## RESUMO

**Objetivo:** Demonstrar as contribuições das técnicas de *Search Engine Optimization* para a Encontrabilidade da Informação em ambientes informacionais digitais.
**Método:** Utilizou-se como metodologia a pesquisa bibliográfica com abordagem qualitativa sobre as técnicas de *Search Engine Optimization* e Encontrabilidade da Informação, no campo da Ciência da Informação.
**Resultado:** Os resultados indicam que as técnicas de *Search Engine Optimization* desempenham um papel significativo na capacidade de se encontrar informações na *web*, otimizando os atributos que favorecem a visibilidade do conteúdo nos resultados de busca.
**Conclusões:** Conclui-se que o uso das técnicas e tecnologias de *Search Engine Optimization* em conjunto com os atributos da Encontrabilidade da Informação, é possível não só melhorar a EI em ambientes digitais, mas também aumentar a relevância e a autoridade no ambiente online, permitindo que os usuários encontrem com facilidade as informações de que necessitam, contribuindo para a efetividade dos sistemas de informação.
**PALAVRAS-CHAVE:** *Search Engine Optimization*. Encontrabilidade da Informação. SEO.

## 1 INTRODUCTION

With the progress of the World Wide Web (WWW), the adoption of Information and Communication Technologies (ICT) has grown exponentially in recent years in the sense of the production of information, which is accessible by different subjects and devices. Information and Communication Technologies have fostered the ways of accessing and using information by providing the exchange of data between different systems and the production and availability of information, in digital environments, by information subjects (VECHIATO; VIDOTTI, 2014).

This scenario stimulates the employment and creation of technologies to provide autonomy of use and selection of tasks to be performed. At this juncture, the need arises to organize, represent, identify, locate, search, find, and filter information according to its relevance in digital environments.

Thus, based on the development of digital information environments in which the human being is the main actor, it becomes necessary to study the capacity of these environments to provide information retrieval, aiming at the ease of a user in finding it. The possibility of a relationship between the Search Engine Optimization (SEO) techniques and Information Findability (IF) is centered on how information will be represented, found, and used, considering the context, content, and user aspects, as proposed by Morville and Rosenfeld (2006).

In this perspective, the concept of Information Findability stands out, in this work, from the idea of how information is sought and how it may be found by users of an informational ecology (BRANDT; VECHIATO; VIDOTTI, 2018). According to Oliveira and Vidotti (2016, p. 97),

> [...] Complex Informational Ecologies are like a set of spaces and environments (analog, digital, or hybrid), technologies (analog, digital, or hybrid), and subjects, all interconnected and intertwined holistically by information.

Search Engine Optimization is a set of techniques that helps Web content increase its chances of appearing among the first results of the rankings of search tools such as Google and Bing (DAVIS, 2006; ENGE et al., 2012; ORDUNA-MALEA; ALONSO-ARROYO, 2017). Once properly applied, they will render a website more visible and well-positioned in search engines (LEDFORD, 2015).

Therefore, adopting SEO techniques, such as using keywords, access metric studies, and other techniques that aim to improve webpage positioning in search engines, constitutes the entire structure of resources that form SEO. However, considering the SEO techniques that guided and conducted this research, the following is asked in this work: in the process of developing digital information environments, how may SEO techniques contribute to the Information Findability process?

Thus, the present study aimed to demonstrate the contributions of SEO techniques to Information Findability in digital information environments.

For such, this work conducted bibliographic research on Search Engine Optimization techniques and Information Findability in the field of Information Science with a qualitative approach, using as sources the databases Web of Science (WoS), Scopus, and *Base de Dados em Ciência da Informação* (BRAPCI, Information Science Database). With the purpose of retrieving informational resources related to the field, the search expression "search engine optimization AND findability" and its translation into Portuguese "*otimização mecanismos de busca* AND encontrabilidade" were used as search parameters and simple searches were executed in all fields of the record and without limitation of publication date.

## 2 INFORMATION FINDABILITY IN DIGITAL ENVIRONMENTS

The World Wide Web (Web) and the way information is accessed and applied in digital information environments have become relevant research areas due to continuous technological, social, and cultural changes. In this sense, there is a need to develop interfaces between different theoretical and technical frameworks in order to understand and facilitate the interaction of users with the information available on the Web (CONEGLIAN et al., 2019).

IF studies stem from contributions by Morville (2005) on findability; according to the author, the term is related to the thought of how to "find a piece of information" on the Web, envisioning the possibility of providing it to the degree of how information is found, made available, structured, and made understandable to users (CAMPOS; SOUSA; OLIVEIRA, 2021). In Brazil, the scientific concept incorporated into Information Science was presented by Vechiato (2013), who proposed the Information Findability Attributes (IFAs), the Information Findability Model (IFM), and the Information Findability Recommendations (IFRs).

Moreover, Vechiato and Vidotti (2014) stated that to promote IF, it is necessary to think about the possibilities of its production, organization, representation, storage, and preservation, emphasizing access, use, and appropriation. Regarding the IFAs, the authors considered that they go through numerous steps, transitioning from the information cycle, such as production, representation, and dissemination, to storage and preservation. These attributes are conceptualized as characteristics that foster the possibility for users to find information in an information system or environment. We demonstrate the IFAs, according to Vechiato and Vidotti (2014), thus identified: navigational taxonomies, terminological control instruments, folksonomies, metadata, mediation of computer scientists, *affordances*, *wayfinding*, information discovery, accessibility and usability, mediation of information professionals, mediation of informational subjects, intentionality, mobility, convergence, and ubiquity.

Chart 1 presents the IFAs, which should be reflected in the development of digital information environments.

Chart 1 – Information Findability Attributes

| Attribute | Description |
|---|---|
| **Navigational taxonomies** | Used in top-down organization structures, they refer to the organization of information categories with a view to facilitating navigation and information discovery. These categories, for example, are usually organized in menus or the body of webpages, in the communities and collections of repositories, or in the captions used to describe the subjects on library shelves, previously organized from a classification system. According to Aquino, Carlan, and Brascher (2009), navigational taxonomies must be supported in the following aspects: coherent categorization of matters relative to the understanding of subjects; terminological control to reduce ambiguity; hierarchical relationship between terms; multidimensionality, allowing a given term to be associated with more than one category according to the context of use. |
| **Terminological control instruments** | Comprise controlled vocabularies, such as thesauri and ontologies, to support the representation of informational resources. |
| **Folksonomies** | They are related to the social organization of information and provide the subject with the classification of informational resources and finding information through navigation (a tag cloud, for example) or search engines, expanding the possibilities of access. They are used in bottom-up organization structures. When associated with controlled vocabularies and semantic technologies, they enhance the possibilities of Information Findability. |
| **Metadata** | Comprise the representation of informational resources and are stored in databases for information retrieval purposes. |
| **Mediation of computer scientists** | Associated with the development of systems, devices, databases, and interfaces with the use of computational languages, with a view to the management and retrieval of information. |
| **Mediation of information professionals** | Occurs in informational environments in which there are institutional subjects involved in the selection, structuring, and dissemination of information. |

| Attribute | Description |
|---|---|
| **Mediation of informational subjects** | Related to the info-communication actions that informational subjects undertake in any information systems and environments, for example, concerning the production and organization of information and knowledge in collaborative environments, generated from their knowledge, behavior, and competencies that characterize their Intentionality. |
| ***Affordances*** | They function as incentives and clues that objects have and provide subjects with the performance of specific actions in the interface of the environment. These actions are related to orientation, location, findability, access, and discovery of information, among others. |
| ***Wayfinding*** | Associated with spatial orientation, using aspects that facilitate the localization, findability, and discovery of information through navigation in the interface of the environment. |
| **Information discovery** | It is conditioned to the other Information Findability Attributes concerning the facilities that the interface (navigation or search engines) offers to find the information appropriate to the informational needs of the subject, as well as to possible background informational needs. |
| **Accessibility and Usability** | Related to the ability of the system to allow equitable access to information (accessibility) within the scope of the target audience established in a project with inherent facilities for the use of the interface (usability). |
| **Intentionality** | The theory of Intentionality underlies the importance of emphasizing the experiences and skills of informational subjects in designing information environments and systems. |
| **Mobility, Convergence, and Ubiquity** | Associated with the natural environment, external to information systems and environments, but which include them, dynamizing them and enhancing the possibilities of subjects in finding information through different devices and in different contexts and situations. |

Source: adapted from Vechiato and Vidotti (2014)

## 3 *SEARCH ENGINE OPTIMIZATION TECHNIQUES*

Currently, applying SEO techniques and technologies to digital information environments, regardless of the sector in which they are inserted, is imperative. The increased use of the Internet, the new Web search consumption habits, the growing competition, and the great need to obtain qualified organic traffic without paid ads and changes to search engine algorithms are just the beginning for the survival of these environments. Under these circumstances, SEO techniques and technologies emerged, aiming at the need to optimize digital information environments according to the guidelines of search engines in order to obtain a better ranking among search results.

Now, the concept of SEO is multifaceted, as some understand it as a set of techniques (GANDOUR; REGOLINI, 2011), others as a practice (MCVITTIE, 2012), a process (JONES, 2008), or a science (LEDFORD, 2015), considering still other authors who define it as art (LIEB, 2009) aiming to improve the volume and quality of users in digital information environments through organic search results (LIEBERAM-SCHMIDT, 2010). Hence, it is stated that SEO is the fusion of techniques and technologies that aim to improve

the visibility and traffic of a digital information environment among the organic search results of search engines, seeking, as a consequence, to improve its ranking in the SERP since, to achieve this purpose, it is necessary to handle metadata and other optimization techniques to help search engines better understand the content of a website and rank relevantly for user search queries. These techniques include the careful selection of keywords, the creation of high-quality and relevant content, the optimization of page titles and descriptions, link building, and many other strategies.

SEO may be divided into several phases or steps, which include:

a) keyword search and analysis: this phase involves identifying the keywords relevant to the information environment and target audience. It is important to choose keywords that have a reasonable search volume and are relevant to users and the business (MALAGA, 2008).

b) technical audit of the website: in this phase, an analysis of the website is performed to identify technical problems capable of affecting its ability to be crawled by search engines or the user experience, such as loading times, coding errors, or a lack of compatibility with mobile devices (PUERTAS-HIDALGO; CARPIO-JIMÉNEZ, 2020).

c) on-page SEO: these techniques refer to practices implemented within a website or page to improve its ranking in search engines. Some on-page SEO techniques include the following: a) keywords: identify and use keywords relevant to the content of the page; b) page title (titles tags): create unique and descriptive titles that include the keywords; c) page description (meta description): create a unique and relevant description of the page that includes the keywords; d) headers (heading tags): use H1, H2, and H3 headers to organize the content and include the keywords; e) content: create high quality, original, and relevant content that includes the keywords; f) URL: use friendly, short, and descriptive URLs that include the keywords; g) image tags: include descriptive alt tags for images and include the keywords when appropriate; (h) internal links: include relevant internal links to other pages on the website; (i) website speed: ensure that the website loads quickly and the images and files are optimized for a better user experience; j) mobile-friendly: ensure that the website be responsive and adapt to different mobile devices (SEARCH..., 2021).

d) off-page SEO: consists of link building, being a strategy to increase the authority of the website, which involves obtaining links from other high-quality websites. This may include using techniques such as creating high-quality content that people want to share and link to, engaging with other website owners, participating in discussion forums, and collaborating with other industry influencers (KILLORAN, 2013).

e) data analysis: the continuous analysis of the data of a website is important to evaluate its SEO performance and identify areas that need to be improved. This may include analyzing traffic data, conversion rates, keyword rankings, and more (MALAGA, 2008).

## 4 METHODOLOGY

From the point of view of its objectives, this research is exploratory because it "[...] aims to provide more information on the matter [...] enabling its definition and delineation"(PRODANOV; FREITAS, 2013, p. 54). Regarding technical procedures, it is considered bibliographic research, i.e., research elaborated resorting to material that has already been published.

To proceed with the research, the literature review was carried out using as sources the databases Web of Science (WoS), Scopus, and *Base de Dados em Ciência da Informação* (BRAPCI, Information Science Database). With the purpose of retrieving informational resources related to the field, the search expression "search engine optimization AND findability" and its translation into Portuguese "*otimização mecanismos de busca* AND *encontrabilidade*" were used as search parameters and simple searches were executed in all fields of the record and without limitation of publication date.

The searches were carried out from January 26 to February 26, 2023. As a result of this first phase, 22 documents were obtained, nine from the Web of Science, 11 from Scopus, and two from BRAPCI, as shown in Chart 2:

**Chart 2** – Number of articles retrieved

| Database | Number of articles retrieved |
|---|---|
| *Web of Science* | 9 |
| *Scopus* | 11 |
| Information Science Database (BRAPCI) | 2 |
| **Total** | **22** |

Source: Prepared by the authors

For the screening of the studies, we proceeded to article selection, applying the criterion that an article needed to have at least one of the search parameters in one or more of the following fields: title, abstract, and keywords. As a result, one document was eliminated for being duplicated and six because they did not fit the mentioned criterion, with 15 articles going to the next step. Proceeding to the next step of document selection, the following parameters and inclusion and exclusion criteria were established: (1) inclusion criteria: scientific articles available in full text that include the search parameters addressed and the inclusion of the documents, having as a method the reading of the titles, abstracts, keywords, introductions, results, and final considerations; (2) exclusion criteria: not being in the English or Spanish and having no relation to the proposed content.

Next, the titles, keywords, abstracts, introductions, results, and final considerations were read. As a result, 12 documents were selected to compose the last phase, and three were discarded because they were duplicate documents. After this phase of partial reading, of the 12 studies, six documents were selected for in-depth reading (AUINGER et al., 2012; CAMOSSI et al., 2022; DRIVAS et al., 2020; ONAIFO; RASMUSSEN, 2013; PEREIRA; KRZYZANOWSKI; IMPERATRIZ, 2018; SERRANO-CINCA; MUÑOZ-SORO, 2019). Thus, included in the corpus of the research were the studies that addressed and presented SEO techniques and elements of IF that may contribute to the positioning and information findability in digital information environments on the Web. Therefore, in this phase, documents that did not meet this inclusion criterion were eliminated.

As a result, of the 22 documents analyzed, only six were selected to compose the analysis because the matters addressed were related and had similarities with the theme developed in the present study.

## 5 RESULTS AND DISCUSSION

The six documents that composed the documentary corpus allowed a more in-depth analysis regarding the compatibility of the topics of the articles with the study proposal. This relationship occurs because the articles analyzed addressed the use of SEO techniques in digital information environments, improving the visibility and accessibility of online information and allowing users to find the relevant content for their information needs more easily.

Chart 3 shows the titles of the documents that addressed Information Findability and SEO techniques.

**Chart 3** – Keywords of the selected articles

| Authors | Titles |
|---|---|
| (AUINGER et al., 2012) | *Search Engine Optimization Meets e-Business – A Theory-Based Evaluation: Findability and Usability as Key Success Factors.* |
| (ONAIFO; RASMUSSEN, 2013) | *. Increasing libraries' content findability on the web with search engine optimization* |
| (SERRANO-CINCA; MUÑOZ-SORO, 2019) | *What municipal websites supply and citizens demand: a search engine optimisation approach* |
| (DRIVAS et al., 2020) | *Big Data Analytics for Search Engine Optimization* |
| (PEREIRA; KRZYZANOWSKI; IMPERATRIZ, 2018) | Técnicas de *Search Engine Optimization* (SEO) aplicadas no site da Biblioteca Virtual da FAPESP |
| (CAMOSSI et al., 2022) | Técnicas de *Search Engine Optimization* (SEO) aplicado para o Comércio Eletrônico |

Source: Prepared by the authors ~~(2023)~~.

The selected documents will be assessed and addressed in chronological order: Auinger et al. (2012), Onaifo and Rasmussen (2013), Pereira, Krzyzanowski, and Imperatriz (2018), Serrano-Cinca and Muñoz-Soro (2019), Drivas et al. (2020), and Camossi et al. (2022). In these papers, we analyzed how the authors approached the use of SEO techniques and the IF concepts aimed at digital information environments on the Web, observing the results and conclusions pointed out in their studies on this theme.

Auinger et al. (2012) emphasized that Findability is one of the success factors for any digital information environment and that it can be the difference between the success and failure of digital environments. Therefore, SEO techniques and technologies should be applied to improve the overall performance of a digital information environment. In the course of this study, several theory-based usability requirements and recommendations and SEO standards and methods were introduced at first. Subsequently, SEO methods were presented and assigned to the Web usability guidelines, and their effects were described. The authors stated that these two areas are closely linked, and SEO methods positively influence website usability. In conclusion, the findings based on the theory may be confirmed by the results of the usability evaluation study carried out, with a positive correlation between the use of SEO techniques and technologies and the usability of digital information environments to render these environments findable on the Web.

Onaifo and Rasmussen (2013) discussed search engine optimization strategies to improve the findability of library content on the Web. The authors argued that with the increasing importance of the Web as a source of information, it is critical that libraries adopt search engine optimization strategies to ensure that users find their collections. These techniques include choosing relevant keywords, creating accurate titles and descriptions, and using appropriate metadata.

Pereira, Krzyzanowski, and Imperatriz (2018) highlighted that the understanding and application of SEO techniques are essential to promote the indexing of pages by search engines and, consequently, implement information findability. The authors also emphasized the importance of content creation, which is one of the elements of great importance in creating and elaborating digital information environments, stressing that content merits a large part of the efforts and dedication.

Serrano-Cinca and Muñoz-Soro (2019) performed an empirical study using a sample of Spanish city halls to compare whether the information found on a municipal *website* met the needs of citizens. The authors stressed that information findability is established by analyzing the supply and demand of information on municipal websites and how SEO strategies may be applied to improve the findability of such information by citizens. To do so, the most frequently searched keywords were compared with the content of the municipal websites. The study revealed that municipal websites should not only contain information of interest to citizens but also meet accessibility standards, have responsive web designs, and follow the usability rules of the Web. They also need to be findable, which also requires improvements in the friendly design of the website search engines relative to some technical resources that improve the ability to find them, such as the use of SEO techniques and technologies.

Drivas et al.. (2020) explored the application of Big Data analysis techniques within the SEO context. The relationship between information findability is established through using Big Data analysis to improve the efficacy of SEO strategies, which may increase information findability in digital environments. The study results highlighted that, in the SEO context, Big Data analysis may be used to identify patterns and trends in website traffic data, user behavior, interactions on social networks, and other relevant indicators. This information may be used to inform and adjust SEO strategies to improve information findability.

Camossi et al.. (2022) discussed the importance of SEO in the context of e-commerce. The study aimed to analyze and present SEO techniques that may be applied to optimize the visibility and performance of e-commerce websites in search results. The research covered the key elements of SEO, such as keywords, content optimization, URL structure, metadata, link building, and website usability. The authors explored how these elements may be used strategically to improve the ranking in search engines and attract more qualified traffic to websites, in addition to how SEO techniques may be applied to improve information findability.

Finally, based on the discussions presented, we present Chart 4, which aims to systematize the relationships between SEO techniques and the Information Findability attributes on the Web. The objective is to provide an overview of the leading SEO techniques currently used and how they contribute to improving various aspects of Information Findability, such as accessibility, usability, information discovery, wayfinding, and navigational taxonomies, among others. Thus, Chart 4 provides a clearer understanding of the impacts of SEO techniques on Information Findability. Such understanding is fundamental to contribute to the optimization of the navigation of users and the improvement of their experience searching for information online. With this systematization, it is possible to clearly visualize the relationships between SEO techniques and the Information Findability attributes, allowing a more comprehensive and integrated approach to implementing these techniques to improve the visibility and accessibility of content on the Web.

**Chart 4** – Relationship between the Information Findability Attributes and Search Engine Optimization techniques

| SEO Techniques | Information Findability Attributes |
|---|---|
| Keywords | Information Discovery |
| *Meta Descriptions* | Information Discovery |
| *Meta Tags* | Information Discovery |
| External Links | Information Discovery |
| Internal Links | Information Discovery, Navigational Taxonomies |
| Friendly URLs | Accessibility and Usability |
| Responsiveness | Accessibility and Usability |
| Loading Speed | Accessibility and Usability |
| Structured Metadata | Mediation of Information Professionals |
| *Sitemap* | Mediation of Information Professionals |
| *Robots*.txt | Mediation of Computer Scientists |
| Redirects | Mediation of Computer Scientists |
| Header tags | Mediation of Information Professionals |
| *Canonicalization* | Mediation of Computer Scientists |
| Quality Content | Information Discovery |

| SEO Techniques | Information Findability Attributes |
|---|---|
| *Link Building* | Information Discovery |
| Social Networks | Information Discovery |
| *Affordances* | Usability |
| *Wayfinding* | Usability, Navigational Taxonomies |
| Terminological Control Instruments | Mediation of Information Professionals |
| Folksonomies | Mediation of Users |
| Navigational Taxonomies | Mediation of Information Professionals, Wayfinding |
| Mediation of Information Professionals | Mediation of Users, Mediation of Computer Scientists |
| Mediation of Computer Scientists | Mediation of Information Professionals |
| Information Discovery | Information Discovery |
| Accessibility and Usability | Accessibility and Usability |

Source: Prepared by the authors

Chart 4 relates the SEO techniques to IFAs, aiming to show how these techniques may contribute to improving the user experience and the visibility of the content on the Web.

The Information Findability Attributes include the mediation of information professionals, accessibility and usability, information discovery, wayfinding, affordances, the mediation of computer scientists, metadata, folksonomies, terminological control instruments, and navigational taxonomies. Each of these characteristics is important to ensure that users find and understand the content efficiently.

In turn, SEO techniques are strategies and practices used to improve the positioning of a website on search engine result pages, aiming to increase the visibility and organic traffic of a website. These techniques include keyword optimization, link building, content optimization, and technical optimization. Chart 5 focuses on the comparison and unfolding of SEO techniques with the Information Findability attributes.

**Chart 5 –** Comparison of the Information Findability Attributes with SEO techniques.

| Findability Attributes | SEO Techniques | Explanations |
|---|---|---|
| Mediation of information professionals | Relevant and up-to-date content | Information professionals may use SEO techniques to identify the most relevant keywords for their content, rendering it more visible and accessible to users. |
| Accessibility and usability | Responsive design and fast loading | A responsive design and fast loading are factors that directly impact the accessibility and usability of a website, given that they contribute to a user being able to access the content quickly and without obstacles. |
| Information discovery | Keywords, tags, and metadata | The keywords, tags, and metadata used in SEO techniques allow users to find relevant information more efficiently since these techniques aim to improve the visibility and accessibility of content on the Web. |
| *Wayfinding* | Clear URLs and organized navigation structure | Clear URLs and an organized navigation structure contribute to users being able to navigate the website |

| Findability Attributes | SEO Techniques | Explanations |
|---|---|---|
| | | clearly and efficiently, allowing them to find the information they are interested in easily. |
| *Affordances* | Clear and intuitive visual and textual elements | The visual and textual elements present on a website should be clear and intuitive, allowing users to easily understand how to navigate and find the desired information. |
| Mediation of computer scientists | Metadata, URL structure, and image optimization | Computer scientists may use SEO techniques to optimize the URL structure, images, and metadata of a website, contributing to the improvement of visibility and accessibility of the content. |
| Metadata | Title, description, and tags | Metadata such as the title, description, and tags are important elements in implementing SEO techniques, as they allow content to be better identified and found by users. |
| Folksonomies | Tags and categories | The tags and categories present in SEO techniques allow users to find related information easily, contributing to the organization of the content and improving the search experience of users. |
| Terminological control instruments | Consistent use of terms and keywords | The consistent use of terms and keywords is important for the identification of the content by search engines and its understanding by users, contributing to Information Findability. |
| Navigational taxonomies | Internal links and hierarchical navigation structure | The internal links and hierarchical navigation structure used in SEO techniques contribute to the organization of the content and allow users to find related information efficiently. |

Source: Prepared by the authors

Chart 5 presents a synthesis of SEO techniques and how they relate to the attributes of Information Findability, evidencing the possibilities of optimizing visibility and access to online information. The comparison between SEO techniques and the Information Findability attributes allows visualizing the connections between these elements and how they complement each other to improve the efficiency of Information Systems on the Web.

Through the analysis of Chart 5, it is possible to understand that SEO techniques are crucial tools to improve Information Findability on the Web, as they contribute to the development of strategies for indexing, organizing, and retrieving data, as well as the improvement of the user experience in online browsing. Each SEO technique presented in Chart 4 is directly related to at least one of the Information Findability attributes, showing how the combined use of these techniques can optimize the visibility and accessibility of information online.

## 6 FINAL CONSIDERATIONS

Through theoretical deepening, observation of databases, and analysis of selected studies, some reflections on the attributes of IF and SEO techniques and technologies can be made.

The development of the theoretical foundation based on the literature review and analysis of results allowed us to resume the objective of revealing the contribution of SEO techniques to IF in digital information environments through bibliographic research with a qualitative approach aiming to analyze the contributions and recommendations.

In this sense, it is understood that SEO techniques may be viewed as a valuable tool to increase IF on the Web. Upon comparing SEO techniques with IF attributes (Chart 5), it was possible to observe that both aim to facilitate user access to the desired information. While the IF attributes focus on organization, categorization, and access to information, SEO techniques seek to improve the visibility of the content on the Web, allowing users to find it easily.

It is essential to emphasize that SEO techniques should not be used only to improve the positioning of websites in search results but rather as a way to meet user needs. In this sense, mobility and intentionality are aspects that must be taken into account when applying these techniques. The optimization of websites for mobile devices, for example, is crucial to ensure that users can access them anywhere and at any time. In turn, the creation of relevant content directed to the interests of users may increase the attractiveness of websites and render them more useful and valuable to users. By adopting these strategies efficiently, it is possible to significantly improve the accessibility and usability of a website, allowing it to be found and utilized more effectively.

In short, by correctly applying SEO techniques in conjunction with the attributes of Information Findability, it is possible not only to improve IF in digital environments but also to increase the relevance and authority in the online environment. This is because search engines take into account several factors to classify and rank search results, such as the quality of content, the number of relevant backlinks, and the user experience. Thus, it is possible to build a stronger and more efficient online presence.

Finally, it is important to stress that IF and SEO techniques are areas in constant evolution and adaptation. As users and technologies change, new needs and solutions arise, requiring a continuous monitoring, evaluation, and adjustment approach. Therefore, it

is critical to remain up to date with best practices and trends in both areas to ensure that digital information environments are consistently meeting the needs of users and standing out in the online scenario.

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