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Construct and Survey of the Dimensions used to Assess the Quality of Commercial Websites: A Systematic Review

Construção e Levantamento das Dimensões Utilizadas para Avaliar a Qualidade de Sites Comerciais: Uma Revisão Sistemática

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RESUMO

Maintaining an attractive, easy-to-use website that stands out in the industry in which it operates is a premise for any business that intends to use the internet effectively. However, users to encounter many problems when interacting with websites, and this is because many organizations do not have a complete understanding of what a website really means to them. Although there is a lot of evidence in the form meta-analysis reviews related to website quality assessment, a systematic review of these meta-analyses is lacking in the literature. Our objective was to synthesize the existing literature to identify the main dimensions and analysis methods associated with website quality assessment. Following the recommendations PRISMA statement for systematic reviews, we reviewed relevant articles identified in the Web of Science and Scopus databases. A total of 38 original research articles related to website quality assessment were retrieved and selected for eligibility. The results present an overview of studies on website quality assessment, identifying the main criteria used for their assessment. Our review shows that there are more than a hundred dimensions used in studies to assess the quality of websites, however, these dimensions have similarities and therefore were grouped, providing a broad view of the most used dimensions.

Keywords: Websites quality. Websites evaluation, Electronic commerce, Electronic Business.

RESUMO

Manter um site atraente, fácil de usar e que se destaque no setor em que atua é uma premissa para qualquer empresa que pretenda utilizar a internet de forma eficaz. No entanto, os usuários encontram muitos problemas ao interagir com sites, e isso ocorre porque muitas organizações não têm um entendimento completo do que um site realmente significa para eles. Embora haja muitas evidências na forma de revisões de meta-análise relacionadas à avaliação da qualidade do site, uma revisão sistemática dessas meta-análises está faltando na literatura. Nosso objetivo foi sintetizar a literatura existente para identificar as principais dimensões e métodos de análise associados à avaliação da qualidade do website. Seguindo as recomendações da declaração PRISMA para revisões sistemáticas, revisamos artigos relevantes identificados nas bases de dados Web of Science e Scopus. Um total de 38 artigos de pesquisa originais relacionados à avaliação da qualidade do site foram recuperados e selecionados para elegibilidade. Os resultados apresentam um panorama dos estudos sobre avaliação da qualidade de websites, identificando os principais critérios utilizados para sua avaliação. Nossa revisão mostra que existem mais de uma centena de dimensões utilizadas em estudos para avaliar a qualidade de sites, porém, essas dimensões possuem semelhanças e por isso foram agrupadas, proporcionando uma visão ampla das dimensões mais utilizadas.

Palavras-chave: Qualidade de sites. Avaliação de Websites. Comércio Eletrônico. Negócios Eletrônicos.

1 INTRODUÇÃO

The digital transformation in all layers is significantly changing the way as people do business around the world. As a result, many daily processes are executed in a totally virtual way. Besides, as a result of the impact of the COVID-19 Pandemic, there is even a greater need of boosting the development of solutions and virtual platforms (Medeiros, Goldoni, Batista Junior, & Rocha, 2020; Tran, 2021).

Thus, companies normally use resources in electronic media such as websites to attract more customers and to have success in an increasingly competitive market, aiming to serve the growing demand of consumers from digital media. However, users have a tendency of finding many problems during the interaction with websites and this is probably due to the fact that sometimes the use of technology is not well succeeded (Kabassi, 2018). This happens because many organizations fail in understanding what a site really represents to them. So, many sites have usability and functionality problems and the interaction with them is complicated. Many researchers highlight the need of evaluating the quality of sites (Fogli & Guida, 2018; Lopes & Melão, 2016; Ongsakul *et al.*, 2020).

For that reason, different experiments of evaluation were searched to evaluate the quality of sites. Despite many trials being made in order to approach the evaluation of sites for different categories, there is not yet a method or a technique universally accepted of doing this evaluation (Ecer, 2014; Kabassi, 2018; Kamesh, Bhanu, & Sastry, 2018; Król & Zdonek, 2020). In order to evaluate the quality of the site by counting only the accesses in pages or using a single criterion only, such as the facility of browsing, is not precise (Kabassi, 2018). Instead of this, the evaluation of a site generally depends upon several criteria to capture all dimensions of the final product/service. Therefore, the quality of websites is treated as a multidimensional variable (Tezza, Bornia, Spenassato, & Trierweiller, 2016), although there is not a consensus about what are its dimensions (Ongsakul *et al.*, 2020).

Even considering that several researchers struggled in creating evaluation models for websites to the more varied sectors, we want to demonstrate a landscape of studies about the evaluation of the quality of websites, hoping to answer the following questions:

i. What dimensions [or criteria] are used to evaluate quality websites?
ii. What are the sources of these dimensions?
iii. Are there similarities between the dimensions used in studies that evaluate websites?

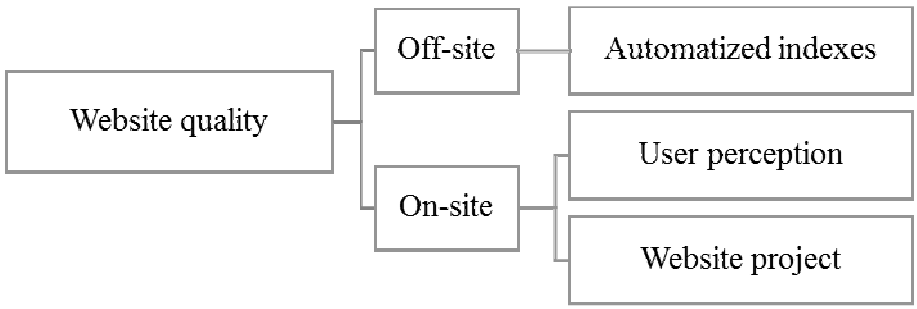
To answer these questions, this study carries out a systematic literature review considering websites evaluation studies. Conducting effective reviews of literature is essential to advance knowledge and to understand the breadth of research on a topic of interest, in addition to synthesizing the empirical evidence and providing a basis for subsequent research, identifying the research topics or domains that require further investigation (Paré, Trudel, Jaana, & Kitsiou, 2015). Therefore, due to the exploratory nature of the methodology, this research generates knowledge and highlights future research directions.

1. LITERATURE REVIEW

1.1. Website quality evaluation

The concept of website quality attracted a huge attention for researchers and professionals of the sector (Ongsakul *et al.,* 2020). It is a consensus that the quality of the site has a multidimensional interface. In academic literature, the quality of the site is normally recognized as a critical stage to push online business. Therefore, hundreds studies were dedicated to the quality and evaluation of sites. Those studies were made in several areas and in different proportions. For Król and Zdonek (2020) the type of evaluation may be split in two main groups: (i) off-site, relating with the environment of the site; for instance, the number of links received and the number of signals in social media and (ii) on-site, regarding the quality of use of a site (see Figure 1).

Figure 1. Structure of evaluation of website quality.



Off-site quality may be evaluated by automatized indexes available on the web. Although they are trustable, they should not be used as an index of website quality, because they are developed as the result of an evaluation of the basic attributes of the site, being used more as a

visibility index. Król and Zdonek (2020) explores the off-site quality, however in this study we will give emphasis to the on-site quality. The on-site quality may be evaluated by means of two visions, the first one about the perception of users, the second one made with the survey of criteria used in other models. Users are not able to evaluate technical characteristics of the site, such as the accessibility criteria and using the optics of the project. It is possible to evaluate, putting those characteristics together, more the ones regarding the non-technical characteristics such as information and design.

In several research essays, in order to examine the quality of the site, the concept of site quality was initially limited to usability (Kuan, Bock, & Vathanophas, 2008). Usability is a characteristic of system projects and is defined by the international Organization for Standardization as the extension where a product may be used to reach goals with efficacy, efficiency and satisfaction (ISO 9241-11). Several studies measured the usability of sites using those three domains (for instance, (Green & Pearson, 2006; Roy, Pattnaik, & Mall, 2014; Teo,

Oh, Liu, & Wei, 2003)). Normally, previous researches of usability indicated that usability is associated with several positive results such as reducing the number of errors, more precision, a more positive aptitude regarding the destination system and greater use (Nielsen, 2000). For Kuan *et al.* (2008) the quality of the site is a wider field encompassing usability, should focus on system quality to increase customer conversion, and on service quality for customer retention.

Thus, since the middle of the 90s several researchers started to develop models in order to evaluate the quality of websites under several perspectives. Abdallah and Jaleel (2015) observed that the evaluation structures of sites normally follow an approach of Information Systems (IS) or of another combined approach. And the IS approach is focused in evaluating aspects oriented to the technology of the sites such as usability, navigability or quality of information, thus providing a measurement for the technical ability of the site developer. On the other hand, the proposers of the marketing approach put emphasis in factors such as advertising, online transactions and custom service. The combined structure is a mix of those approaches with the two other ones. Table 1 resumes some evaluation models developed mainly to evaluate e-commerce sites.

Although there is no standard methodology to analyze websites, several studies provide useful insights for developing an embracing structure. For instance, the SiteQual (Webb & Webb, 2004) a tool developed to measure the perceived quality of a shopping website, uses nine elements that are categorized in four main dimensions: ease of use, aesthetics design,

speed processing and security. Although it is considered as a widely accepted model for evaluating the quality of the online service, it focuses exclusively in the interface of the site, even if discounting the 'client oriented' and other aspects of e-marketing. Its applicability is limited to evaluate the efficacy of marketing in the web.

WebQual was created by Eleanor T Loiacono *et al.* (2002) and is a widely used website assessment tool. Eleonor Loiacono made three updates to its model, currently WEBQUAL is composed by 36 questions, 12 dimensions and four constructs (Eleanor T Loiacono *et al.*, 2007). This set of criteria from the WEBQUAL model becomes a determinant of the quality perception of a site and, in consequence, of the intention of a user of returning to it (Jing, Zaidin, Zakuan, Ismail, & Ishak, 2015; Y.-H. Lee & Lee, 2017; McCoy, Everard, & Loiacono, 2009). Several authors were based on WebQual in order to evaluate the electronic service (Akram *et al.*, 2018; Kim & Stoel, 2004a; Sun, Yang, Wang, & Zhang, 2015).

The E-S-Qual developed by Ananthanarayanan Parasuraman *et al.* (2005) is a modified version of SERVQUAL (see (Anantharanthan Parasuraman, Zeithaml, & Berry, 1985)) for evaluating the quality of the electronic service in the e-commerce environment. The traditional SERVQUAL was adequate to measure the quality of all interactions and experiences with companies not based on the internet (Kang, Jang, & Park, 2016). However, as the quality of the electronic service (e-SO) became more and more important for determining the success of e-commerce applications, a new method of conceptualization was needed. The development of the new version of SERVQUAL for the electronic context demanded the development of electronic service dimensions.

Table 1. Websites evaluation models.

Model	Description	Area of Operation	Source
SiteQual	An instrument to obtain user feedback on the quality of the site in terms of: Reliability, Assured Empathy, Perceived usability, and Trustworthiness.	Business-to-consumer (B2C)	(Webb & Webb, 2004)
WebQual	WebQual includes 12 dimensions (informational fit-to-task, tailored information, trust, response time, ease of understanding, intuitive operations, visual appeal, innovativeness, emotional appeal, consistent image, on-line completeness, relative advantage)	Business-to-business (B2B)	(Eleanor T Loiacono, Watson, & Goodhue, 2002, 2007)

The DeLone and McLean model of information systems success	A model to measure the success of electronic commerce, created in 1992, had two dimensions: quality of information and quality of the system. It was subsequently updated, adding a new dimension: quality of service.	Information Systems	(DeLone & McLean, 1992, 2003)
MUG (Microsoft Usability Guidelines)	It presents Microsoft guidelines on usability not only for websites, but for most software as well. It consists of five dimensions: Content, Ease of Use, Promotion, Personalization and Emotion.	Usability and marketing on the Microsoft Network (MSN)	(Keeker, 1997)
E-S-Qual	Is a modified version of SERVQUAL for evaluating the quality of electronic service in the e-commerce environment, comprising four factors: Efficiency, Fulfillment, System availability, and Privacy.	Online Stores	(Ananthanarayanan Parasuraman, Zeithaml, & Malhotra, 2005)
WEQ (Website Evaluation Questionnaire)	Questionnaire used to detect and diagnose usability problems. It consists of three dimensions: Navigation, content and layout.	Development of questionnaire that can be used by government organizations	(Elling, Lentz, & Jong, 2007)
eTailQ	Scale for measuring the quality of eTail. The scale consists of four factors: website design, fulfillment / reliability, privacy / security and customer service.	Online etail	(Wolfinbarger & Gilly, 2003)
WAMMI – (Website Analysis and Measurement Inventory)	Model to measure user satisfaction in relation to web user interface design with five factors: attractiveness, controllability, efficiency, helpfulness and learnability.	Chamber of commerce	(Kirakowski & Cierlik, 1998)

By means of the method composed by four dimensions (Efficiency, Fulfillment, System availability, and Privacy) as well as 22 others of sub criteria, customers evaluate the quality of

service deciding if there is any gap between their expectancies and perceptions. If the level of their perceptions about Quality of Service was greater than the level of expectancies, then the service provided is acceptable. If their perception was greater than the level of expectancies the service is ideal. However, if the perceptions of customers regarding the quality of service were under the level of expectancies, the service is unsatisfactory and this has a negative effect in the intention of repurchasing. Several authors based on E-S-Qual in order to evaluate the quality of the electronic service (Swaid & Wigand, 2009).

The WAMMI developed by the Human Factors Research Group (HFRG) in 1999, it is a questionnaire used as a website analysis tool that measures and analyzes the user's experience of the web to help them achieve their goals. The WAMMI consists of a questionnaire with 20 questions that was evaluated through five options on a Likert scale "Strongly Agree", "Agree", "Neutral", "Disagree" and "Strongly Disagree". WAMMI also proposed its own WAMMI factors or also called usability attributes – demonstrating how easy it is to use the site, which are (Claridge, 2021):

- Attractiveness – to be attractive the site must be visually pleasing to its users, and also offer advantages to respondents, whether in terms of functionality or information;
- Controllability - for the website to have good control, users must be able to easily navigate through it and do the things they want with ease;
- Efficiency - to be efficient, users must feel that they can quickly find and do what interests them effectively and economically, as well as feel that the site responds at a reasonable speed;
- Usefulness - in order to be of good use, the site needs to meet users' expectations about its content and structure;
- Learning - In order for the site to be highly learnable, users must be able to use the site with a minimal introduction, where everything is easy to understand from the start.

This tool has been used by many websites and has become popular among researchers. The statements used in WAMMI are standardized and cannot be changed and the questionnaire can be accessed on the WAMMI website (http://www.wammi.com/questionnaire.html).

WEG was developed by Elling *et al.* (2007) based on the literature on usability and user satisfaction. WEG evaluates the quality of navigation, content and layout of government websites. The navigation dimension measures users' opinions about the information search process, while the content dimension measures the result of this process, the quality of the information found on the site. The layout dimension is related to the so-called “look and feel”

of the website, and relates to how you successfully accomplish an appropriate “look and feel” for your Business-to-business website design. WEQ has been refined to a new version which can be found in (Elling, Lentz, de Jong, & Van den Bergh, 2012).

Wolfinbarger and Gilly (2003) developed the eTailQ – a 15-item scale, with the objective of measuring customer perceptions about the quality of electronic retail. The scale contains four factors: website design, reliability/service, privacy/security, and customer service. Website design involves attributes associated with design, customer interactions with the website, covering navigation, information search, order processing, personalization and product selection. The reliability/service scale refers to accurately representing the product so that customers receive what they really ordered, with on-time delivery. Privacy/security refers to ensuring the website's security, customers should feel safe and trusting the website, and scale customer service combines responsive, helpful and determined service to resolve issues by quickly responding to customer inquiries. eTailQ is presented with a service quality scale as it considers the measurement of the website interface and the perceived dimensions of electronic service quality, such as security, reliability and customer service.

The Microsoft Usability Guidelines (MUG) proposed by Microsoft in 2006, has become a key index in the constructs of web usability assessment. These guidelines are in five factors, which are (Venkatesh & Ramesh, 2006): (1) content, (2) usability, (3) promotion, (4) personalized services and (5) emotions. According to S. Wang, Li, and Zhu (2019) usability is thought of as the efforts made by users during the web cognition process and is decided by structures, goals and feedback. According to the authors, the structures refer to the general organizational structure of the web; goals mean whether or not the web theme is defined and understandable; Feedback is the operation and progression information given by the web to users. In this way, usability can be affected by the usability of the view, the usability of the structure and the usability of the interaction (S. Wang *et al.*, 2019).

In order to provide a parsimonious and unified view of website quality, there is the successful Information Systems (IS) model DeLone and McLean (1992, 2003) to directly assess the attributes of an e-commerce website. In contrast with quality models of previous sites, the success model of IS from DeLone and McLean provides only three dimensions of quality: Quality of System, Quality of Information and Quality of Service, which effectively may capture all attributes identified in previous studies regarding the quality of websites. Using those three dimensions of quality, several attributes of existing websites may be organized in order to form a more parsimonious website structure (Kuan *et al.,* 2008).

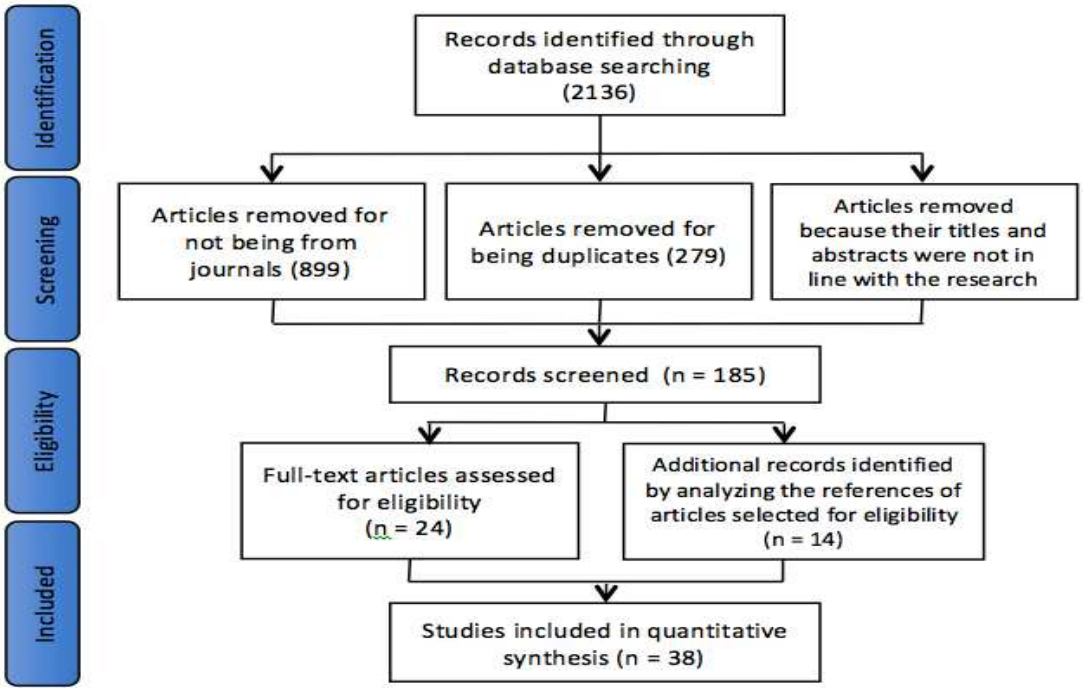
In the model of DeLone and McLean the quality of the system corresponds to the technical level (characteristics of the e-commerce system used by the site producing information about the product), while quality of information is about its semantic level (success of the information of products in the site during the placement of the intended meaning). Only in 2003 the model was updated when dimension Quality of Service was added, reflecting the success of the online peripheral support provided by means of a site (for instance, feedback and frequent questions). Several authors have been using a tridimensional model in order to evaluate the quality of the website (J. V. Chen, Rungruengsamrit, Rajkumar, & Yen, 2013; Hsu, Chang, & Chen, 2012; Hung-Joubert, 2017; F. Zhou & Jia, 2018). DeLone and McLean (2003) argue that attempts should be made to reduce the number of measures different used to measure IS success.

2. METHOD

2.1. Study search and selection strategy

A literature review was performed using the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines as shown in Figure 2. Considering that the objective of this research is related to the identification of the main dimensions and analysis methods associated with quality assessment of websites, we searched for studies that fit this topic. The databases included in the search were the Web of Science and Scopus.

Figure 2. Flow chart of search process.



The following search terms were used in all databases: Website quality OR website assessment OR website measur$ OR website assessment. A range not limited to one journal of published data and included full journal data articles up to 2020. To validate the key dates used in searching long-standing databases, we performed an adherence test. This test was performed randomly by analyzing ten articles from the documents identified in the initial search and comparing their keys to as used in the search terms. This comparison showed that the keywords used initially were part of the set of keywords included in the ten articles, suggesting an alignment with the research topic and ignoring the need to incorporate additional keywords into our search (Table 2).

Table 2. Consolidation of the research axis and definition of the Literature Portfolio.

Search Terms							Database	Initial Result	Remaining publications after each filtering criteria				
									i	ii	iii	iv	v
Website quality	OR	Website assessment	OR	Website measur$	OR	Website evaluation	Scopus	1329	751	958	185	24	+14
							Web of Science	807	486				
							Total	2136	1237				38

Note that this search provided a literature portfolio containing 2136 documents for analysis. During the screening process, publications (in English language only) were analyzed according to the following criteria: (i) only journal articles (ii) duplicate articles, (iii) alignment of title, abstract and keywords with the research topic, (iv) full article analysis and alignment with the research topic, and (v) feedback. In the feedback, the manual search of the references of the articles selected in (iv) was also carried out to complement the searches in the databases, in this way we captured articles aligned with the research topic in the references of the articles selected in (iv). We evidence here that in filter (iv), only articles that used methods that validate scales were selected, such as Factor Analysis, Item Response Theory and/or Structural Equation Modeling.

The screening of titles, abstracts and keywords, followed by full texts, was performed by the first author (MFM) and the other authors independently reviewed the selection of studies. Any discrepancies were resolved by discussion and consensus among the authors.

Mendeley® software was used to support the filtering process. Initially, 899 articles were withdrawn because they were not from journals. Then, due to duplicate versions, 279 were dropped. After that, 773 articles were removed because their titles and abstracts and keywords were not in line with the research topic. Then, after a complete analysis of the articles, 24 articles were selected. In addition to these, another 14 articles were incorporated into the reference, collected from references of previous articles. Finally, the 38 remaining works were considered as part of the literature portfolio (LP).

2.2. Literature Portfolio Analysis

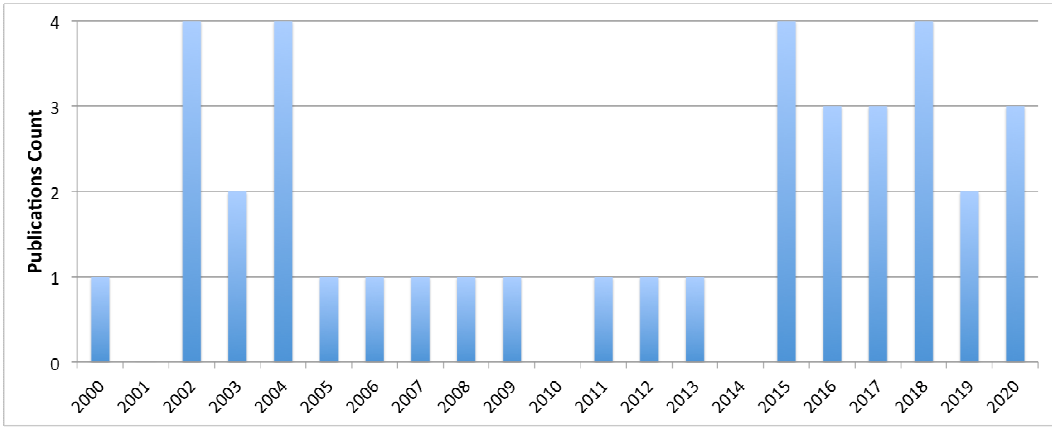
The literature analysis facilitates the identification of trends in scientific production in different areas of research. This analysis first considers the LP's 'basic variables', such as the most assiduous authors regarding the term and evolution of publications over time. Then, a content analysis was performed in relation to the following “specific variables”: (i) sectors evaluated by studies; (ii) criteria most used to assess the quality of websites and (iii) methods of analysis. These variables provide support to analyze the behavior of studies on website quality assessment, verifying gaps and flaws that can be investigated in other studies on the subject. The analysis also allows a better understanding of the panorama of the subject, shedding light on aspects that are not yet explicitly evidenced in the literature.

3. RESULTS AND DISCUSSION

3.1. Basic Variables

Figure 3 presents the results of the distribution of publications over time. As observed in Figure 3, the first publication on website quality assessment was registered at the beginning of this century with an increase in publications in 2002 and 2004. After this period, there was a slowdown in research and consequently in publications for approximately 10 years, re-emerging as an important area of research after 2015.

Figure 3. Distribution of publications over time.



From the 38 papers in the literature portfolio (LP), 94 authors were identified and only six of them were co-authors of two publications each. Table 3 shows the number of publications per author and the number of journals in the LP. Regarding as for journals, note that the Journal Information and Management stands out with six publications, followed by the journal Behavior & Information Technology out with three publications.

Table 3. Number of publications from authors and number of publications per journal of the LP.

Authors	Publications Count
Ali, F./ Chen, M.C. / Hsu, C.L. / Kim, S. / Kiran, R. / Tandon, U.	2
Others 88 authors	1
Journals	**Publications Count**
Information and Management	6
Behaviour & Information Technology	3
Journal of Electronic Commerce Research	2
Others 27 Journals	1

The journal Information and Management receives research that implements and manages information systems applications, seeking to collect and disseminate information on new and advanced developments in the field, providing material for training and education, encouraging progress in the methodology and applications of information systems, as well addresses the range of development and use of information systems in the use of policies, strategies and managerial activities for business, public administration and international organizations (Management, 2021).

The Journal Behavior & Information Technology hosts research and case studies that put people before technology by addressing usability and user experience, human-computer interaction, human-centered and user-centered design, as well as social, business, and humans of the digital world (Technology, 2021).

The Journal of Electronic Commerce Research welcomes research that encompasses key technologies enabling a better understanding of e-commerce, as well as the implications of these technologies for societies, economies, businesses, and individuals (Research, 2021).

3.2. Specific Variables

Table 4 presents the summary of the 38 studies that make up the LP. One can observe the authors, year of publishing the study, dimensions used, sample size, reliability indexes, number of items, and how the scale was constructed, whether it was adapted from other authors or proposed.

Table 4. Literature PortfolioInformation.

Authors	Year	Dimensions	Dimensions Count	Sample	Items	Cronbach's alpha	Scale
(Liu & Arnett, 2000)	2000	Quality of information and service, System use, Playfulness, System Design Quality	4	119 webmasters	28	0,63-0,92	Proposal
(Ranganathan & Ganapathy, 2002)	2002	Information Content, Design, Security and Privacy	4	214 users	15	0,87-0,89	Proposal
(Aladwani & Palvia, 2002)	2002	Technical adequacy, specific content, web content, web appearance	4	127 users	25	0,88-0,94	Proposal
(Torkzadeh & Dhillon, 2002)	2002	Internet product choice, online payment, Internet vendor trust and shopping travel	4	421 users	21	0,87-0,93	Proposal
(Barnes & Vidgen,	2002	Usability, Information and Service Interaction	3	376 users	22	0,81-0,89	Updated version of WebQual 3.0 (Barnes &

2002)							Vidgen, 2001)
(Gounaris & Dimitriadis, 2003)	2003	Customers care and risk reduction, Information and Interaction facilitation	3	871 users	14	0,76-0,81	Adapted from (Barnes & Vidgen, 2001; Ananthanarayanan Parasuraman, Berry, & Zeithaml, 1991)
(Wolfinbarger & Gilly, 2003)	2003	Website design, Customer service, Fulfillment/reliability and Security/privacy	4	1013 users	14	0,79-0,88	Proposal
(Hong & Kim, 2004)	2004	Internal reliability, external security, useful content, usable navigation, System interface attractiveness, Communication interface attractiveness	6	300 websites and 2381 users	18	0,79-0,91	Useful content adapted from (Huang, Lee, & Wang, 1998), Navigation usability adapted from (Davis, 1989), others proposed
(Kim & Stoel, 2004a)	2004	Informational fit-to-task, Tailored communication, Online completeness, Relative advantage, Visual appeal, Innovativeness, Emotional appeal, Consistent image, Ease of understanding, Intuitive operations, Response time, Trust	12	273 users (only women)	25	0,61-0,92	Adapted from WebQual (Eleanor Terese Loiacono, 2000)
(Shih, 2004)	2004	Information quality, system quality and service quality	3	212 users	12	0,85-0,95	Proposal
(Webb & Webb, 2004)	2004	Reliability, Assured empathy, Perceived usability and Trustworthiness	4	178 users	32	0,83-0,97	Reliability, Assured empathy and Perceived usability adapted from (Ananthanarayanan Parasuraman *et al.*, 1991). Trustworthiness adapted from (R. Y. Wang & Strong, 1996).
(Ananthanarayanan Parasuraman *et al.*, 2005)	2005	Efficiency, Fulfillment, System availability and Privacy.	4	549 users	22	0,83-0,94	Adapted from Servqual (Ananthanarayanan Parasuraman *et al.*, 1991)
(Kim & Lee, 2006)	2006	Informational fit-to-task, Interactivity, Trust, Response time, Design appeal, Intuitiveness, Visual appeal, Innovativeness, Flow-emotional appeal, Integrated communications, Business process, Viable substitute.	12	278 USA 347 South Korea	27	0,66-0,83	Adapted from WebQual (Eleanor Terese Loiacono, 2000)
(Eleanor T Loiacono *et al.*, 2007)	2007	Informational fit-to-task, Tailored communication, Online completeness, Relative	12	311 and 377 students (2 years	36	0,71-0,93	Adapted from WebQual (Eleanor Terese Loiacono, 2000)

		advantage, Visual appeal, Innovativeness, Emotional appeal, Consistent image, Ease of understanding, Intuitive operations, Response time, Trust		differen ce)			
(Kuan *et al.*, 2008)	200 8	Information quality, system quality and service quality	3	101 users	21	0,90-0,94	Proposal
(Swaid & Wigand, 2009)	200 9	Information quality, website design, reliability, responsiveness, assurance, Personalization	6	557 users	28	0,80-0,86	Information quality adapted from (Y. Li, Tan, & Xie, 2002), Realibility and Personalization adapted from (Wolfinbarger & Gilly, 2003). Responsiveness and Assurance adapted from (Ananthanarayanan Parasuraman *et al.*, 2005; Wolfinbarger & Gilly, 2003). Usability adapted from (Ananthanarayanan Parasuraman *et al.*, 2005).
(Wells, Valacich, & Hess, 2011)	201 1	Visual appeal, Security, Download Delay, Navigability,	4	240 users	36	0,8-0,97	Proposal
(Hsu *et al.*, 2012)	201 2	Information quality, system quality and service quality	3	534 users	14	0,76-0,88	Information quality and System quality adapted from (Wixom & Todd, 2005). Service quality adapted from (Jayawardhena, 2004).
(J. V. Chen *et al.*, 2013)	201 3	Information quality, system quality and service quality	3	285 Thailand users 250 Taiwan users	30	0,78-0,93	Information quality (Q. Chen & Wells, 1999). System Quality, and Service quality adapted from (Barnes & Vidgen, 2002; Ananthanarayanan Parasuraman *et al.*, 2005) and (Barnes & Vidgen, 2002).
(Sun *et al.*, 2015)	201 5	Response Time, Ease of Understanding, Intuitive Operations, Online Completeness, Relative Advantage, Consistent image, Information Fit-to-task, Tailored Information, Trust, Visual Appeal, Innovativeness, Emotional Appeal, Responsiveness, Empathy	14	133 USA users 175 China users	42	0,78-0,90	Adapted from (Eleanor T Loiacono *et al.*, 2007), only Responsiveness adapted (Wolfinbarger & Gilly, 2003).
(Abdallah & Jaleel, 2015)	201 5	Look and Feel, Navigation, Credentials, Content and Customization	5	16 users	26	0,89	Proposal

(L. Wang, Law, Guillet, Hung, & Fong, 2015)	2015	Usability, functionality and Security and Privacy	3	422 users	14	0,75-0,93	Proposal
(Loureiro, 2015)	2015	Design-Visual appeal, Information content, Ease of use and Interactive Features.	4	270 users	19	0,88-0,91 CR	Adapted from (Han & Mills, 2006; Park, Gretzel, & Sirakaya-Turk, 2007).
(Tezza *et al.*, 2016)	2016	User orientation during navigation, Accessibility and reliability of the system, User control or user interaction with the system, Presentation of information	4	441 websites	47	N/A	Proposal
(Lopes & Melão, 2016)	2016	Content and Design	2	915 websites	43	N/A	Proposal
(Ali, 2016)	2016	Usability, Functionality and Security and Privacy	3	441 users	14	0,84-0,93	Adapted from (L. Wang *et al.*, 2015).
(Hahn, Sparks, Wilkins, & Jin, 2017)	2017	Atmospheric Quality, Customer Review, Emotional Engagement, Reliable Information, Locality Information and Functionality	6	843 users	24	0,86-0,94	Proposal
(Hung-Joubert, 2017)	2017	Information quality, system quality and service quality	3	123 users	65	0,78-0,94	Proposal
(U. Tandon, Kiran, & Sah, 2017)	2017	Navigation, ease of understanding, information usefulness, website design, ease of use, security and privacy, ease of ordering, and customization.	8	410 users	26	0,73-0,80 CR	Proposal
(F. Zhou & Jia, 2018)	2018	Information quality, system quality and service quality	3	223 users	12	0,854	Adapted from (Shih, 2004).
(Hsu, Chen, & Kumar, 2018)	2018	Information quality, system quality and service quality	3	393 users	12	0,90-0,97	Adapted from (Kuan *et al.*, 2008).
(Jiménez-Barreto & Campo-Martínez, 2018)	2018	Design, Ease of use, Information and Interactivity	4	135 users	16	0,83-0,89	Adapted from .(Loureiro, 2015)
(Akram *et al.*, 2018)	2018	Usefulness, Ease of Use, Entertainment and Complementary Relation	4	1161 users	36	0,80-0,89	Adapted from (Eleanor T Loiacono *et al.*, 2007).
(U. Tandon & Kiran, 2019)	2019	security and privacy, ease of ordering, website design, ease of navigation, and	5	500 users	18	0,70-0,84 CR	Security and Privacy and Website Design (Wolfinbarger & Gilly, 2003). Ease of ordering,

		customization of product					and Ease of navigation and customization of product adapted from (U. Tandon *et al.*, 2017) and (Y. Lee & Kozar, 2012).
(Gao & Li, 2019)	2019	Information quality, system quality and service quality	3	265 users	9	0,81-0,92	Adapted from (T. Zhou, 2013).
(A. Tandon, Aakash, & Aggarwal, 2020)	2020	System quality, content quality, trust, customer support, usage, personalization, customer feedback	7	204 users	23	0,93-0,98	Proposal
(Giao, Vuong, & Quan, 2020)	2020	Website design, Security/privacy, Fulfillment/Reliability and Consumer service	4	594 users	16	0,73-0,86	Adapted from (H. Li, Aham-Anyanwu, Tevrizci, & Luo, 2015).
(Ongsakul *et al.*, 2020)	2020	Usability, Functionality and Security and Privacy	3	683 users	14	0,88-0,91 CR	Adapted from (Ali, 2016).

Note that sixteen papers suggested new scales, in other words, they developed their items based on literature and not in ready scales (or any other dimension). Model WebQual from Loiacono was used by six studies, being that three studies used WebQual (2000), three others used WebQual (2007). Parasaruman was the base for five studies, in which three used scales of ServQual and two others used E-S-Q proposed by Parasaruman in 2005. eTailQ from (Wolfinbarger & Gilly, 2003) was used in three studies while the proposal WebQual from Barnes and Vidgen was cited twice.

From the 38 papers, eight of them used three equal dimensions, Information Quality, System Quality and Service Quality. Two other studies used 12 dimensions, based on Loiacono. Other two papers used three equal dimensions, Usability, Functionality and Security and Privacy. Twenty-six other papers differ from the dimensions used, some use similar dimensions and others more specific. The frequency of use of each dimension can be checked in Table 5, where that the most used ones are Information Quality, System Quality and Service Quality.

Table 5. Frequency of dimensions

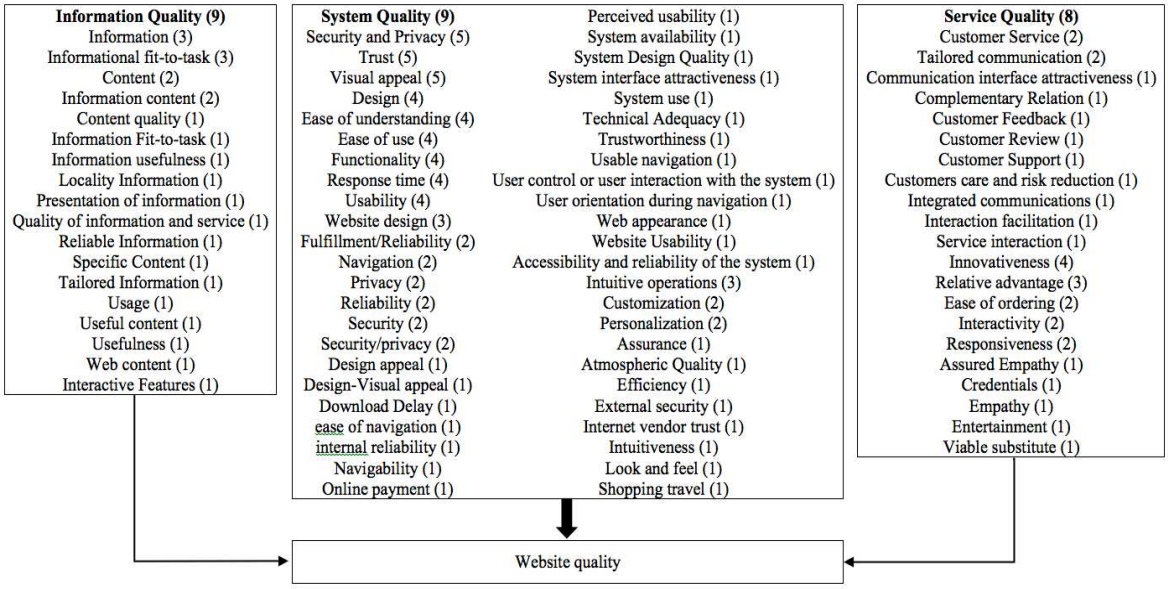
Dimensions	Count
Information quality; System quality	9
Service quality	8
Security and Privacy; Trust; Visual appeal	5
Design; Ease of understanding; Ease of use; Functionality; Innovativeness; Response time; Usability	4
Consistent image; Emotional appeal; Information; Informational fit-to-task; Intuitive operations; Online completeness; Relative advantage; Website design	3

Content; Customer Service; Customization; Ease of ordering; Fulfillment/Reliability; Information content; Interactivity; Navigation; Personalization; Privacy; reliability; responsiveness; Security	2
Others 63 dimensions	1

Regarding the types of sites approached, the publications approach websites in several sectors. The Retail sector (that sell products in general) was used in 15 works. Another 15 works addressed websites in general (The 'General' terminology was used for works that used product and service websites). Websites of hotels was used in four works. Tourism Destinations was approached in two works. Five other approached sites of Services, Social Shopping, Travel Agencies, Apparel Retail and Florist's Web.

Although there are basic elements present in sites of different sectors industrial, also there are substantial differences on websites in certain sectors. L. Wang *et al.* (2015) says that hotel sites work as information channels and transaction forums, differently of being only a website offering products. Kuan *et al.* (2008) highlight that in sites offering services, the online customers get information about products offered almost exclusively by means of the functionality of the site. This is contrary to tangible products whose information may be obtained from off-line sources. For authors this means that resources of the site would have a more prominent role in buying decisions from the user than in sites of products. In those 38 articles analyzed, 182 dimensions used to evaluate the quality of websites were identified. From those, 63 dimensions were used only once. However, we perceived that many authors would rather provide different names for the same dimension. Because of, it was decided to categorize the dimensions using greater representation in the study, Quality of Information, Quality of Service and Quality of System (Table 5). Thus, in Figure 4 we characterized dimensions by similarity in three large groups. Numbers between brackets represent the amount of times that the dimension was used at the 38 papers.

Figure 4. Categorization of dimensions in three groups



3.3. Information Quality

For Hsu *et al.* (2012) and Hsu *et al.* (2018) Information Quality means a measure of value perceived by a customer of the output produced by a website. For J. V. Chen *et al.* (2013) to measure quality of information it is important to observe the informativeness, organization and entertainment. Authors highlight that the site must have information in a way that it is interpretable, understandable, easy to handle and accessible. For Hung-Joubert (2017) information quality is about the content of an online system that must be customized, complete, relevant, easy to understand and save. For F. Zhou and Jia (2018) quality of information shows the degree in which the content of the site is precise, complete and opportune. In the your research Gao and Li (2019) highlight that Information Quality includes some attributes such as opportunity, relevance and precision. For Shih (2004) the quality of information is associated with the precision and integrity of the information. Finally, Kuan *et al.* (2008) describes quality of information as the degree where the user believes that the site information has the attributes of content, accuracy, format and update.

Para Swaid and Wigand (2009) Information Quality is the customer perception of usefulness and quality of the website content. Authors used the usefulness of information, accuracy, fit to task, up-to-date in order to measure the Information Quality. Eleanor T Loiacono *et al.* (2007), Kim and Lee (2006) and Kim and Stoel (2004b) included the

dimension Informational fit-to-task, from the WebQual model, which is the one regarding the capacity of a site in providing information regarding the capacity of a site to provide information that enhances and improve the users' task.

Abdallah and Jaleel (2015) used the Content dimension, where it states that information must be precise, needed and updated. Loureiro (2015) used dimension Information where it measures observing the utility and amount of information present on the site, besides the facility of observing them. This concept was also used in Jiménez-Barreto and Campo-Martínez (2018). Ranganathan and Ganapathy (2002) on its Information content dimension cites the availability and completeness of information. For Barnes and Vidgen (2002) information is the quality content of the site, encompassing the adequacy of information for the reasons of the user, such as: precision, format and relevance, a concept corroborated in Gounaris and Dimitriadis (2003).

We realized that most of the concepts of dimensions regarding Quality Information are similar and encompass availability, update, utility and organization.

3.4. System Quality

For Hsu *et al.* (2012) and Hsu *et al.* (2018) System quality refers to the overall system performance of a website and can be measured by the ease of use when shopping at an online retailer. J. V. Chen *et al.* (2013), on the other hand, choose usability and availability of the system to evaluate its quality. For Hung-Joubert (2017) System Quality measures the ease of use perceived by the users, the author used the Usability, Availability, Reliability, Adaptability, and Response Time to measure the quality of the system. For F. Zhou and Jia (2018) the quality of the system regards the characteristics of availability, Reliability and Response time of the site. Gao and Li (2019) measured system quality in terms of browsing, access speed and visual appeal. For Shih (2004) system quality is associated with the processing characteristics of the site, such as the facility of payment and the protection of user data. Kuan *et al.* (2008) defined the quality of the system as the degree in which the user believes that the site is easy to browse and that the interaction of the interface is consistent.

Kim and Stoel (2004a), Kim and Lee (2006), Eleanor T Loiacono *et al.* (2007) and Sun *et al.* (2015) used the dimension Visual Appeal, which corresponds to the aesthetic of the site, evaluating if the site has a pleasant design. Similar to that, Lopes and Melão (2016) highlight that design regards the way as the site content is presented to users, including visual elements, structure and organization. In this sense, Tezza *et al.* (2016) found dimension Accessibility and System Use, highlighting that this dimension of verifying group items of

some possible obstacles for the system that may prevent, confuse or hinder the access of users. Loureiro (2015), Jiménez-Barreto and Campo-Martínez (2018) explain that the design of the site comprises the characteristics of accessibility, such as the size of the site and presence of interaction. For Ranganathan and Ganapathy (2002) and Giao *et al.* (2020) design is associated with the characteristics of ease of use and browsing.

For Swaid and Wigand (2009) the easiness of browsing is inserted in dimension usability. In this context, L. Wang *et al.* (2015) used dimension usability, meaning how much a site is efficient and nice. Abdallah and Jaleel (2015) used dimension browsing regarding the ease of use and the intuitive flow in the site. Similar to that Eleanor T Loiacono *et al.* (2007), Kim and Stoel (2004a) and Sun *et al.* (2015) used dimension Intuitive Operations meaning that it is the point in which browsing in the website seams easy for the user to learn. Kim and Lee (2006) used the same dimension but named Intuitiveness. For Lopes and Melão (2016) design characteristics of the site cannot be separated from the questions of accessibility and safety and privacy.

Thus, Soyoung Kim and Stoel (2004), Kim and Lee (2006), Loiacono, Watson, and Goodhue (2007), Sun *et al.* (2015) and Tandon, Aakash, and Aggarwal (2020) used dimension Trust, regarding the security of doing transactions in a site. Similar to that, Swaid and Wigand (2009) used Assurance about the perception of the user regarding trust in the site. All that is related to security against external threats to the site. Hong and Kim (2004) used external security that represents security against external threats to the site. Wolfinbarger and Gilly (2003) used dimension Security and Privacy regarding the security of payments with credit card and the privacy of shared information. Similar to what is used in Ongsakul *et al.* (2020), Ali (2016) and Wang *et al.* (2015).

We perceived that most of the concepts of dimensions related with System Quality are similar and encompass usability, easiness of use, design, response time, browsing, privacy and security.

3.5. Service Quality

For Hsu, Chang, and Chen (2012) and Hsu, Chen, and Kumar (2018) Service quality signifies overall customer evaluations and judgements about the quality of online service delivery. Chen *et al.* (2013) limited the dimension of quality of service to its trust/warranty (knowledge and courtesy of employees with the customers and their capacity of transmitting trust) and empathy (care and individualized attention to clients). However, authors mention that the quality of service must be evaluated also by measuring responsiveness. For Hung-

Joubert (2017), the quality of service describes the support that a site offers to its users, depending on Responsiveness, Assurance, Empathy, Reliability, and Follow-up Service. For Zhou and Jia (2018) Quality of Service is about the capacities of service and after-sale support of the site. Hsu, Chen, and Kumar (2018) highlights that quality of service is related with the quality of delivering the online service. For Gao and Li (2019b) reflects the efficacy of the support provided to users for helping with their online shopping. The authors measure the quality of service using reliability, response capability, warranty and customization. For Shih (2004) Quality of Service is the interaction between user and e-commerce and is associated to user support and delivery time. For Kuan, Bock, and Vathanophas (2008) quality of service is defined as the degree in which the user believes that the site is responsive, interactive, clear about security and privacy policies and efficient on its capacity of research and comparison. For the authors, service support on the web may take several formats, such as answering to user demands and providing resources of research and comparison.

Swaid and Wigand (2009) used dimension responsively where it makes explicit that it is the perception of the customer in getting help when needed due to automated or human factors. Kim and Stoel (2004) and Loiacono, Watson, and Goodhue (2007) used dimension Tailored Communication regarding the interaction between users and company by means of the site, in order to allow that users and company get customized answers. Kim and Lee (2006) used the same dimension but named as Interactivity, meaning the capacity of allowing user and company to communicate directly between them. Under this perspective, Nam *et al.* (2020) and Wolfinbarger and Gilly (2003) used dimension Customer Service, meaning the willingness of answering to customers in real time.

Eleanor T Loiacono *et al.* (2007) also uses dimension Relative Advantage, regarding how easier it is to get information by means of the site than to contact the company by offline means. For that, it is important that the user feels trust in the site. To have trust it is necessary to know the company. For that, Abdallah and Jaleel (2015) use dimension Credentials to support the service (mission, values, team), being the display of information from the company (mission, values, teams) and several types of contact for the user to receive information.

We could see that most of the concepts of dimensions regarding Service Quality are similar and include trust in the company, customer support and response capacity to users.

4. IDENTIFYING RESEARCH GAPS FOR FUTURE RESEARCH

This research focused on answering three goals: (i) identifying the dimensions used to evaluate the quality of websites; (ii) which are the sources of those dimensions and (iii) which are the similarities of the used dimensions. To meet the first goal, our research identified over 100 dimensions. Regarding the second goal, we identified that model WebQual of Laiacono was the more used model. In the third goal, we grouped the dimensions in three groups that could effectively capture all the attributes identified in previous studies on the quality of websites, based on frequency and similarity. The analysis derived from the execution of objectives allowed to suggestion of two main research directions, and these are discussed below.

4.1. An approach more and more focused in customization

The advancement of digital transformation increased the autonomy of the customer over transactions in the site, making the market more and more competitive. Besides, changes in custom care happen each time faster. Currently, companies need of adapting themselves to the new customer profiles - increasingly demanding and multi-connected – came to define the great trends of customer care. New consumers are inconstant. At any moment they may give up doing business with the company and opt by a competitor if the customer service was not satisfactory. With digital transformation, focusing on the user experience became indispensable for companies aiming to have success in business. This way, it is necessary that the models incorporate more and more criteria to evaluate customer care inside the site. The new customized care is based in big data (offering customized products and services) and artificial intelligence, like chat-bots, to solve instantaneous questions from users. There is also the integration of sites with social networks and message chats for a faster and assertive service.

Measuring custom care in the site with basic questions such as: “Are the questions answered readily?” (Wolfinbarger & Gilly, 2003); “does the site make easier the communication with the organization” (Barnes & Vidgen, 2002); “Does the site allows me to interact with it in order to receive customized information” (Eleanor T Loiacono *et al.*, 2007), does not seem so much. With the fast change pulled by the digital transformation, more and more technologies are available in the market and it is necessary to measure witch tool the customer uses for a better experience.

Torkzadeh and Dhillon (2002) when developing their research found that users did not seem concerned with customer support before the sale (for instance, talking with a sales

person, having the opportunity of personal interaction). The authors highlight that those constructions seemed to be less relevant for the commerce by Internet and, because of that, items regarding Quality of Service were not included in the model. One year later, DeLone and McLean (2003) updated its model, including exactly the Quality of Service, because they verified that the model with attributes of information and system was not enough to capture the quality of a website. In a report, Segment (2017) it was demonstrated that only 22% of users are satisfied with the personal care that they receive in a website. This way, focusing in user experience is essential for the success of the site.

4.2. Applications and Development in Particular Sectors

We demonstrated that, although several sites of industries were used, there are no models neither application in sites with products of high aggregated value in which the transaction is not made on site. However, the website is used as a large showcase for the company to capture the customer and to make the transaction latter, such as happens in sites of car sale and real estate. We believe that the particularities of this model must be explored, by applying the already existing models, identifying problems and building new models focused in this type of industry. Other sectors also have particularities and must be explored, such as sites of universities, museums, sites of tourist attractions in general), telecommunication services.

5. CONCLUDING REMARKS

The objective of this research was to present an overview of studies on the quality of websites, in order to identify the main dimensions and methods of analysis associated with the evaluation of the quality of websites. For this, we followed the recommendations of the PRISMA statement for systematic reviews, reviewing articles for their content. In addition, this review made it possible to identify research gaps, whose filling is suggested by the development of a research schedule.

This review was carried out focused on website quality assessment models. The review was limited to models that proposed scales for commercial websites, so it was decided to focus on studies that used Factor Analysis, Structural Equation Modeling and Item Response Theory. The analysis of these methods is supported by Barriocanal, Sicilia Urbán, González, and Hilera (2005), who mention that these methods demonstrate reliability and validity for an

evaluation scale. Note that university, government and hospital websites, for example, were not included, as these websites are often informational and non-transactional.

The results of this research revealed that there are more than a hundred dimensions used in studies to assess the quality of websites, however, these dimensions have similarities and therefore, in this work they were grouped providing a broad view of the most used dimensions. We identified that the WebQual model by Eleanor T Loiacono *et al.* (2002) was the most used model in this literature portfolio. WebQual was developed in four stages and consisted of four constructs, which gave rise to 12 dimensions, which were evaluated through 36 items.

Due to the similarities of the dimensions used, we grouped the dimensions into three groups that could effectively capture all the attributes identified in previous studies on the quality of websites, based on frequency and similarity, which are: Information Quality, System Quality and Service Quality. DeLone and McLean (2003) corroborate with the clustering of dimensions, the authors argue that attempts should be made to reduce the number of different measures used to measure the success of the Information System.

In addition, we also suggest two research directions, one focused on customization and the other for specific sector sites, such as high value-added product sites. At first with digital transformation, it has become indispensable for companies that aim to succeed in business - focus on user experience. Thus, it is necessary that the models incorporate more and more criteria to evaluate customer service within the site. This new customized service can be based on big data (offering customized products and services) and artificial intelligence, such as chat-bots, to solve users' instant queries. In the second, we demonstrate that there are no models or applications on sites with high added value products where the transaction is not carried out on site. We concluded that the site is used as a great showcase for the company to capture the customer and make the transaction last, as in car and real estate sales websites. We believe that the particularities of specific sector websites should be explored, applying existing models, identifying problems and building new models focused on this type of industry. Other sectors also have particularities and should be explored, such as university sites, museums, tourist attractions, as well as telecommunications services.

This research has some limitations. First, results were restricted to publications available in the databases Scopus and Web of Science. Although they were widely considered, there may be important studies that are not indexed on those databases. Therefore, future researches could amplify the number of databases queried so that a broad set of papers is considered. Besides, the insertion of other key-words in the initial search may lead to

complementary perceptions about the theme. In this sense, an advanced combination of key-words could bring other approaches not included in this research.

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1) concepção e planejamento.	X	X	X	X
2) análise e interpretação dos dados.	X	X	X	X
3) elaboração do rascunho ou na revisão crítica do conteúdo.	X	X	X	X
4) participação na aprovação da versão final do manuscrito.	X	X	X	X