Double-entry analysis system (*DEAS*) for comprehensive quality evaluation of websites: case study in the tourism sector

Carles Sanabre; Rafael Pedraza-Jiménez; Sara Vinyals-Mirabent

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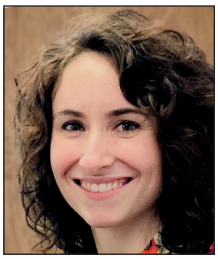
Carles Sanabre ✉
https://orcid.org/0000-0001-7711-8005

Universitat Pompeu Fabra
Departament de Comunicació
Roc Boronat, 138
08018 Barcelona, Spain
carles.sanabre@upf.edu

Rafael Pedraza-Jiménez
https://orcid.org/0000-0002-6918-6910

Universitat Pompeu Fabra
Departament de Comunicació
Roc Boronat, 138
08018 Barcelona, Spain
rafael.pedraza@upf.edu



Sara Vinyals-Mirabent
https://orcid.org/0000-0001-7120-6039

Universitat Pompeu Fabra
Departament de Comunicació
Roc Boronat, 138
08018 Barcelona, Spain
sara.vinyals@upf.edu

Abstract

A new analysis system for evaluating website quality is presented. It is characterized by its ability to interrelate and evaluate both technical and strategic aspects of a website. It is based on the premise that, while the technical aspects that govern the operation and functionality have a great impact on the quality of a website, they do not guarantee its success on their own. This approach differs from those commonly adopted in analysis systems, since until now most of them have been developed by adopting a predominantly operational or functional view.

Keywords

Websites; Website quality; Website evaluation; Web quality index; Strategic web quality; Technical web quality; Comprehensive web quality; Analysis systems; Methods; Web strategy; Tourist websites; E-tourism.

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1. Introduction

A website is a dynamic entity that evolves and needs to be periodically reviewed using analysis programs or systems to guarantee its quality (**Sanabre**, 2015). Currently, there are many, very different systems for such analysis (**Codina**, 2006; **Pedraza-Jiménez**; **Codina**; **Guallar**, 2016; **Hernández**; **Jiménez**; **Martín**, 2009; **Jiménez-Iglesias**; **Pérez-Montoro**; **Sánchez-Gómez**, 2017). These proposals adopt very different approaches which vary depending on the elements that their authors consider key in evaluating and determining the quality of a website. In some cases, these proposals include their own quality indices, as is the case of the *Web site evaluation index*, which mainly measures the quality of the following aspects: navigation, content, languages, privacy, and security (**Xanthidis**; **Argyrides**; **Nicholas**, 2009).

Among these systems, those that focus their analysis on the content or technical characteristics of the website are more predominant (**Codina**, 2006). Others, of a more generic nature, propose quality models designed for use in both software and web analysis (**Fogli**; **Guida**, 2015). Some of these systems analyze aspects such as accessibility, usability, impact, and utility, taking into consideration the EQ-EVAL and QM-U methodologies (**Fogli**; **Guida**, 2018). In addition, there are highly specialized analysis systems that focus on specific aspects, such as visibility in search engines (**Lopezosa**; **Codina**; **Rovira**, 2019).

As a whole, all these tools coexist with analysis systems of a strategic nature, although the latter remain very scarce. Consequently, when talking about the quality of a website, it is often only its technical aspects that are referred to. This makes it possible for a website that exhibits high technical quality to be evaluated as correct or even excellent, while it may lack a well-thought-out business logic and be doomed to fail due to a lack of adequate strategic conception (**Sanabre**; **Pedraza-Jiménez**; **Codina**, 2018).

Unlike traditional approaches, our proposal begins with the premise that it is not possible to adequately evaluate the quality of a website by only taking into consideration its technical and functional aspects. Furthermore, we consider that the technical and functional aspects must be aligned with the strategic aspects to guarantee that it adequately fulfills its function.

This work confirms and formalizes this interrelation by proposing a double-entry system for analyzing website quality. That is to say, a system that, on the one hand, makes it possible to define and analyze the strategy and to determine which technical aspects will have the greatest impact on its achievement. On the other hand, it allows the technical aspects to be directly evaluated, and to identify the extent to which they favor or condition the success of the website's mission.

The current work also aims to apply and test the new proposed analysis system. To this end, various official websites of European tourist destinations are evaluated using it.

2. The website in the tourism sector and its evaluation

Nowadays, the internet is the place where tourists seek information about destinations, the space where they make their decisions, the tool they use to organize their trip, and even the place where they buy tourist products (*European Commission*, 2017; **Patkose**; **Stokes**; **Cook**, 2004; **Xiang**; **Wang**; **O'Leary**; **Fesenmaier**, 2014). Thus, online communication and websites in particular have become a new channel for tourism consumption (**Buhalis**; **Law**, 2008; **Law**; **Qi**; **Buhalis**, 2010; **Luna-Nevarez**; **Hyman**, 2012; **Park**; **Gretzel**, 2007), and with this, researchers in the field of communication have been paying increasing attention to the characteristics of these websites and their possibilities (**Standing**; **Tang-Taye**; **Boyer**, 2014; **Sun** *et al*., 2017).

In particular, official websites, such as those of organizational communication entities for a destination, have attracted great attention from researchers due to their influence on the attitude and decision-making process of tourists (**Tang**; **Jang**, 2011). In this sense, **Luna-Nevarez** and **Hyman** (2012) describe the official destination site as its representative on the internet, reflecting everything about the destination and what it offers to tourists.

As a consequence of the relevance that these websites have acquired for the institutions that administer them, i.e., destination marketing organizations (DMOs), it is essential to ensure their quality (**Fernández-Cavia** *et al*., 2013). For DMOs, it is vital to have high-quality official websites, at both a strategic and operational level, that satisfy the informational needs of potential tourists and discourage their users from turning to alternative sources of information (**Chias**, 2005). For this, it is not enough nowadays to create official websites, but instead it is imperative that DMOs invest constant effort in their evaluation and optimization (**Morrison**, 2013).

There are various evaluation systems that allow for the improvement of websites (**Ip**; **Law**; **Lee**, 2011) and have been applied in research studies to judge the value, usefulness, or functionality of a product according to certain criteria (**Guallar**; **Abadal**; **Codina**, 2013). Such evaluative proposals may vary depending on the elements that their authors consider key to the quality of a website and on the methodological approach. In tourism, there are five predominant evaluative approaches:

- Counting
- Automation
- Numerical computation
- User experience
- Combinations of methods for the analysis of optimal characteristics (**Law**; **Qi**; **Buhalis**, 2010)

In this way, in relation to the quality of tourist websites, we can verify once again that technical approaches are predominant. Therefore, there is a need for a holistic approach that simultaneously takes into account operational as well as strategic quality (**Auer**; **Petrovic**, 2004; **Sanabre**; **Vinyals-Mirabent**; **Pedraza-Jiménez**, 2019). Although such evaluation varies between the perspective of the user and the issuer (**Auer**; **Petrovic**, 2004), we find ourselves in a context where DMOs are increasingly interested in

> "knowing whether their website has high-quality elements, beyond evidence for the quality of the content or the showiness of the design" (**Codina**, 2000).

3. The website as a strategic tool

The ideation of websites (**Pedraza-Jiménez** *et al*., 2013) has been approached using different methodologies. There are classic (but still current) approaches, which are characterized by emerging prior to the emergence of the social web. One of the first and most important, due to its enormous influence, is that by **Nielsen** (1994, 1999) which focuses on usability.

Another of the best-known proposals is **Garrett**'s (2011) general scheme, whose foundations mainly lie at an operational or technical level. In addition, it also refers to strategic aspects, to indicate the need to establish the objectives of the website at an initial phase, prior to development. However, it does not explain how to define them. **Garrett**'s main contribution is to integrate almost all the disciplines related to web design (such as user experience design, interface design, or development implementation) without requiring excessive dependencies between them.

On the other hand, **Olsen** (2003) presents a model with elements that, without being related, consider some basic strategic aspects of the website. Another important reference is **Dalton** (2007), who proposes a web ideation system that emphasizes the needs of the users and the business objectives of the organization. **Rosenfeld** and **Morville** (2006) speak along the same lines, pointing out the importance of determining which strategies a business pursues before defining the information architecture of its website. However, those authors do not define techniques or tools to establish this relationship.

For their part, **Hernández**, **Jiménez** and **Martín** (2009), based on an extensive bibliographic review, conclude that the key aspects of web design are:

- Searchability
- Access speed
- Usability
- Content quality
- Interactivity
- Transactional capacity.

Other proposals, such as that of **Kaur** and **Gupta** (2014) in their *Web quality model cube*, consider that the quality of a website resides in its technical aspects and in content. In this case, usability is considered a key factor in quality. The importance of this factor was also recognized by **Qayyum** and **Rafiq** (2016), but those authors consider that this factor, by itself, is insufficient to evaluate the quality of a website globally.

Along the same lines, the work of **Piñeiro-Naval**, **Igartua**, and **Marañón** (2017) on the municipal websites of Spain deserves attention. In their study they consider web design to be

> "a complex concept, formed by the principles of visual appearance, information architecture, and usability, which represent the core elements to be evaluated in the planning and development of a website"

However, in this case as well, explicit value is not given to the strategy as a core element for success.

In other cases (**Pérez-Montoro**; **Codina**, 2010), the use of wireframes or mockups is proposed to address this complexity and to transfer the idea of those responsible for the website to the designer. However, when using this procedure, one can make the mistake of neglecting an adequate strategic design. This problem has already been verified by authors such as **González-López**, **Bañegil-Palacios**, and **Buenadicha-Mateos** (2013), who point out the need for organizations to evaluate the online strategy related to their website. In fact, they propose an index that measures a part of the web strategy related to the online headquarters, the so-called *Quantitative web quality index*. However, the same authors conclude that their index

> "should be considered as part of a larger index that brings together more concepts related to the organization's web strategy"

Therefore, they do not approach the study of the strategy of the site from a global perspective. Along the same lines, we highlight the ideas of **Fisher**, **Craig**, and **Bentley** (2007), who associate the concept of "site strategy maturity" with its quality.

If we focus on websites of tourist destinations, we also find various studies that have focused on the analysis of their quality, but these studies still do not address the problem of the global strategy. This is the case of the proposal by **Tran** and **Yan** (2014), who elaborate a model for DMOs that mainly focuses on the analysis of the technical aspects of the website, such as its SEO or transactional capacity.

The study by **Jayaram** and **Kamal** (2016) is also interesting, as they propose a conceptual model that aims to expand knowledge about the role of interactivity on the web. According to their work, the more interactive a hotel website, the higher its value as perceived by the customer. They thus highlight the relevance of interactivity as a value for the user.

Finally, the proposal by **Mandal**, **Roy**, and **Raju** (2017) should also be mentioned. Based on their study of tourist websites, those authors contribute the new concept of website resilience, which they define as the customer's perception of a website's features or capabilities in terms of restoring its operations and functionality when faced with any type of disruption, for example, after a technical failure. They also present a model focused on the aspects of *analytics*, *resilience*, *agility*, *attractiveness,* and *intention to revisit*. This model considers strategic aspects, such as the intentionality of the user or the design, although in a very incomplete fashion.

This literature review on web quality thus confirms that the strategic aspects of the website are recognized as essential factors for the success of its mission. Despite this, studies that identify the incorporation of the strategy into the analysis process remain scarce, nor have any works that study how the strategic and technical aspects condition and influence each other been identified. In this regard, only the *Website canvas model* analysis and strategic ideation system has been identified (**Sanabre**, 2015; **Sanabre**; **Pedraza-Jiménez**; **Codina**, 2018).

4. The website as an operational tool

In recent decades, many researchers have worked towards the development of useful methodologies for evaluating the operation of official tourism websites. Several studies have focused on the evaluation of characteristics such as quality and information (**Inversini**; **Cantoni**; **De-Pietro**, 2014; **Law**; **Bai**, 2008; **Rodríguez-Molina**; **Frías-Jamilena**; **Castañeda-García**, 2015), technical elements **(Dedeke**, 2016; **Kang**; **Kim**, 2006), design (**Lee**; **Gretzel**, 2012; **Vinyals-Mirabent**, 2014), and impact and general operation (**Dickinger**; **Stangl**, 2013).

Despite all these studies, the debate regarding which characteristics a holistic web evaluation model should contain remains open (**Law**; **Qi**; **Buhalis**, 2010). The multidimensional nature that characterizes these systems for website analysis poses a challenge for their creation (**Cho**; **Sung**, 2012; **Fernández-Cavia** *et al.*, 2014). Currently, there are five major areas of web evaluation: informational, technical, persuasive, relational, and strategic, although only the first four have generated an abundant scientific literature so far.

Many researchers have included the technical dimension in their evaluation proposals (**Ip**; **Law**; **Lee**, 2011). Characteristics such as usability, accessibility, or the architecture of the site are key elements that determine its quality at a technical level (**Li**; **Wang**, 2010; **Morrison**, 2013). In addition, factors such as positioning (**Rovira** *et al.*, 2010) or site security (**Park**; **Gretzel**, 2007) have been added more recently to the set of technical features that determine web quality. However, due to the great attention that the technical characteristics have garnered, the communicative and discursive characteristics have sometimes been neglected (**Inversini**; **Cantoni**; **De-Pietro**, 2014; **Opoku**; **Abratt**; **Pitt**, 2006; **Opoku**, 2009).

This can be clearly seen if we return to the context of the official websites of tourist destinations. The quality of the information they offer is crucial for the perception of the destination by the user (**Tang**; **Jang**; **Morrison**, 2012). In fact, several authors point to the importance of evaluating not only the quality or quantity of information offered, but also its persuasive capacity and ability to attract tourists (**Fernández-Cavia** *et al.*, 2014; **Park**; **Gretzel**, 2007). We found proposals that consider visual appeal, the effectiveness of marketing techniques (**Morrison**, 2013), or the ability of the discourse to promote marketing actions at the destination (**Fernández-Cavia** *et al.*, 2014; **Li**; **Wang**, 2010).

Tourism experts agree with web quality experts that the evaluation of the interactive capabilities of the site is essential for its operational functioning (**Contreras**, 2010; **Li**; **Wang**, 2010). In this sense, customization options based on the profile of each tourist (**Pike**, 2012), or functions that enable the tourist to co-create the official discourse of the destination (**Therkelsen**, 2015), are some key indicators for the web evaluation at this level.

We thus conclude that advances in evaluation systems for tourist websites have been disparate and complementary, and although analysis tools exist to facilitate an operational evaluation of the official websites of destinations, they focus on their more technical aspects (**Pedraza-Jiménez**; **Codina**; **Guallar**, 2016), while in this domain there is still a lack of analysis systems that take the strategic dimension into consideration.

5. Objectives

This work has three objectives:

I. To present a new analysis system for the comprehensive evaluation of web quality.

II. To propose an index that allows for the evaluation and comparison of the quality of the websites evaluated using this system.

III. To apply this system to a case study, specifically tourism websites, to test its operation.

To achieve these objectives, it is necessary to propose a system capable of identifying the strategic aspects that guarantee the success of a website's mission. Likewise, the system must identify the technical characteristics of an operational and functional nature that guarantee the correct functioning of the site. Finally, the system must identify how the strategic aspects are related to these technical characteristics of the website to detect their interdependencies.

6. Methodology

6.1. Bibliographic review

A literature review was carried out using the *Web of Science* and *Scopus* databases, as well as the academic search engine *Google Scholar*. Searches were limited to the period between 2000 to 2019. The initial search terms, which were extended as relevant results were found, were:

("website quality" OR "web site quality" OR "web quality") AND (assessment OR evaluation)

"website strategy" OR "web site strategy" OR "web strategy"

("website quality" OR "web site quality" OR "web quality") AND (assessment OR evaluation) AND (strateg*)

("website quality" OR "web site quality" OR "web quality") AND (assessment OR evaluation) AND (tourism OR destination)

In this way, most of the systems and proposals mentioned above were identified, revealing a gap regarding the strategic precision of the website, an aspect that has been incorporated into and is central to the current proposal.

6.2. Analysis systems

Two analysis systems were selected to serve as a basis for the formalization of this new proposal. The current authors participated in the creation of these systems, and their operation has already been tested. One of them, called the *Website canvas model* (**Sanabre**, 2015; **Sanabre**; **Pedraza-Jiménez**; **Codina**, 2018), is useful for the analysis and specification of the strategy of a website. The other is the *Tourism website assessment system* (*TWAS*, or *Sistema de análisis de sitios web turísticos* (SAST) in Spanish) (**Fernández-Cavia**; **Vinyals-Mirabent**; **López-Pérez**, 2013) used for the evaluation of operational and functional characteristics.

The *Website canvas model* (*WSCM*) identifies 14 key aspects in the strategy of a website, representing them in a synthesized way on a canvas or model (Figure 1). It takes the *Business canvas model* by **Osterwalder** and **Pigneur** (2010) as a reference, modifying it for application in the context of the creation, design, and development of websites (**Sanabre**, 2015; **Sanabre**; **Pedraza-Jiménez**; **Codina**, 2018).

Meanwhile, the *Tourism website assessment system* (*TWAS*) is a system to evaluate the technical quality of a website, consisting of 12 parameters and 127 indicators (Table 1). The parameters refer to general aspects of the website, such as its content, navigation, usability, etc. These parameters are made up of a set of indicators, each of which allows for the evaluation of a specific aspect. For example, in the parameter "Content," there is an indicator that evaluates whether the destination website provides adequate information on how to navigate within it.

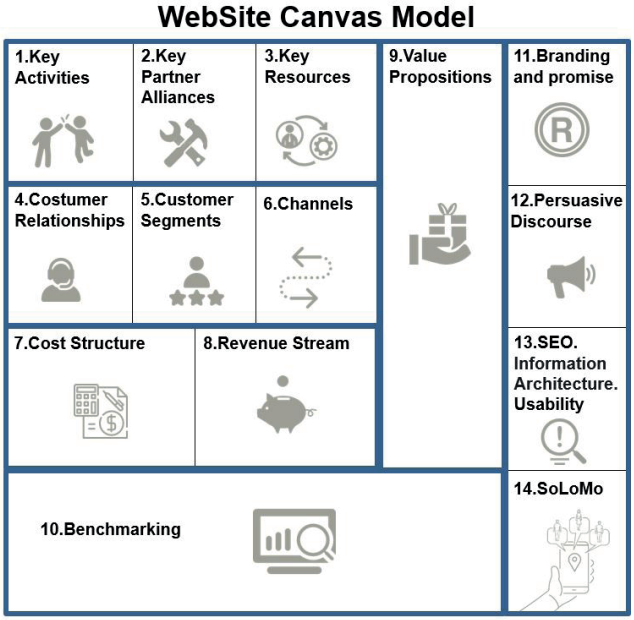

Figure 1. Elements of the *Website canvas model*

6.3. Interviews

Semistructured interviews were conducted with those responsible for eight Spanish tourist destinations and the respective technical personnel responsible for their official websites, specifically the Region of Murcia, City of Madrid, Galicia, Rías Baixas, Sitges, La Rioja, Malaga, and Tarragona. The interviews, which were conducted at the headquarters of the respective organizations between the months of March and July 2014, helped to identify the relationships between the strategic and technical aspects of the website. In them, a set of questions organized into the following five topics were used:

- Organization of the DMO. Policy. *Place branding versus Destination branding public diplomacy.*
- Branding strategies. Target brand.
- Values and communication. Marketing plan.
- Communication plan.
- Website.

Table 1. Parameters that make up the *TWAS*

Parameters	No. of indicators
Home pages	14
Quality and quantity of content	17
Information architecture	11
Usability and accessibility	19
Search engine optimization (SEO)	6
Distribution or marketing	8
Languages	6
Brand treatment	13
Discursive analysis (text and image)	8
Interactivity	12
Social web	8
Mobile communication	5

- Social platforms.
- Mobile communication.

To summarize the results, the first column of Table 2 collects the main problems indicated by the interviewees. The second column presents the strategic aspects identified by the *WSCM* that would be affected. The third column shows the technical parameters of the *TWAS* system that these problems would affect.

Table 2. Problems detected in the interviews

Problems and concerns detected in the interviews	***WSCM* area**	***TWAS* parameters**
Lack of agreed strategic approach	All areas Value proposition	Not applicable
Shortfalls in the identification of audiences	Customer segments Customer relations SoLoMo	Social web Languages
Site maintenance Updates	Key partners Key resources	Not applicable
Poor search engine indexing	SEO	Search Engine Optimization (SEO)
Lack of collaboration between sector personnel	Key partners Customer segments	Distribution or marketing
Difficulties in communicating the value proposition	Value proposition	Discursive analysis (text and image)
Difficulty in defining and communicating the brand (occurring in the case of consortia, or when the project is the responsibility of a department of the city council and there is no identifying brand)	Branding and promise Persuasive discourse	Brand treatment
Problems in defining the architecture of the site	SEO Information Architecture	Information Architecture Usability and accessibility
Social networks	SoLoMo	Social web
Mobile	SoLoMo	Mobile communication
Knowing what the competitors are doing	Benchmarking	Not applicable
Lack of commercial focus	Value proposition Return on investment Persuasive discourse	Distribution or marketing
Lack of indicators of the return of investment	Return of investment	Distribution or marketing
Lack of site quality indicators	Strategic quality index	Technical quality index

6.4. Identification of relationships

To identify the relationships between the strategic aspects and the technical characteristics, a heuristic method was used, as well as interviews with those responsible for the websites. The heuristic identification was based on the previous experience of the authors. The development of more than a dozen systems for evaluating the quality of websites (**Pedraza-Jiménez**; **Codina**; **Guallar**, 2016), as well as the development of more than a hundred websites, have served as the basis for the formulation of this proposal, based on expert observation (**Denzin**; **Lincoln**, 2011). This experience was also useful to include a series of solution patterns or recommendations for website problems in the new system.

Specifically, the formalization of the identified relationships was implemented by merging the two mentioned analysis systems, *WSCM* and *TWAS*. Table 3 summarizes the correspondence between the strategic sections of the *WSCM* and the parameters and indicators of a technical, operational, and functional nature of the *TWAS*.

The table above identifies the strategic and technical sections that influence each other, that is, the aspects that have a direct interdependence, which presumably implies that the problems detected in one of the aspects, be them technical or strategic, would also affect the other related aspects.

For example, if there are deficiencies detected in the evaluation of the parameter "Interactivity," such as a lack of interactive resources, audiovisual material, or guides on the destination, it is difficult for users to recommend and share this information on their social networks, as this parameter is directly related to the strategic section "SoLoMo" (social, local, and mobile). This would be symptomatic of possible shortcomings in the website's social strategy. The same occurs in an analysis of whether to enable user comments, where a negative evaluation of this interactivity indicator would suggest a review of the "SoLoMo" strategy (social, local, and mobile).

Another example of these relationships is that established between the strategic section "Persuasive discourse" of the *WSCM* system and the "Storytelling" indicator of the "Brand treatment" parameter of the *TWAS* system. Thus, "Persua-

Table 3. Correspondence between the parameters of the *TWAS* and sections of the *WSCM*

***TWAS* PARAMETERS (technical, operational, and functional)** / ***WSCM* sections (strategic)**	**A. Homepage**	**B. Quality and quantity of content**	**C. Information architecture**	**D. Usability and accessibility**	**E. Search engine optimization (SEO)**	**F. Distribution and marketing**	**G. Languages**	**H. Brand treatment**	**I. Discursive analysis**	**J. Interaction**	**K. Social web**	**L. Mobile communication**
1. Key activities	X					X				X		
2. Key partner alliances	X					X				X		
3. Key resources										X		
4. Customer relationships	X	X					X			X	X	
5. Customer segments	X	X					X			X		
6. Channels			X	X						X	X	X
7. Cost structures						X						
8. Revenue stream	X	X				X						
9. Value proposition	X	X								X		
10. Benchmarking												
11. Branding and promise			X	X				X		X	X	
12. Persuasive discourse			X	X				X	X	X		
13. SEO, Information architecture, usability			X	X	X	X	X	X				
14. SoLoMo	X					X				X	X	X
Total	7	4	4	4	1	6	3	3	1	10	4	2

sive discourse" defines which arguments will be used on the web to convince users to act in accordance with the objectives of the organization. Meanwhile, the "*Storytelling*" indicator assesses whether the actual content on the website conveys the desired story, that is, the arguments previously defined by the organization.

It should be noted that this matrix already reveals the importance of the fact that the technical parameter "Interactivity" includes the strategy of a website. In other words, possible shortcomings or deficiencies in this technical parameter can negatively affect the strategy. Specifically, it could have a negative impact on up to 10 of the 14 sections that define the strategy. Therefore, we can deduce that, if an analysis reveals a low result in the technical evaluation of an interactivity parameter, the strategic component of the web will be critically affected.

Based on these two evaluation methods, the *Double-entry analysis system* (*DEAS*) has been formulated, which allows for the evaluation of the quality of a website by starting its evaluation from either its technical or strategic aspects. When the evaluation of a website begins by considering its technical aspects, the method tells us:

1) The quality of these technical aspects, which of them are properly satisfied, and which need to be improved

2) The strategic aspects that are affected by the technical characteristics that present shortcomings

If, on the contrary, the *DEAS* is activated using the strategic aspects of the website as input, the method indicates:

1) Whether all the strategic aspects necessary for it to successfully fulfill its mission have been considered

2) Which technical aspects are relevant for the strategy to be successful

The tool is thus created to evaluate the overall quality of a website as well as allowing benchmarking studies to be carried out. In addition, this new analysis system incorporates recommendations, guidelines, or patterns of solutions to the problems detected during the evaluation. The objective of the guideline or pattern will be to provide information so that the identified deficiencies can be resolved.

As an example, Table 4 shows part of the application of this system to the official website of the Istanbul tourist destination. The first column presents the strategic aspects (only one is shown in the example), which *DEAS* relates to the technical aspects that appear in the second and third columns. In the final column, the analysis system offers possible solutions that could be adopted in the event of a poor score.

Table 4. Example application of *DEAS*, showing its structure (fragment of application of *DEAS* to *howtoinstanbul.com*)

WSCM	TWAS parameter and indicator		Points	Solution/Pattern
WSCM element: SoLoMo	*TWAS* parameter: Mobile	*TWAS* indicator: Do the analyzed web pages have mobile applications?	0	Implement an app strategy. Go to the *WSCM*'s key partners section and check whether there are partners that could develop this solution. Recommendation: Go to *WSCM* 10. Benchmarking: Study how competitors apply an app strategy.

The complete analysis of a website with *DEAS* would involve, firstly, analyzing all the technical indicators of *TWAS* and identifying the parameters that do not pass the evaluation. Next, using the *DEAS* correlation matrix (Table 3), identify the strategic sections of the *WSCM* that, according to the analysis, are affected. Finally, the system offers recommended solutions for these problems (Table 4).

In summary, when applying the system, the global quality of the website is evaluated, and deficiencies or critical aspects that require intervention are identified, providing the system with patterns or recommendations (Figure 2) to solve them (**Terry-González** *et al.*, 2016).

6.5. Quality index

An index has been devised for the *DEAS* system, being called the *Global web quality index* (*GWQI*). Its creation is based on the indexes used by the two systems described above: the *Web quality index* (*WQI*) of the *Tourism website assessment system* (*TWAS*) and the *Strategic web quality index* (*SWQI*) of the *Website canvas model* (*WSCM*).

The *WQI* was proposed by **Fernández-Cavia** *et al*. (2014) to express the quality of the operational and functional aspects of a website through a numerical value. Its calculation takes into account the scores obtained in the indicators of all the *TWAS* parameters. Specifically, after analyzing a website, this index is obtained by calculating the arithmetic mean of the score obtained for each parameter.

On the other hand, for the global evaluation of the *Website canvas model* system (**Sanabre**; **Pedraza-Jiménez**; **Codina**, 2018), the *Strategic web quality index* (*SWQI*) is used. Its calculation takes into consideration 13 of the 14 sections of the *WSCM*. This is because the benchmarking section is considered neutral; That is, since it does not evaluate aspects of the website itself but rather studies the strategy of competing sites, it is considered that it should not contribute a score to the index.

Regarding the calculation of the index, its value is obtained quite easily. Basically, a value equal to 0 is assigned to those sections rated as deficient, and a value equal to 1 to each strategic section rated as optimal. The score obtained is divided

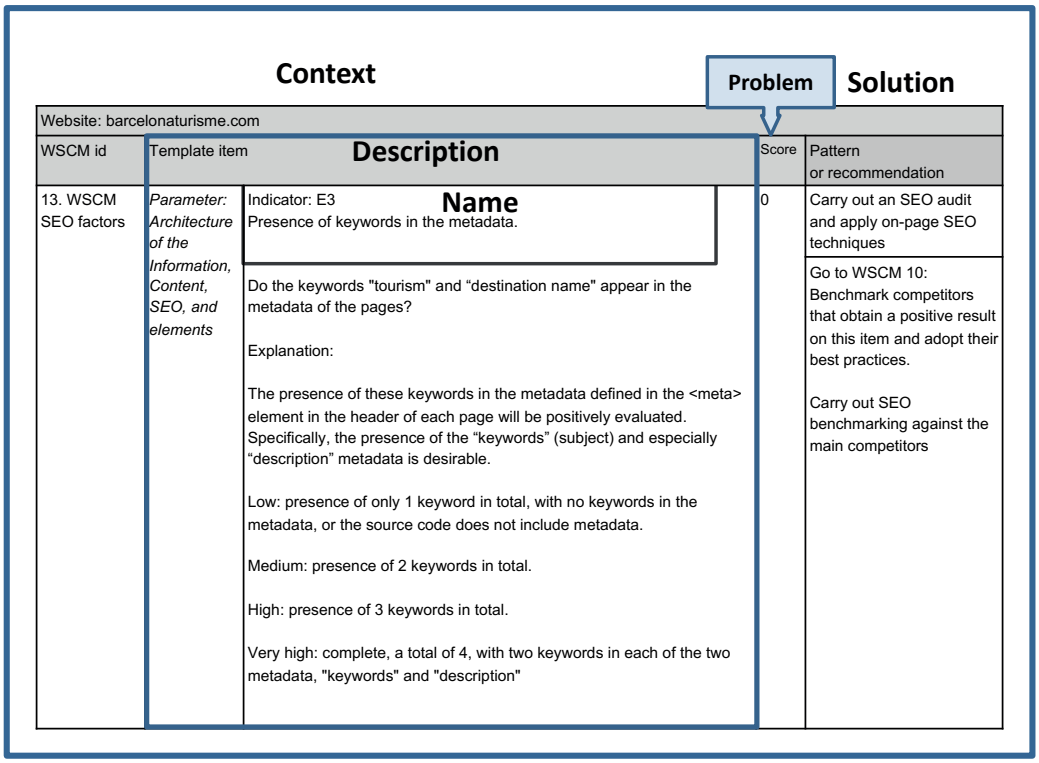

Figure 2. Basic elements of the structure of a pattern in *DEAS*

by 13 to yield a normalized value ranging between 0 and 1; For example, if after analyzing a website with the *WSCM* it were identified that, of its strategic sections, 9 are optimal while 4 have serious deficiencies (Table 5), a score of 9 out of 13, would be obtained, that is, an *SWQI* of 0.69.

Table 5. *SWQI* application example

Critical areas of intervention for domainX.com			
Tool of analysis	**Critical areas of action *WSCM***	**Optimal areas *WSCM***	***SWQI***
DEAS	4. Customer relationship 5. Customer segments 11. Branding and promise 12. Persuasive discourse	1. Key activity 2. Key partners 3. Key resources 6. Channels 7. Costs Structure 8. Revenue streams 9. Value propositions 13. SEO, Information architecture, usability 14. SoLoMo **TOTAL: 9 points**	0.69

To calculate the *Global web quality index* (*GWQI*), the *WQI* and *SWQI* indices must first be obtained. Both of these are then used to formulate the *GWQI*, considering both the technical functions based on the *WQI* and the strategic approach based on the *SWQI*. In this way, the *GWQI* is obtained as the arithmetic mean of the results obtained by each index. The following table shows a summary of the three indices and the method applied for the calculation (Table 6).

Table 6. Quality indices and the method for their calculation

Quality index	**Value**	**Calculation**
Operational/functional technical *Web quality index* (*WQI*)	12 technical parameters 127 technical indicators	The arithmetic mean of the set of evaluated parameters
Strategic web quality index (*SWQI*)	13 strategic sections	The sum of the number of sections rated as optimal by the *WSCM* divided by the total number of sections
Global web quality index (*GWQI*)	Operational/functional technical parameters and website strategy	The arithmetic mean of the set of *WQI* and *SWQI*

As a summary, Figure 3 offers a global vision of the elements that the *DEAS* analysis system assesses, including the three indices just mentioned.

Finally, in this work a case study method is applied to test the system. Specifically, the *DEAS* and its *GWQI* index are used to evaluate the global quality of the official websites of the destinations: Barcelona, Istanbul, London, and Paris. Authors such as **Martínez-M** (2006), **Yin** (2009), **Campbell** (1975), or **Barratt**, **Choi** and, **Li**, (2011) have demonstrated the validity of this method to make analytical generalizations, as would be the case of the analysis system proposed herein.

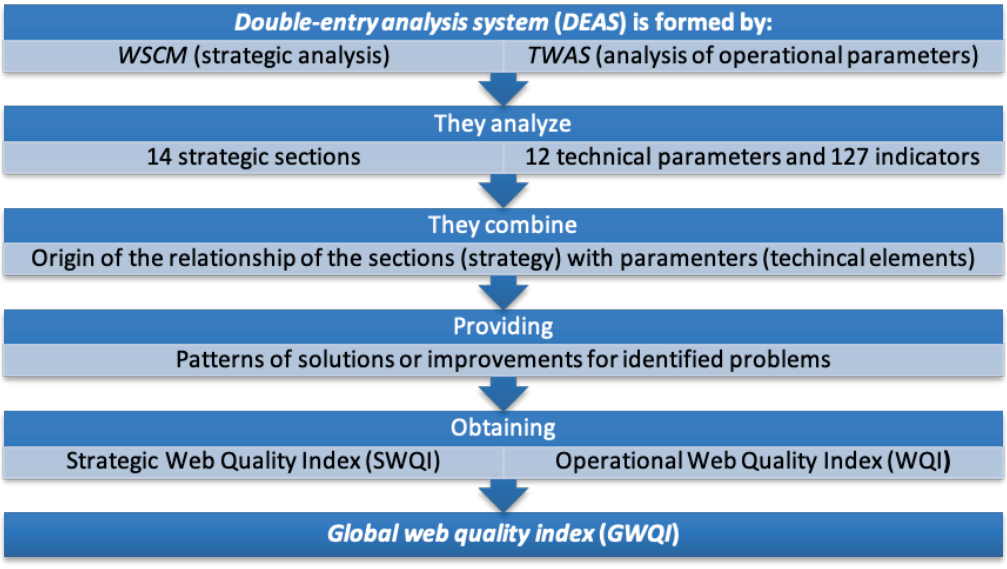

Figure 3. Elements that make up the *Double-entry analysis system* (*DEAS*)

7. Results

The results of the case study carried out to apply and test both the analysis system and the proposed index are shown below. Specifically, using the *DEAS* and its *SWQI* index, the quality of the official websites of the four most important European tourist destinations has been analyzed and compared (by way of benchmarking), which according to *Mastercard global destinations cities index 2016* and the *Philips Lighting & SmartCitiesWorld 2017* are:
London: *https://www.visitlondon.com*
Paris: *https://www.parisinfo.com*
Istanbul: *http://www.howtoistanbul.com*
Barcelona: *https://www.barcelonaturisme.com*

The evaluation process consisted of first applying the *TWAS* (fourth quarter of 2016) to the websites of these four tourist destinations. Figure 4 shows and compares the results of these analyses.

As seen in Figure 4, various technical parameters of the websites were identified as being deficient. Specifically, the evaluation revealed that those shown in Table 7 were problematic.

Table 7. *TWAS* technical parameters with poor evaluation detected for the official websites of the destinations

TWAS parameters with deficiencies	Destinations that the official website belongs to			
	London	Paris	Istanbul	Barcelona
Languages			X	
Interaction	X	X	X	X
Brand	X			
Mobile		X	X	
Social web			X	X

In general terms, these results indicate that the technical quality of the official websites of all the destinations analyzed could be improved, with Istanbul being the one with the greatest number of deficient parameters. Furthermore, they reveal that interacting problems are widespread. Note that the information presented in Table 7 is of a general nature, and it does not show the details of the scores of the indicators of each *TWAS* parameter. On the contrary, it only specifies the parameters for which problems have been found. This approach was chosen since the aim of this table is to highlight the type of general problems that can be detected by technical evaluation systems. However, **Fernández-Cavia**, **Vinyals-Mirabent**, and **López-Pérez** (2013) present a detailed analysis of destinations using this evaluation system.

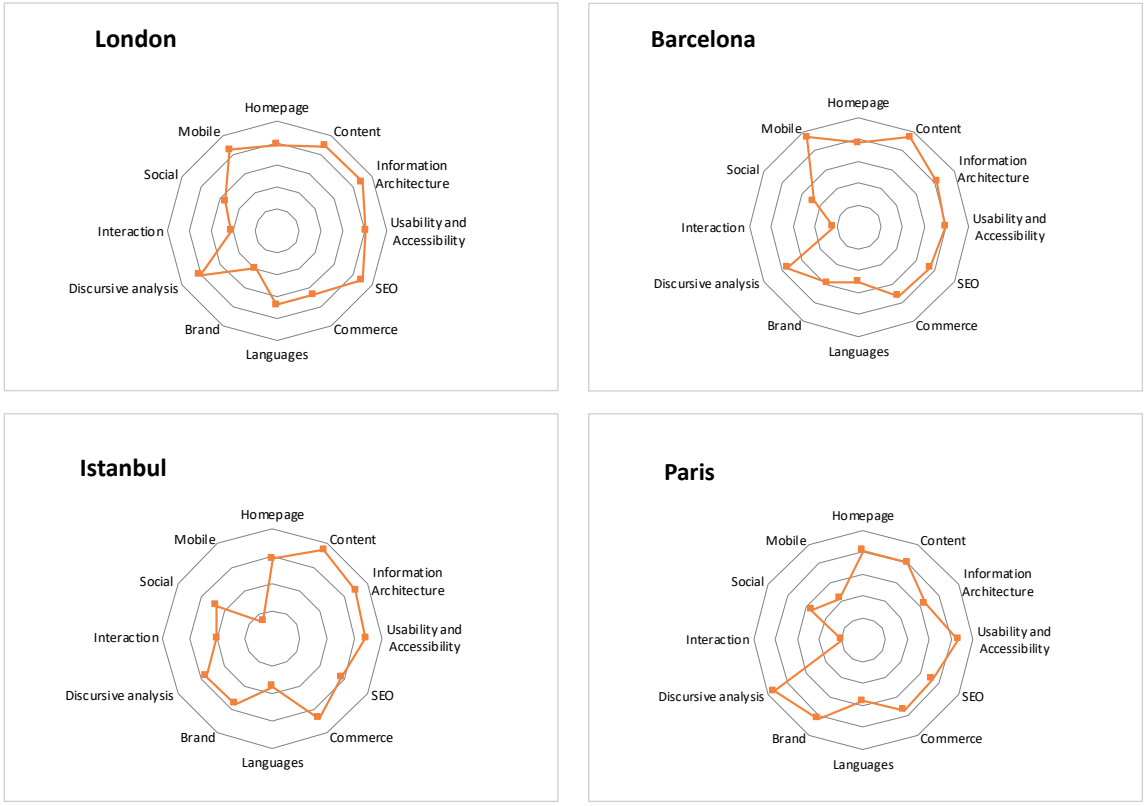

Figure 4. Summary graph of parameters for each destination. Results within the first three inner circles indicate low scores (less than 0.50)

Having evaluated the technical quality of the four destinations, their strategic quality was evaluated using *WSCM*. Table 8 illustrates the strategic sections in which the official websites of the destinations had deficiencies (first half of 2017), revealing that they all had them, with the official London website being the one with the best strategic approach.

Table 8. Strategic sections of the *WSCM* with poor evaluation detected on the official websites of the destinations

WSCM sections with deficiencies	**Destinations that the official website belongs to**			
	London	**Paris**	**Istanbul**	**Barcelona**
Key activity		X	X	X
Key partners		X	X	X
Key resources	X	X	X	X
Customer relationships	X	X	X	X
Customer segments		X	X	X
Channels		X	X	X
Structure of costs				
Revenue stream				
Value propositions				
Branding and promise	X	X	X	X
Persuasive discourse	X	X	X	X
SEO, Information architecture, usability	X	X	X	X
SoLoMo	X	X	X	X

The observation of each table alone does not yield clear conclusions about the functioning and quality of the studied websites. However, their visualization together offers more complete information, seeming to show that the London website is the one with the highest overall quality, in contrast to the Istanbul website, which appears to be the one with the most deficiencies.

This relationship is what *DEAS* establishes, although at a much deeper level, starting from its relationship matrix. For example, in this evaluation, in the case of *Paris.info*, *DEAS* detected that there was a poor interactivity indicator, as it was impossible for users to comment on the content (1) (see Table 9). This indicator affects the general interactivity (2) and, consequently, also negatively affects different aspects of the strategy (3, 4, 5, and 6).

Obviously, identifying such a deficiency in a single indicator as in this example does not imply a negative assessment of a parameter and thereby one or more strategic aspects. Rather, a negative evaluation of various indicators would lead to a negative evaluation of the parameter and impact the strategic aspects of the website.

Table 9. Example of the identification of a deficient indicator using the *TWAS* for *Paris.info* and its relationship with the strategic sections of the *WSCM*

Paris.info				
WSCM	***TWAS***		Score	Solution/Pattern
Sections affected	Parameters affected	Indicator evaluated as deficient		
Customer relationships (3)	**Interactivity (2)**	**User comments (1)**	0	Implement social media strategy and allow and moderate user ratings and opinions
Customer segments (4)		Is the user allowed to comment on the contents: textual, news, articles, images, photographs and videos created by the authors of the web?		
Channels (5)				Go to *WSCM* 10: benchmarking competitors that obtain a positive result on this item and adopt their best practices
SoLoMo (6)				

In this way, as seen in this example, the application of the *DEAS* enables the identification of how these technical problems affect the strategy of the analyzed website. The use of the table of relationships described in the methodology section allows the identification of the following strategic aspects that would be affected by the interaction problems detected:

- Relationship with users/clients: the website's ability to establish fluid communication with potential tourists.
- Customer segments: customers are not well served, especially tourists who are more active and like to comment on

their trips on social networks.
- Channels: communication with users on social networks and mobile devices is neglected.
- SoLoMo: the socialization of content such as points of interest, museums, shows, etc., on the web or through mobile devices is not promoted.

As a whole, this is an example of the way in which our system interrelates the strategic aspects and technical characteristics of a website. However, to enable a comparison of the results between different websites, it is convenient to use the quality indexes incorporated into the system.

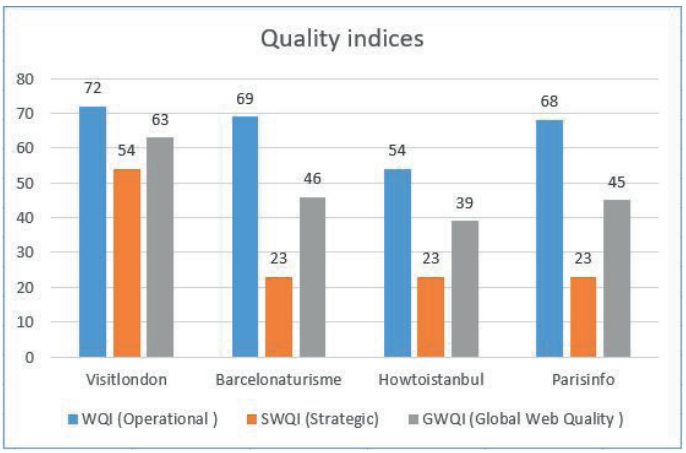

Figure 5. Results obtained for the web quality indices *WQI*, *SWQI*, and *GWQI* for the websites analyzed

DEAS provides the *Global web quality index* (*GWQI*) which, as mentioned in the methodology section, is the arithmetic mean of the *WQI* (technical quality) and *SWQI* (strategic quality) indices. The results of the application of these three indices to the four tourist websites analyzed are shown in Figure 5.

The application of the *DEAS* and *GWQI* to the websites of each destination reveals the critical areas in which it would be advisable to intervene. The most relevant aspects of each result are detailed below:

For London, *visitlondon.com*, it is recommended to benchmark competitors and focus efforts on customer relations, branding, and the persuasive discourse.

The Barcelona website, *turismebarcelona.com*, despite obtaining good technical quality results (69 out of 100), is awarded a bad strategic index (23 out of 100), which generates a low global quality index, revealing the need for a site review. An evaluation of their entire strategy is recommended, placing special emphasis on two aspects that the analysis identifies as critical: the Social web and Interaction.

The official Istanbul website, *howtoistanbul.com*, should focus its efforts on improving the customer segment section and their relationship with them. It would also be advisable to address improvements in its SoLoMo approach (social, local, and mobile strategy), studying the best practices of its competitors (benchmarking), as well as adopting improvements in the language parameter.

The Paris website, *parisinfo.com*, presents good technical quality. However, they are advised to review their strategy, as their *SWQI* is low. The priority aspects for improvement are the architecture used to organize the content and the interaction options.

8. Discussion

According to **Cheng** *et al*. (2013), it is very important that a website be of high quality, since it transmits to its users the values and corporate qualities of the institution it represents. Even so, and despite the various problems involved in managing a site (**Rodríguez-Martínez**; **Codina**; **Pedraza-Jiménez**, 2010), organizations often do not establish quality review systems. The consequence is that they end up having websites that do not provide any differentiation with respect to other institutions or companies and that, in addition, do not respond to their institutional needs. This is probably due to the fact that their development is started without having previously carried out an adequate strategic design.

In this work, a system that takes into account strategic aspects is proposed for evaluating web quality. The system has been tested in real cases and, therefore, is very practical. This differentiates it from other existing systems and models for evaluating web quality (some of which are cited at the beginning of this article) and which are characterized by being mainly theoretical contributions.

Likewise, unlike other proposals, *DEAS* is a modular evaluation system that allows a comprehensive evaluation. There are many systems for evaluating the technical characteristics of a website. Also, although they are not so numerous, various evaluation systems have been designed to address strategic aspects at greater or less depth. However, there are very few systems - and those that exist are specialized to very specific aspects, as pointed out by **Hernández**, **Jiménez**, and **Martín** (2009) –that, like *DEAS*, enable the joint evaluation, and even relation, of the technical characteristics and strategic aspects of the website. This is probably one of the main advantages of the proposed approach.

Finally, it is important to highlight the modular nature of this evaluation method, which makes it a flexible system, capable of incorporating and relating different analysis systems to comprehensively evaluate the quality of websites; That is, although in this work *DEAS* has been presented and tested by incorporating the *TWAS* and *WSCM* systems, the method has been designed such that the technical characteristics of a website could be evaluated using analysis systems other than *TWAS*. For example, if one wanted to evaluate the quality of an e-commerce website, it would be sufficient to

replace the *TWAS* system in *DEAS* with an evaluation system specialized in e-commerce, such as that of **Roig** and **Pedraza-Jiménez** (2016). This is one of the functions that increases the potential of this method.

Despite the large volume of work on quality and evaluation systems, especially oriented towards tourism portals, e-commerce, governments, banking (**Wątróbski** *et al*., 2016), or cybermedia (**Ochoa-Urrego**, 2019), the novelty of our model is that it complements and extends current evaluation systems to improve the strategic component of websites. It is an accessible and practical system for all types of organizations, regardless of their size.

9. Conclusions

This work presents a new system, *DEAS*, for the comprehensive evaluation of websites. The results of its application show that it is effective for:

1) Defining and analyzing strategy

   It helps those responsible for a website to define an appropriate strategy to achieve their objectives. In addition, it identifies which technical aspects can affect the strategy and, consequently, the success of its mission.

2) Evaluating technical aspects

   It evaluates the technical aspects of the website in order to detect possible problems that affect its proper functioning.

   It can anticipate what impact a technical problem will have on the site's strategy and mission. It also indicates to those responsible for the technical aspects which areas must be strengthened to improve specific features of their strategy.

On the other hand, this article also proposes a new index for the evaluation of the global quality of websites, called the *GWQI*. This index allows the use of *DEAS* to carry out benchmarking studies, that is, to carry out quality comparisons between competing websites.

Furthermore, the objective of testing *DEAS* and *GWQI* has been achieved by evaluating the official websites of the four most visited destinations in Europe, confirming that their technical quality is insufficient to achieve their objectives. Moreover, a website may have great technical quality but still not satisfy the objectives of its managers at all.

In this way, based on the analyzed case studies, this method reveals that "interactivity" is a technical parameter that has a great impact on the strategic aspects of a website and, therefore, on its overall quality and value as perceived by the users (**Abdullah**; **Jayaram**; **Kamal**, 2016). This finding will be the subject of further analysis and study by the authors in future work.

Finally, as future work, in addition to applying it in other sectors, the *DEAS* system will be tested by merging and relating new analysis systems. Specifically, it is of great interest to integrate *DEAS* into the system for the analysis of cybermedia (**Pedraza-Jiménez**; **Codina**; **Guallar**, 2016), e-commerce analysis systems (**Roig**; **Pedraza-Jiménez**, 2016), and the integrated model for the analysis of information aggregators on mobile devices (**Figueroa-Encina**, 2018).

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