

Online User-Generated Contents for Performance Measurement of Cultural Institutions

Keywords: online data; user-generated content; cultural institutions; performance measurement; decision making; user centrality

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Abstract

Purpose: The purpose of this research is to investigate the role of online User-Generated Contents (UGCs), especially in textual form, as tools for Performance Measurement (PM) of cultural institutions. Even if previous studies recognized the potential of relying on data shared online by users to understand their behaviours, scant literature shows how to extract knowledge from online UGC texts and how to use these data to account for users' perspectives in order to measure performances and support decision-making within organizations based on such information. This research wants to acknowledge and contribute in filling in this gap in current literature.

Design/methodology/approach: From a methodological perspective, this research will be elaborated in three phases. The first phase will consist in the definition of a theoretical framework for measurement of performances through online data among which textual online UGCs analysis. This will be achieved based on the definition of a taxonomy of mathematical models that have been used in extant literature to capture and represent semantical and syntactical properties of text, combined with the identification of different types of text-based indicators to account for textual forms of online UGCs. In a second phase, the framework will be implemented in the context of cultural institutions, by means of a mix of quantitative and qualitative methods. In particular, quantitative methods will be used for the statistical analysis of online text generated by users and particular attention will be reserved to the description of the procedure to collect, manage, pre-process, elaborate, interpret and report such analyses and results. Qualitative methods, such as case studies, will contribute in supporting the applicability of the proposed framework in specific cultural institutions.

Findings: This research aims at offering three main results. One expected result will be the definition of a methodological procedure to source a performance measurement system through online UGCs of textual format, highlighting the difficulties of undergoing the whole process of collecting, managing, maintaining, elaborating and interpreting unstructured data such as online UGCs. Another result of this research will consist in the identification of topics discussed by different groups of online users and in the discussion of the heterogeneity of topics across groups, characterizing audience segments according to the textual expressions they shared online. This will showcase how the exploitation of online UGCs can increase the knowledge on specific audience segments of cultural institutions based on the themes they review online. As a final result, this research will analyse and discuss cultural managers' perspective towards the design, usage, reporting and trust of the adoption of online UGCs as management tools.

Originality/value: This work will contribute to performance management literature exploring the possibility of including textual expressions of online users' perceptions into a system for the management of performances of institutions. This will be implemented in the specific sector of Culture, where users assume a key role and their understanding is a topic of central interest for cultural institutions. From a managerial perspective, this work aims to offer cultural managers new ways to monitor performances of institutions, accounting also for the perspective of actual users of cultural services offered.

1. Area of Investigation

This research aims to investigate the usage of online user-generated contents (UGC) for cultural management. In particular, the goal of this research is to understand the role that online user-generated content assumes in feeding performance measurement systems (PMS) for cultural institutions, investigating ways to account for measures of thoughts, perceptions and needs expressed by online users.

Despite a growing interest in Social Science communities towards the topic of online UGCs (**Figure 1**), extant literature in performance measurement accounts mostly for reactions of online users to institutional activities, commonly measured through the number of “likes”, “comments” and “shares” to a social media post (e.g., Agostino and Arnaboldi, 2017; Oviedo-García et al., 2014; Bonsón and Ratkai, 2013). Instead of relying on the *number* of reactions, this research aims to contribute to the scant literature dealing with the measurement of users’ voice expressed in online *text* generated by users to support performance measurement.

Culture has been selected as a relevant sector where to ground this research for at least two main reasons. First, cultural institutions recognize a central role to users (OMC, 2014; Kotler and Kotler, 2000; Falk et al., 1998) and are the more and more asking users to engage online, encouraging cultural participation, creativity and online users’ contributions (ICOM, 2020; ICOM & OECD, 2020; NEMO, 2020; Department for Digital, Culture, Media and Sport, 2019; Nielsen, 2015; UNESCO, 2012; UNESCO 2009). Second, the debate on the potentialities of employing data coming from online users in the cultural sector (e.g., Lohmann and Schmücker, 2009) offers a few evidences on the actual usage of online UGCs, particularly in textual format, as sources to support decisions being aware of the users’ voices (e.g., Marchiori and Cantoni, 2015; Cao and Nguyen, 2012).

Documents by year

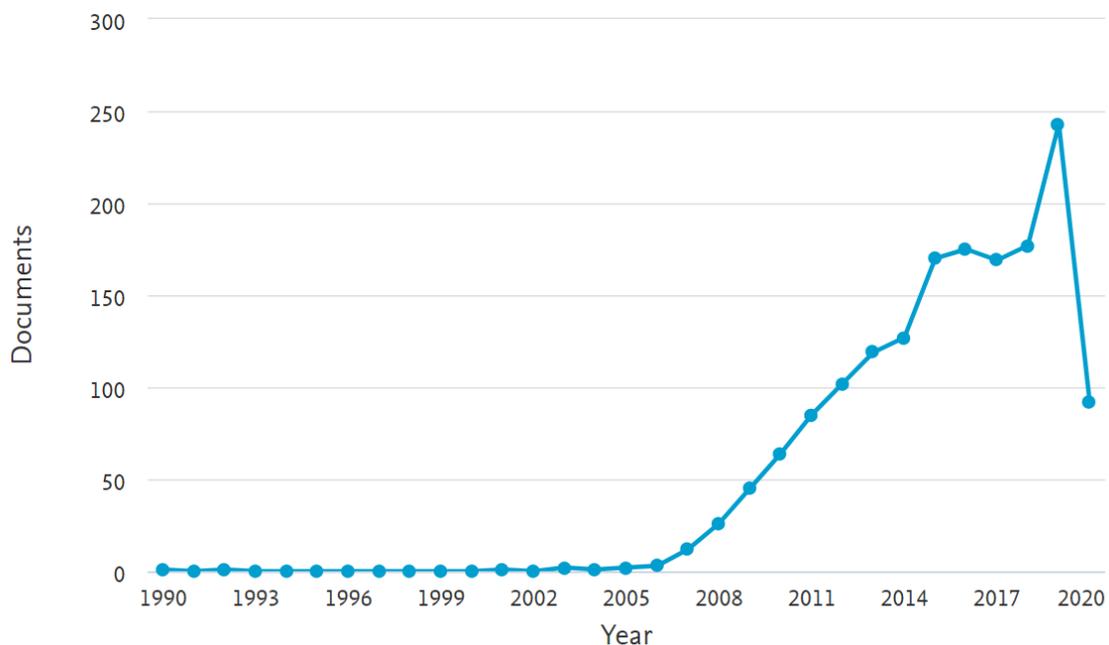


Figure 1 Trend in time of 1617 documents retrieved querying Scopus database for TITLE-ABS-KEY ("user generated" AND online) AND SUBJAREA (arts OR busi OR deci OR econ OR psyc OR soci). Source: Scopus. Last accessed: May 2020.

2. State of the art

This section presents a narrative literature review (NLR) of extant literature on performance measurement (iii) of cultural institutions (iv) that rely on online data (i), especially in textual format, for the analysis of user's behaviours (ii) (**Figure 2**).

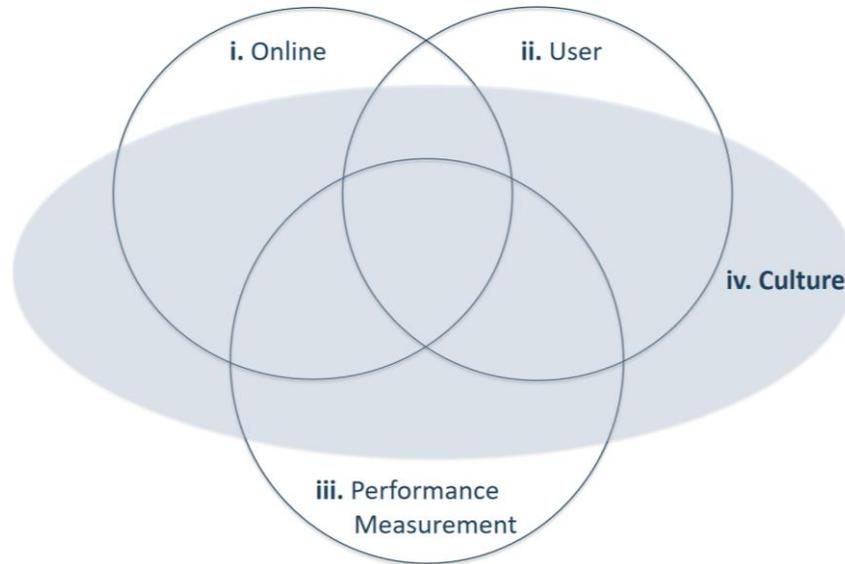


Figure 2 Graphical representation of three main topics (circles) and the sector of interest (shaded oval) addressed along the NLR

The choice of performing a narrative literature review (NLR) is supported by a first screening of the literature targeting simultaneously performance measurement and the diffusion, analyses and usage of online user-generated contents. A series of preliminary searches (**Appendix A, p. 25**) highlighted the existence of multiple open debates on the topics when considered separately but evidenced scant literature addressing simultaneously the three topics of interest (**Figure 2**). These searches also showed that little exists on measurement of performances of organizations based on online users' opinions (e.g., Gitto and Mancuso, 2017). Indeed, results evidence that it is not uncommon to study users' interests through online text (Khan et al., 2019; Zhou et al., 2017) and it is not uncommon to measure performances of organizations through textual information (Fisher et al., 2016). However, even if users' perceptions extracted from online text have been recognized to be potentially relevant to increase the knowledge on users and their behaviours (Galati and Galati, 2019; Abrigo and Estuar, 2019; Rathana et al., 2018), little literature has been addressing the issue of measuring performances of organizations by means of users' expressions through online text (Blahova et al., 2017; Burnham and Wong, 2018; Lo and Fang, 2018). Therefore, this NLR aims at critically overview the variegated streams of discussions around the topics of performance measurement and around the usage of online UGCs, highlighting the missing link between the three topics of interest (**Figure 2**).

Driven by the aforementioned preliminary searches (**Appendix A, p. 25**), this NLR is constructed on top of two systematic searches (**Figure 3**). This is done to guarantee a wide coverage on the many communities discussing the topics of interest of this research. The two systematic searches were built following the query strategies presented in **Table 2** and **Table 2**.

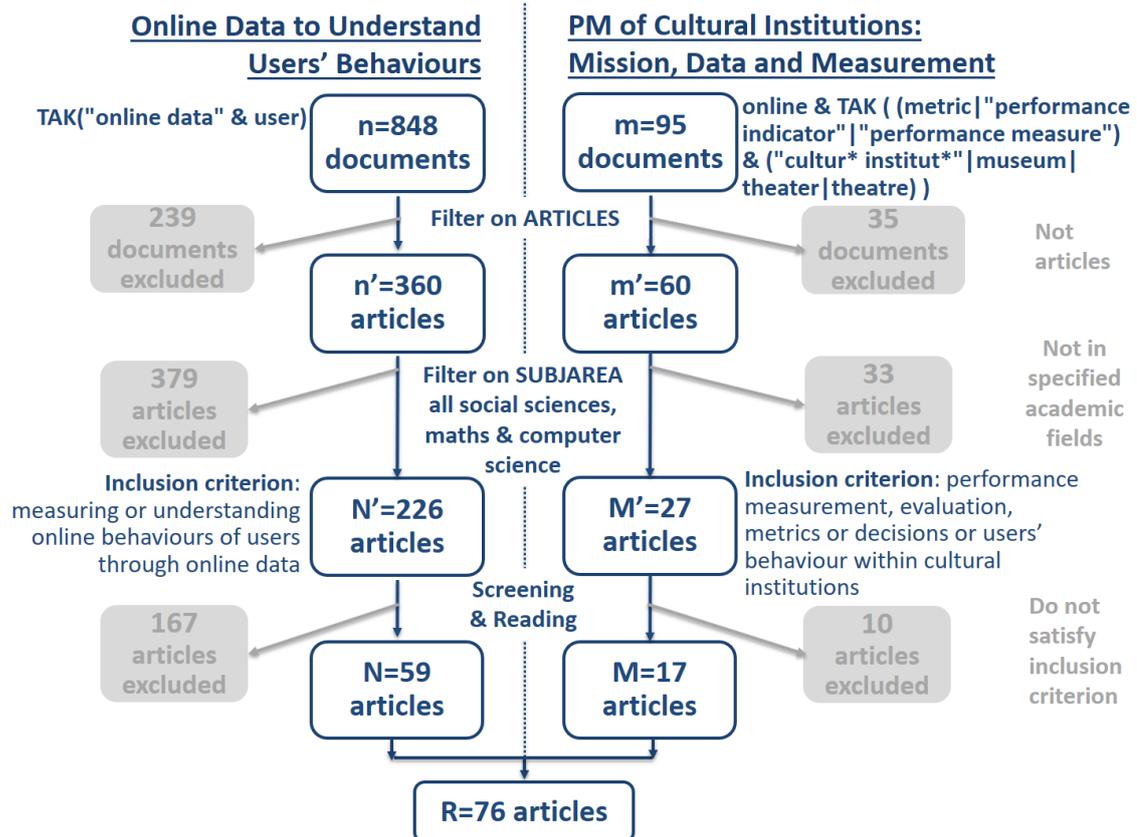


Figure 3 Graphical representation of the protocol used for the two systematic searches, showing the search prism from the query-samples (n and m) to the final set of articles reviewed (R). With reference to [Figure 2](#), topics addressed are: (i) and (ii) for left branch; (i), (iii) and (iv) for right branch.

The right branch in **Figure 3** shows the search for relevant literature concerned with the usage of online data to measure performances of cultural institutions. Specific performance measurement keywords – “metric”, “performance indicator” and “performance measure” combined with a logic “OR” – have been combined with keywords referring to cultural institutions¹ – “cultur* institut*”, “museum”, “theater” and “theatre” combined with a logic “OR”. These keywords have been then combined with “online”, representative keyword for the online data topic (**Table 2**).

The left branch in **Figure 3** depicts the steps undergone to search for relevant literature concerned with the usage of online data to understand online users. This has been done combining the keywords “online data” and “user” with the “AND” logic operator (**Table 2**). Observe that keywords are intentionally generic to be able to grasp a wide variety of contents pertaining to the different debates and streams of research potentially connected to the core topic of interest of the research, that is the understanding of users’ by means of online UGC of textual form for performance measurement. Indeed, in connection to the existence of an open debate on the definition and terminology² to refer to online data generated by users (e.g., O’Hern and Kahle, 2013; Bureau, 2008; Daugherty et al., 2008; OECD, 2007), the terms “user-generated content” or “user generate content” have been intentionally excluded from the search.

¹ Keywords “museum” and “theater” have been introduced to guarantee a wide coverage of the research to two of the most famous cultural institutions, for which specific and extent literature exists (e.g., Chiaravalloti, 2014; Carnegie and Wolnizer, 1996).

² The terminology to refer to online data generated by users include for instance “user-generated contents”, “user-created contents”, “consumer-generated media” or “tourist created content”.

Table 1 Description of query strategy adopted for literature search on online user data (*Figure 3*, left branch), with explicit short motivations for the choice of specific search parameters.

Search Query	TITLE-ABS-KEY("online data" AND user) AND SUBJAREA(ARTS OR BUSI OR DECI OR ECON OR PSYC OR SOCI) AND DOCTYPE(ar)	
Database	Scopus	One of the largest and most renowned databases among social scientists
Keywords	"online data" AND user	Generic keywords grasping the core concepts connected to the research topic of interest
Fields	Title, Abstract, Keywords	Consider only documents targeting specifically the topic of interest
Subject Area	COMP OR MATH OR ARTS OR BUSI OR DECI OR ECON OR PSYC OR SOCI	Aligned with the purposes of the research, explore documents classified as belonging to subject areas of Computer Science (COMP), Mathematics (MATH) or "All Social Sciences", defined by Scopus as "combined field that searches Arts and Humanities (ARTS), Business, Management, and Accounting (BUSI), Decision Sciences (DECI), Economics, Econometrics, and Finance (ECON), Psychology (PSYC), and Social Sciences (SOCI) subject areas"
Document Type	Article (ar)	Consider only publications subjected to a peer-reviewed procedure

Table 2 Description of query strategy adopted for literature search on performance measurement of cultural institutions (*Figure 3*, right branch), with explicit short motivations for the choice of specific search parameters.

Search Query	("online" AND TITLE-ABS-KEY(("performance indicator" OR "performance measure" OR metric) AND (museum OR theatre OR "cultur* institution"))) AND SUBJAREA(ARTS OR BUSI OR DECI OR ECON OR PSYC OR SOCI) AND DOCTYPE(ar)	
Database	Scopus	One of the largest and most renowned databases among social scientists
Keywords	"online" AND ("performance indicator" OR "performance measure" OR "metric") AND ("museum" OR "theatre" OR "theatre" OR "cultur* institution")	Keywords grasping the core concepts connected to the research topic of interest: combination of keywords related to performance measurement, to cultural institutions (ranging from museums to theatres) and to the online world.
Fields	Title, Abstract, Keywords	Consider only documents targeting specifically the topic of interest. "online" keyword searched within the entire document fields because there must be at least one reference to the online world but not necessarily the focus of the study.
Subject Area	COMP OR MATH OR ARTS OR BUSI OR DECI OR ECON OR PSYC OR SOCI	Aligned with the purposes of the research, explore documents classified as belonging to subject areas of Computer Science (COMP), Mathematics (MATH) or "All Social Sciences", defined by Scopus as "combined field that searches Arts and Humanities (ARTS), Business, Management, and Accounting (BUSI), Decision Sciences (DECI), Economics, Econometrics, and Finance (ECON), Psychology (PSYC), and Social Sciences (SOCI) subject areas"
Document Type	Article (ar)	Consider only publications subjected to a peer-reviewed procedure

Starting from the identified keywords, the two search procedures followed the same structure depicted in **Figure 3**:

- The database used for the analysis has been Scopus, one of the most renowned and diffused databases among social science scholars.
- Identified keywords have been searched for in the fields of title, abstract and keywords (“TITLE-ABS-KEY”), in order to select only those documents that focus specifically on the topic of interest for the research. An exception has been done for the keyword “online”, searched within the whole fields of the document in the search for literature addressing performance measurement in culture (**Figure 3, right**). Indeed, according to the purposes of this research, “online” is a fundamental keyword to refer to the usage of online data but this keyword should not limit the understanding of extant literature dealing with the wider topic of performance measurement of cultural institutions³.
- The search has been performed with reference to articles only (“ar”), to ensure retrieved documentation to have undergone at least to a peer-reviewed procedure.
- The search has been referred to all Scopus’ fields under the umbrella of “All Social Sciences”, to target all the social science debates around the topics including Arts and Humanities (“ARTS”), Business, Management and Accounting (“BUSI”), Decision Sciences (“DECI”) and Social Sciences (“SOCI”), Economics, Econometrics, and Finance (“ECON”) and Psychology (“PSYC”), and the subject areas of Computer Science (“COMP”) and Mathematics (“MATH”), to take into consideration the literature on modelling of online text.

After implementing these first steps of the search protocol, the two resulting samples of N¹=226 and M¹=27 articles have been screened for relevant contributions according to the specific objective of the search. In particular, the following inclusion criteria have been applied:

- Inclusion criterion for left branch in **Figure 3**: studies related to understanding, monitoring or measuring online behaviours of users through online data;
- Inclusion criterion for right branch in **Figure 3**: studies connected to performances measurement and metrics or related to users’ behaviours within cultural institutions.

Implementing such criteria resulted in the final review sample of R=76 articles⁴, of which N=59 connecting users with online data (**Figure 3, left**) and the remaining M=17 linking online world with performance measurement of cultural institutions (**Figure 3, right**).

The remaining of this section will discuss these R=76 articles to identify gaps in the current state of the art on the topic of online UGCs for performance measurement of cultural institutions. In particular, the first subsection will review the N=59 articles connected to the measurements or understanding of online behaviours of users through online data online (**Figure 3, left**). The second subsection will then review the M=17 articles connected to the measurement of performances of cultural institutions (**Figure 3, right**). **Appendix C (p. 33)** shows the structure employed to guide the recording of information and their analysis for review purposes.

2.1. Online Data to Understand Users’ Behaviours

This section discusses the N=59 contributions specifically connected to the understanding of online behaviours of users through online data to highlight the main gaps in this literature (**Figure 4**). The analysis of the literature led to the identification of three different groups of works, named *personal information*, *movement* and *online UGC* according to the specific type of online data used along the analysis. These works also differ in terms of alternative ways through which users can deliver such online data, either *mediated* or *unmediated* by researcher or by the platform (**Figure 5**).

³ Querying Scopus database (last accessed: May 2020) for TITLE-ABS-KEY (online AND (metric OR "performance indicator" OR "performance measure") AND ("cultur* institut*" OR museum OR theatre OR theatre)) results into a narrow search sample of 35 documents, including 9 of the M=17 results reviewed.

⁴ Additional details on the search procedure and further descriptions of intermediate samples and excluded documents can be found in **Appendix B, p. 27**.

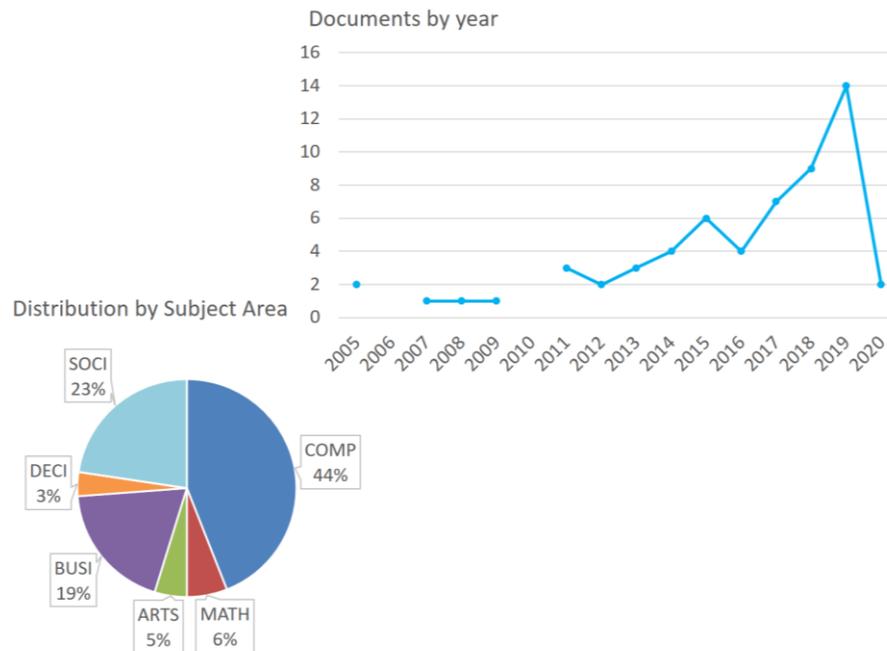


Figure 4 Distribution by year and subject area of the N=59 relevant contributions connected to the search for "online data" AND user (Figure 3, left).

The first group of articles called *personal information* (Figure 5) refers to those studies that investigate the online users' behaviours relying on user's personal information, such as social media profile information. For instance, social network analysis has largely relied on this users' information, studying possible ways to represent and analyse social media friendships through networks, starting from personal information users' share on their pages and accounts (Howden et al., 2014; Rosen et al., 2011). A weakness of using this type of data to understand users is the necessity to access rich users' information, possibility limited by the growth of attention towards data protection or the necessity to ask users for personal information (e.g. Nirmala and Dewi, 2011). A possible solution to this issue is the one of online users' matching or identification, which aim at using few basic personal online information, such as screennames or usernames, to identify users across different platforms and then be able to enrich the retrieved personal information of users (Li et al., 2018). Along with this solution, the literature relying on online personal information clearly evidences the need to target the problem of accessibility to personal users' information. Indeed, even if today's technologies could potentially make online personal information the more and more accessible to analysts, the need to understand users and the issues connected to the accessibility of rich personal users' information push towards researches that enables user's understanding by means of highly accessible online data (Li et al., 2019; 2017).

The second group of articles called *movement* (Figure 5) refers to those studies that analyse the online users' behaviours relying on digital traces of users' movement, coming from either physical or digital spaces. For instance, this class includes studies ranging from the dynamical identification of users' locations in physical space by means of mobile phone usage (Ji and Sproul, 2013) to the improvement of information retrieval systems based on the results actually clicked by users in the online world (Yu, 2011). Within this class of studies, the one for which the delivery of online data is guided by the platform or by the researcher design (*mediated* online data) usually relies on clicks on buttons as form of data collection to measure the online behaviour of users. Examples range from surveys and online purchase behaviours to measure brand image (Tanusondjaja et al., 2015), to the monitoring of attention to online advertisement to estimate the housing demand (Pangallo and Loberto, 2018) or to the measurement of gratification of online users interacting with luxury brands based on users' reactions to firms' social media posts (Athwal et al., 2019)

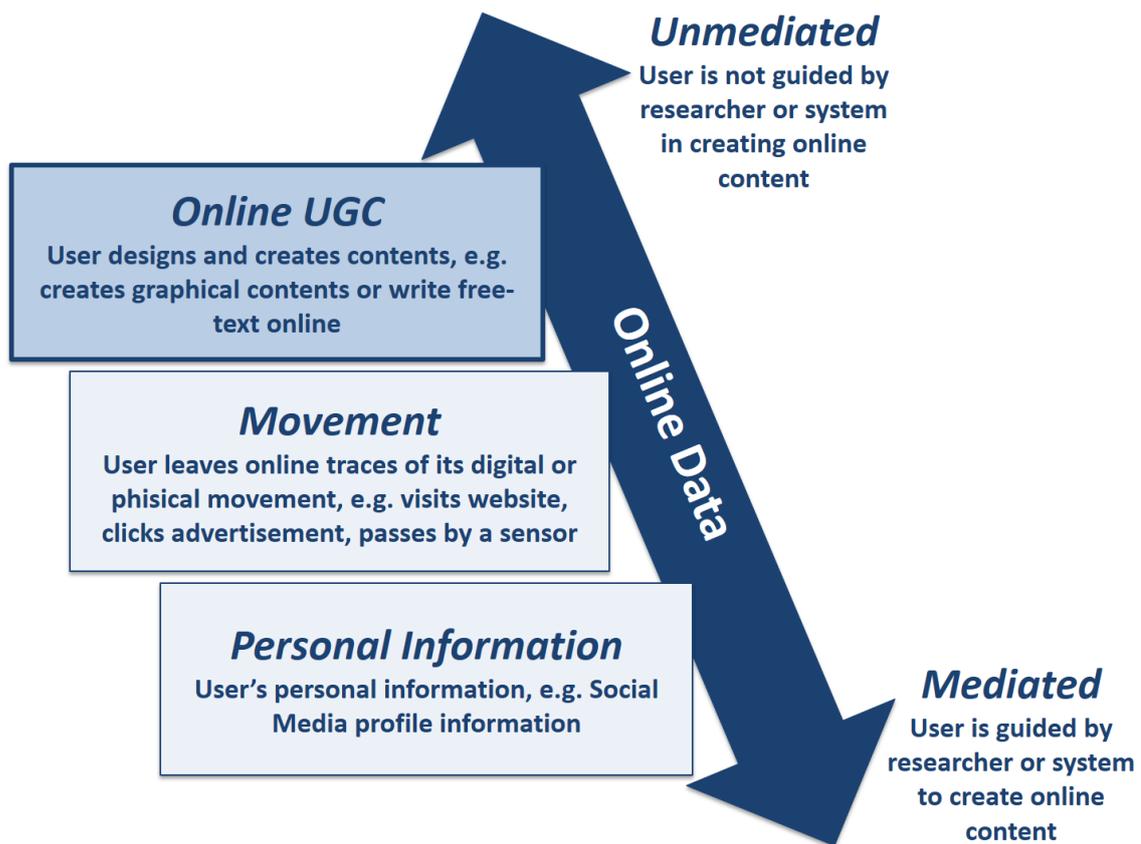


Figure 5 Graphical representation of conceptual review schema. Among the three types of online data (blocks) and the two modes (mediated/unmediated) of delivery of online data, the schema highlights the block of literature of main interest for this thesis, i.e. online UGC.

By means of clicks on online buttons to answer predefined questions, to finalise a purchase or to react to a predefined content, the *mediated* approach to online data collection guarantees a clear definition of the structure and type of data to be further processed but imposes a limitation to the user's expression and action, which is confined to the choice of clicking a button that could be an inaccurate proxy of the actual intentions of users (Mavragani and Tsagarakis, 2019; Stamou et al., 2008). On the contrary, various studies rely on *unmediated* forms of collection of online data, observing users' movements in physical or digital spaces rather than waiting for a reaction of users. For example, Tang et al. (2018) determine spatio-temporal patterns of users moving in Spanish cities observing GPS signals of their mobile phones, while Hashemi and Kamps (2018) mix user's personal information with their movement in an IoT museum exhibition to recommend a personalized visit of new points of interests in the city. Instead, examples from digital spaces include for instance the usage of online navigation through various websites to measure the effect of online communications and the prediction of political results (Cardenal et al., 2019; Mavragani and Tsagarakis, 2019) or the observation of the usage of online dating platform to understand women's online behaviour (Wang, 2020). These studies evidence a growing attention in the literature interested in measurement of movements of users by means of *unmediated* online data, that could be used to enrich information derived from mediated online data allowing for improved and more personalized experiences of online users (Hashemi and Kamps, 2018; Tang et al., 2017). Even if analysed literature shows the potential of using these online data, additional attention should be put in understanding how to exploit such information to support organizations (Hashemi and Kamps, 2018).

This is even clearer looking at the third group of studies called *online UGC* (Figure 5). Note that, even if all three types of online data described are indeed created and delivered online by users, the term *online UGC* addressed along this work is specifically referred to the guidelines of the Organization for Economic Co-operation and Development (OECD, 2007), according to which an online UGC satisfies the three conditions of being publicly available online (Publication

requirement), of reflecting a certain amount of creativity (Creative effort) and being developed outside the professional practice (Creation outside profession). However, since online UGC embraces a wideness of variegated contents (e.g., audio, photo, text, video) and ways of creation and diffusion (e.g., blogs, wikis, podcasts, virtual environments, social bookmarks, social networking sites), it is not so straightforward to agree on a unique definition and an active discussion on the grounding criteria of online UGC definition is still ongoing (e.g., O'Hern and Kahle, 2013; Bureau, 2008; Daugherty et al., 2008; OECD, 2007). Within this umbrella of definitions, the term online UGC will be used along this work to refer to contents satisfying the OECD guidelines (OECD, 2007). Consequently, online data such as photos, videos, audio or written texts are all forms of online UGCs. Observe also that these data are *unmediated* because nor the researcher or the platform is guiding the development of such contents or the form in which those contents appear online. This feature makes online UGCs of high interest for many researchers. For example, Jeffrey et al. (2019) perform a study on Snapchat usage to explore the dynamics of user interactions within social media, stressing the key role of researcher in gaining rich insights from social media analyses. Suppala and Rao (2019) define the analysis of social media data to be of “paramount importance in drawing inference from data” and underline the richness of social media data in terms of public’s perspectives and ideas. Similarly, Liu et al. (2016) recognize the importance of exploiting information coming from social media, but also highlight the complexities of supporting decisions in marketing sector through these online UGCs, which come in unstructured and various formats (i.e. texts, images, audio, and video). Another example of the necessity and difficulties of integrating online UGCs from social media with more traditional forms of data is discussed by Preis et al. (2020). Indeed, they use the location of social media images from Flickr to understand users’ habits in traveling and estimate travel statistics. Upon recognition of the potential of these social media information spontaneously provided by online users, the authors offer an interesting overview of difficulties and limitations of using such information to provide official statistics and they call for further investigation on methodologies to address this issue (Preis et al., 2020). The discussion around the potentials of the usage of graphical *online UGCs* is addressed also by Oteros-Rozas et al. (2018), who consider social media user-generated images expressions of human relationship with landscape and use them to identify “cultural ecosystem services” such as aesthetic, recreational enjoyment, sense of place and local identity. Similarly, Seresinhe et al. (2018) employ user-generated images on Flickr to estimate how people perceive the environment around them. On the same line of Preis et al. (2020), Seresinhe et al. (2018) highlight that their study is just an early investigation on the potential usage of social media UGCs of graphical form but they also stress the potential of using such online UGCs to support policy makers in better understanding subjective experiences of environments in which people live.

In addition to graphical online UGCs, a subset of literature addresses the topic of the potentialities of better understanding online users’ by means of online text generated by users. Among the first examples in this direction, works concerned with the improvement and customization of web searches try to understand users’ needs based on the history of query searches (Ramanujam and David, 2016; Capra and Pérez-Quñones, 2005) or to customize the suggestions for web searches for specific segments of population, like children (Pera and Ng, 2017). Other studies have instead focused on the effect of online information exchange on users’ behaviours. Examples include studies on the evolution of online trust (Tang et al., 2015), on the effect of the presence of multiple subjects or of individuals in online photos (Salminen et al., 2019) or on perception of online news (Al-Smadi et al., 2016) and health information (Andersen et al., 2019). Some studies also show that the content of online reviews can highly affect users’ behaviours. For instance, the work of Fu et al. (2018) shows the existence of differences in reviewing behaviours among members and non-members of online shopping websites in terms of review rating, delay but also depth of content. Another example is the one of Marchiori and Cantoni (2015), who show that the exposure to online reviews can alter the perception towards tourism destinations, with non-visitors more sensible with respect to actual visitors of destinations to perception changes after exposure to online reviews. Thanks to the result of their study, Marchiori and Cantoni (2015) suggest to better direct online UGCs to target specific audiences. Even if these works do not exploit online text

generated by users neither for performance measurement nor for decision-making, they show the latent potential of using online text generated by users at least in better understanding online users. The diffusion of examples of this nature incentivize also the interest of businesses and organizations, the more and more interested in gaining information on their customers receiving feedbacks and take more informed decisions without directly asking questions but exploiting the latent potential of online data generated by users (Agathangelou et al., 2018; Wu et al., 2017). A recent example of the potential of using online text to support organizations in better understanding online users' behaviours, is the one offered by Wang et al. (2019). Destination image of boutique hotels is investigated through the analysis of a large-scale set of the contents of online reviews, that reveal eight main aspects of interest for customers. Even if not explicitly addressing the measurement of performances of hotels, the results of the analyses of online reviews of customers evidence the perception of customers of low performances in some services offered by the hotels, showing the potentiality of relying on these sources of data to acknowledge for users' perceptions. Indeed, authors underline the advantage of using these forms of data, which can "cover viewpoints on almost every aspect of people's lives by millions of users" and which can create "greater value for hotels to select more appropriate and effective strategies for their target markets" (Wang et al., 2019). The latent potential of online reviews is highlighted also by Yang et al. (2019), who explore the possibility to discover and isolate information on user-experience within the text of customers' online reviews in order to support product design and business strategic planning. Beside modelling user experience from online review content and testing the proposed algorithm, authors highlight that their study "provides important implications for proactive thinking" and "explores a new dimension of user experience modelling, i.e., the context of use" (Yang et al., 2019). Therefore, also in this case authors do not address explicitly the topic of measuring or evaluating performances but recognize the potential of exploiting online reviews to support decisions within organizations.

2.2. Performance Measurement of Cultural Institutions: Mission, Data and Measurement

This section addresses the second stream of research of this work discussing M=17 contributions in order to highlight the main gaps in the literature related to the measurement of performances of cultural institutions⁵ (Figure 3, right).

Analysing the content of these articles, it is possible to recognize two main areas of discussion in connection to the performance measurement cycle, namely (1) the definition of the object of control and its measurement, and (2) possible data sources to feed a PMS.

The first area of discussion evidenced from the literature is connected to the definition of the control object and to its measurement, since it discusses the mission and the objectives of cultural institutions and corresponding measures. For example, Hatton (2012) discusses the necessity of speciation of museums' conceptual roots, solicit the redefinition of the strategy in terms of "purpose (mission), community/communities (markets, if you prefer, audiences) and a very small number of key performance measures that are well balanced between quantitative metrics gauging progress towards agreed aims/objectives (input, throughput and output) and qualitative ones indicating effectiveness (pursuing outcomes)" (Hatton, 2012). Specifically, the author states that "It is 'mission critical' that management addresses the challenge of defining a set of key performance indicators that accurately reflects a museum's publicly stated purpose". Indeed, Hatton (2012) underlines the necessity to overcome the usage of generic and over-simplified performance measures introducing instead specific, diversified and tailored measures of performances, according to different outcomes and different purposes pursued by each institution.

⁵ Cultural institution refers here to the definition of the European Commission "architecture, archives, libraries and museums, artistic crafts, audiovisual (including film, television, video games and multimedia), tangible and intangible cultural heritage, design (including fashion design), festivals, music, literature, performing arts, books and publishing, radio, and visual arts" (EU Proposal Regulation, Chapter 1, Article 2.2).

Though the measurement of institution-specific aspects highlights specific characteristics, diversifying performance measurements across cultural institutions can create difficulties for comparisons of organizations, which are fundamental for instance in public funding where a common set of performance measures across different cultural institutions could lead to guaranteeing access to a wider and diversifies audience, possibly all citizens (Galecka and Smolny, 2019).

Jacobsen (2014) takes part into the debate on the trade-off between overall or institution-specific measures, discussing the complexity of defining an overall performance for museums due to the diversities and peculiarities each institute has, in terms of priorities of objectives and in resources. Beyond recognizing the impossibility of defining an overall performance shared across institutions, the author also discusses the difficulties in defining an overall performance for each individual institution. Indeed, according to Jacobsen (2014), even if some museums are still reticent in changing their perspective from a single- to a multiple-mission approach, these institutions have a multi-purpose mission, including economic development, community gathering, learning outcomes, heritage conservation and educational support offered by the institution. Consequently, Jacobsen (2014) supports the necessity to define institute-specific measures of performances, which reflect the specific mission addressed by each institute. Moreover, the author underlines the difficulty of actually measure many performances of cultural institutions, reviewing different studies which also rely on the visitors' perspectives. For example, Jacobsen reports on the work of Munley (2011), who "found ways to measure trust, engagement, reach and influence as public values, proposing that monitoring these measurements may help a museum manage its public value" (Jacobsen, 2014). This interest towards measuring publics' trust, engagement or reach, is a topic of interest also for Simpson (2017). Indeed, the author highlights the necessity to move beyond simple statistics on museums' visitors taking instead into account aspects like the engagement of visitors to quantify value propositions of university museums, such as "innovation/service/product to make more attractive" (Simpson, 2017). Though considered so important, the measurement of engagement of visitors is recognized by the author to be a rather complex task since there is "no obvious way to translate some of the unexpected qualitative data into a quantitative measure". This sounds like a call for further exploration on ways to transform qualitative aspects deriving from cultural users into quantitative measures and also paves the way to the discussion on possible data sources for cultural institutions, including also the visitors of cultural institutions.

In particular, the second area of discussion evidenced from the literature is connected to possible data sources for performance measurement of cultural institutions, including artistic collection and audience of cultural institutions.

A valuable source of information for cultural institutions is represented by their public or audience. As already discussed, moving beyond simple statistics on visitors of museums, both Simpson (2017) and Munley (2011) recognizes the potentialities of exploiting visitors' perspectives and opinions through an open dialogue with the public of cultural institutions. Another example of the usefulness of relying on data coming directly from the users is the one of Capodieci et al. (2019), who realise a dashboard to visualize the social networks interactions between online users and cultural experts providing cultural contents online. Even if this work is not yet aimed at the measurement of performances of cultural institutions, it offers an example of the extremely helpful role of online data such as social media in supporting cultural institutions, in this case to detect contributors and measure the online discussion around digital contents. Another example of the potential of exploiting new data coming from cultural users is the one of Hashemi and Kamps (2018). Already discussed in the literature on online data for users' behaviour, this work shows how to exploit the interactions of users with IoT technologies within museums exhibitions to recommend new point of interest to visit for users and therefore enrich the visitors' experience (Hashemi and Kamps, 2018). With a similar aim, Perez-Valle et al. (2014) describe a study on the usage of a serious game platform called "Playhist" to facilitate and foster learning history into museums through technology. As for the example of Capodieci et al. (2019), also the two studies of Perez-Valle et al. (2014) and Hashemi and Kamps (2018) do not aim at measuring performances of cultural institutions but they show that technology allows to gather

new information on museum visitors' behaviours, which could be potentially useful source of information in supporting decision-makers within cultural institutions.

Another potentially helpful source of information for measuring performances of cultural institutions is represented by data about artistic collection. For instance, Hess et al. (2015) describe a study where the quality and condition of artistic collection is monitored through a 3D scanning technology which allows for a deep check on the stability of exposed collection and guarantees the possibility of a fast intervention in case the of instabilities in the art. Windhager et al. (2019) focus instead on the visualization of museums' collections and advocate for a more systematic approach the recognition of uncertainty in visualizations of cultural collections, where technology can come into use. Addressing the topic of digital transformation of art collection, Bertacchini and Morando (2013) revise the main model in use for digital art collection, namely online display, proprietary licensing, open licensing and user-generated art images. In doing so, they recognize a new role of users, who acquire the responsibility for digital art creation sharing user-generating art images online. This changes not only the social impact of the museum but the authorship on the artistic collection, which is granted to the user. Indeed, users are nowadays not only passive audience of cultural institutions but actually creators of new artistic collections. Observe that, even if these works evidence the necessity to record data on artistic collection, they lack in discussing how these data could actually serve and be used by managers or decision-makers within cultural institutions.

3. Research Problems

The analysis of retrieved literature to discuss the usage of online UGCs for performance measurement of cultural institutions evidences three main gaps on top of which research objectives and research questions will be built.

First, literature supports the thesis of online users being valuable sources of information for organizations (e.g., Capodieci et al., 2019; Hashemi and Kamps, 2018) and shows that the topic of identifying and characterising users based on online data is still of high relevance for practitioners and academics (e.g., Hashemi and Kamps, 2018; Tanusondjaja et al., 2015). However, little exists in exploiting highly accessible and *unmediated* online UGCs, especially in textual form, to better understand users' characteristics (e.g., Li et al., 2019; Seresinhe et al., 2018), since various works still rely on *mediated* forms of online data, such as questionnaires (e.g., Tanusondjaja et al., 2015) or personal user's information (e.g., Howden et al., 2014). This work aims to contribute to this gap in literature showing that highly accessible online UGCs, such as textual data from online reviews, can be used by cultural institutions to enrich the knowledge of their public, without the need to ask personal information to users.

Second, many of reviewed studies still rely on the usage of *mediated* forms on online data, such as clicks on buttons from online browsing to questionnaires (e.g., Athwal et al., 2019; Pangallo and Loberto, 2018; Tanusondjaja et al., 2015). Indeed, even if there is evidence on the power of *unmediated* online data (e.g., Mavragani and Tsagarakis, 2019), little literature offers structured procedures to alleviate the difficulties of undergoing the whole process of collecting, managing, maintaining, elaborating and interpreting unstructured data such as online UGCs, but rather focus on specific sub-phases (e.g., Wang et al., 2019; Yang et al., 2019). Provide examples in this direction could contribute to the definition of procedures to facilitate the management of these types of online data and therefore support an actual and efficient exploitation of the latent potential these data convey. This work aims to contribute to this gap and support both practitioners and academicians in identifying a methodological procedure connected to the analysis of textual online UGCs.

Finally, previous analyses showed scant literature addressing the actual usage of online UGCs for performance measurement of organizations, in particular of cultural institutions. Indeed, even if many contributions recognize the potential of adopting online data generated by users to increase the knowledge on users and to better inform organizations (e.g. Capodieci et al., 2019; Fu et al., 2018; Marchiori and Cantoni, 2015), very few of the retrieved studies address the topic of actually using such information to actually measure performances of institutions and support decision-makers within organizations. The presence of this gap in literature addressing cultural sector is quite surprising since cultural institutions are the more and more oriented towards their audience and public, considering them part of their mission and sources of information, but they do not yet exploit this new role of users to support decision-makers in defining, measuring and monitoring performances of cultural organizations. This work aims at contributing to this gap discussing whether and how cultural institutions rely on online user-generated content to further develop measures of performances to inform their decision making processes.

A summary of research problems (Section 3, p. 14), methodologies (Section 5, p. 17) and expected outputs and contributions (Section 4, p. 16) is shown in Table 3.

Table 3 Summary of research problems (Section 3, p. 14), methodologies (Section 5, p. 17) and expected outputs and contributions (Section 4, p. 16) addressed along this research.

Literature Gap	Research Question	Methodological Approach	Expected Output	Expected Contribution
Little exists in exploitation of highly accessible and <i>unmediated</i> online user-generated data, especially in textual form, to better understand users' characteristics (e.g., Li et al., 2019; Seresinhe et al., 2018), since various works still rely on <i>mediated</i> forms of online data, such as questionnaires (e.g., Tanusondjaja et al., 2015) or personal user's information (e.g., Howden et al., 2014).	RQ1: What are the main differences in the topics of discussion of Italian and non-Italian online reviewers of cultural institutions?	[Phase b] Quantitative analysis, including text analysis (Latent Dirichlet Allocation) of online reviews of a selected sample of Italian museums on Tripadvisor along year 2019	Identification of topics discussed by different groups of online users and analysis of the heterogeneity of topics across groups	Exploitation of highly accessible and <i>unmediated</i> online user-generated data in textual form to better understand users' characteristics and increase the knowledge of specific segments of cultural institutions' audiences
Literature offers few examples of structured procedures to alleviate the difficulties of undergoing the whole process of collecting, managing, maintaining, elaborating and interpreting unstructured data such as online UGCs, but rather focus on specific sub-phases such as analysis (e.g., Wang et al., 2019; Yang et al., 2019).	RQ2: Which are the main phases, strengths and weaknesses, advantages and limitations in the process of inclusion of online UGCs, specifically of text format, in a performance measurement system of cultural institutions and how could they be faced?	[Phase a] Literature review of mathematical models for text representation and of performance measures and indicators to account for online UGCs of textual forms	Theoretical framework and methodological procedure for measurement of performances of cultural organizations relying also on online UGCs of textual format	Overview of models for text representation and of text-based performance indicators Procedure of integration of online UGCs of textual format in performance measurement system
Even if many contributions recognize the potential of adopting online data generated by users to increase the knowledge on users and to better inform organizations (e.g. Capodieci et al., 2019; Fu et al., 2018; Marchiori and Cantoni, 2015), very few of the retrieved studies address the topic of actually using such information to actually measure performances of institutions and support decision-makers within organizations	RQ3: How do managers of cultural institutions design, use, report and trust online user-generated contents as management tools?	[Phase c] Qualitative analysis, e.g. single or multiple case study	Discuss the position of managers of cultural institutions, their level of trust and the potential usability of the proposed model for performance measurement based on online UGCs, with particular reference to textual data	Complement literature on performance measurement of cultural institutions with measures that rely on data generated by online users, central actors for cultural institutions

4. Research Objectives and Expected Impact

This work aims at investigating the role of online UGCs, especially in textual form, as tools for performance measurement of cultural institutions, to automatically and systematically account for expressions of thoughts of online users in supporting the management of cultural institutions. Coherently with gaps highlighted from the analysed literature, the following research questions will be addressed to solve the aforementioned overarching research problem:

RQ₁: What are the main differences in the topics of discussion of Italian and non-Italian online reviewers of cultural institutions?

RQ₂: Which are the main phases, strengths and weaknesses, advantages and limitations in the process of inclusion of online UGCs, specifically of text format, in a performance measurement system of cultural institutions and how could they be faced?

RQ₃: How do managers of cultural institutions design, use, report and trust online user-generated contents as management tools?

Specifically, RQ₁ will address the first gap exploiting a particular type of highly accessible online user-generated data, i.e. online reviews, to better understand users' characteristics starting from the online textual description of their experience. The expected output will be the identification of topics discussed by different groups of users and the analysis of the heterogeneity of these topics across groups. This will help identify the most important aspects of the experience of different groups of users, increasing the knowledge on the audience of cultural institutions by means of highly accessible online UGCs.

The second gap in literature will be addressed through RQ₂, which aims at offering a methodological contribution to the literature by proposing a model to make use of online text generated by users as a tool for performance measurement. One expected contribution to performance measurement literature will be an overview of extant indicators to exploit complex semantic or syntactic features of online text, taking particular attention to the aim for which each measure has been introduced in literature and highlighting strengths and weaknesses of usage of such metrics. The second expected contribution will be the development of a model for performance measurement of cultural institutions based on online text generated by users and the discussion of a general methodology to deal with these textual forms of online UGCs.

Finally, RQ₃ will refer to the third gap evidenced in performance measurement literature of cultural institutions, complementing available studies with measures that rely on data generated by online users, central actors for cultural institutions. This research question will discuss the ways through which managers of cultural institutions design, use and report performance measures based on online UGCs with particular reference to textual data. Therefore, from a managerial perspective, this work aims to offer cultural managers new ways to monitor performances of institutions, accounting also for the perspective of actual users of cultural services offered.

A summary of research problems (**Section 3, p. 14**), methodologies (**Section 5, p. 17**) and expected outputs and contributions (**Section 4, p. 16**) is shown in **Table 3**.

5. Research Methodology

From a methodological viewpoint, this work will consist in three main phases addressed to answer the aforementioned research questions:

- (a) Literature review on mathematical models to capture and represent complex semantic or syntactic properties of text and on performance measures and indicators to account for online UGCs of textual forms;
- (b) Online UGCs collection and quantitative analysis, from text of online review extracted from querying platforms (e.g., Tripadvisor) to posts from social media platforms (e.g., Facebook, Instagram, Twitter);
- (c) Qualitative data collection and analysis, specifically multiple case studies based on interviews with a selected sample of managers of cultural institutions who are exploiting user-generated content.

Phase (a) will provide a taxonomy of extant mathematical models for text representation and overview key performance indicators based on online text. This analysis will lead to the development of a theoretical framework to monitor the performances of cultural institutions relying also on online user-generated contents of textual form, resulting from an overview of extant indicators for text accounting enriched by a taxonomy of extant models for text representation.

Phase (b) and (c) will support the empirical application of the theoretical framework developed in phase (a) to answer research questions RQ₁ to RQ₃. Specifically, the framework will be adapted to museums and opera theaters, two particular types of cultural institutions whose socio-economic activities have beneficial influence on the community (Rentschler & Potter, 1996).

Phase (b) will consist in collection and analysis of online UGCs and will be articulated into:

- identification of sample of cultural institutions;
- manual collection of online channels and platforms (e.g., websites or social media pages or online querying) from which data need to be downloaded;
- definition and implementation of online data crawler for data collection;
- definition of time-horizon and frequency of data collection;
- actual download of online data;
- data pre-processing and cleaning;
- data analysis, including quantitative analysis of online text (e.g. Latent Dirichlet Allocation);
- critical analysis and interpretation of results;
- reporting and discussion of results.

Lastly, phase (c) will consist in understanding the actual and potential usage of online UGCs from the perspective of managers of cultural institutions. Therefore, this phase of multiple case studies will include:

- identification of cultural institutions to be studied;
- identification of key actors to be interviewed within organizations;
- data collection, through primary sources (e.g. interviews) and secondary sources (archival data);
- qualitative data analysis;
- critical analysis and discussion of results.

A summary of research problems (Section 3, p. 14), methodologies (Section 5, p. 17) and expected outputs and contributions (Section 4, p. 16) is shown in Table 3.

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7. Appendix

A) Preliminary Searches

This section gives additional details on preliminary literature searches, performed to identify relevant combinations of keywords to be used in the search strategy. Preliminary searches are presented in **Table 4**, where relevant results are expressed in terms of topics of interest as shown in **Figure 2**.

Table 4 Details on preliminary literature searches. Relevant results are expressed in terms of topics of interest as shown in [Figure 2](#).

Data base	Keywords	Fields	Subject Area	Document Type	N. Results	N. Relevant Results
Scopus	"online data" AND user AND measure	Title, Abstract, Keywords	-	-	52	0 in intersection of topic (i), (ii) and (iii) 15 in intersection of topics (i) and (ii)
Scopus	"performance measur*" OR "performance manag*" OR "performance evaluat*") AND "text"	Title, Abstract, Keywords	-	Review (re)	67	0 in intersection of topic (i), (ii) and (iii) 2 in intersection of topics (i) and (ii) 1 in topic (iii)
Scopus	"performance measur*" OR "performance manag*" OR "performance evaluat*") AND "text" AND ("online" OR "digital")	Title, Abstract, Keywords	-	Review (re)	12	0 in intersection of topic (i), (ii) and (iii) 2 in intersection of topics (i) and (ii) 0 in topic (iii)
Scopus	"performance measur*" OR "performance manag*" OR "performance evaluat*") AND "text" AND ("online" OR "digital")	Title, Abstract, Keywords	Business, Management and Accounting (BUSI)	-	9	0 in intersection of topic (i), (ii) and (iii) 1 in intersection of topics (i) and (ii) 0 in topic (iii)
Scopus	"performance measur*" OR "performance manag*" OR "performance evaluat*") AND "text" AND ("online" OR "digital")	Title, Abstract, Keywords	Economics, Econometrics, and Finance (ECON)	-	1	0 in intersection of topic (i), (ii) and (iii) 0 in intersection of topics (i) and (ii) 0 in topic (iii)
Scopus	"performance measur*" OR "performance manag*" OR "performance evaluat*") AND "text" AND ("online" OR "digital")	Title, Abstract, Keywords	Decision Sciences (DECI)	-	30	0 in intersection of topic (i), (ii) and (iii) 3 in intersection of topics (i) and (ii) 0 in topic (iii)
Scopus	"performance measur*" OR "performance manag*" OR "performance evaluat*") AND "text" AND ("online" OR "digital")	Title, Abstract, Keywords	Arts and Humanities (ARTS)	-	3	0 in intersection of topic (i), (ii) and (iii) 0 in intersection of topics (i) and (ii) 0 in topic (iii) or sector (iv)
Scopus	"performance measur*" OR "performance manag*" OR "performance evaluat*") AND "text" AND ("online" OR "digital") AND ("cultur*" OR "art")	Title, Abstract, Keywords	-	-	32	0 in intersection of topic (i), (ii) and (iii) 5 in intersection of topics (i) and (ii) 0 in topic (iii) or sector (iv)

B) Literature Review Phases

This section gives additional details on samples of documents corresponding to intermediate phases of the literature review, already overviewed in the literature prism of **Figure 3**.

1. **Step 1 – retrieval:** **Figure 6** and **Figure 7** summarize the main characteristics of the two search samples of documents retrieved employing the specific parameters for the search, procedure that resulted in the retrieval of $n=848$ documents for the left search in **Figure 3** and $m=95$ documents for the right search in **Figure 3**. Both figures evidence a growing interest in the topic in recent years (**Figure 6, top** and **Figure 7, top**) and a variety of communities addressing the topic in the scholar arena (**Figure 6, bottom** and **Figure 7, bottom**).
2. **Step 2 – filter articles:** **Figure 8** shows the distribution by subject area of the articles extracted from the search samples, that represents respectively the 42% and 63% of the original search samples ($n=848$ and $m=95$).
3. **Step 3 – filter sector:** After filtering on contributions in the subject areas of Computer Science (“COMP”) and Mathematics (“MATH”) – to take into consideration of the modelling of online user-text – and contributions potentially connected to the understanding of online user’s behaviour, exploring hence the Scopus’ fields under the umbrella of “All Social Sciences” – including Arts and Humanities (“ARTS”), Business, Management and Accounting (“BUSI”), Decision Sciences (“DECI”) and Social Sciences (“SOCI”), Economics, Econometrics, and Finance (“ECON”) and Psychology (“PSYC”), retrieved documents are respectively $N'=226$ and $M'=27$ articles, with the characteristics summarized in **Figure 9** and **Figure 10**.
4. **Step 4 – filter content:** the following two sections offer additional details on documents that have been excluded from the review (respectively $N'-N=167$ for left branch and $M'-M=10$ for right branch of **Figure 3**) procedure since they did not satisfy the inclusion criteria, specifically:
 - Inclusion criterion for left branch in **Figure 3**: studies related to understanding, monitoring or measuring online behaviours of users through online data;
 - Inclusion criterion for right branch in **Figure 3**: studies connected to performances measurement and metrics or related to users’ behaviours within cultural institutions.

Documents Excluded from the Review of Online Data for User’s Behaviour (Figure 3, left)

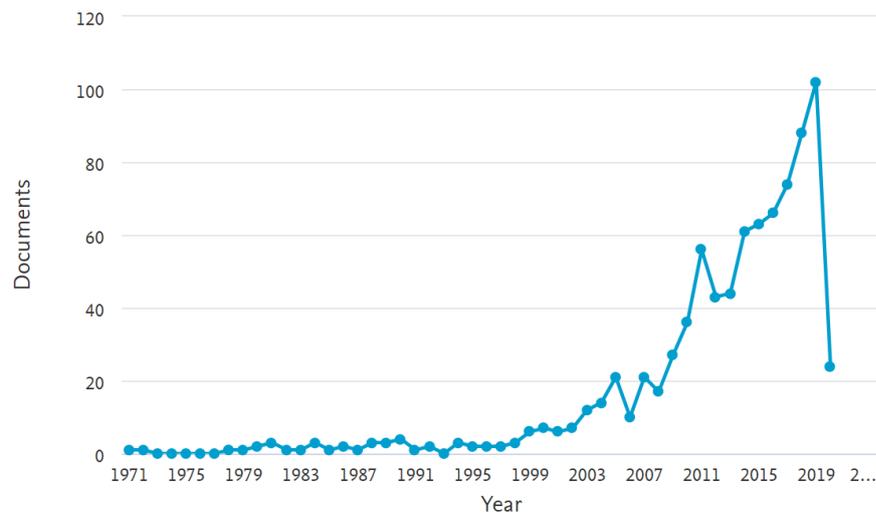
This paragraph describes the main reasons of exclusions of the 74% of the $N'=226$ retrieved articles from the search for contributions aimed at understanding users’ behaviours through online data. It is useful to recall that the search strategy has been intentionally designed to have a wide coverage in retrieved results, as already discussed from search results presented in **Preliminary Searches**. A class of documents excluded from this review is the one of studies connected to ethical issues in the usage of online data, such as data protection and accessibility, or tools to support researches elaborate data (e.g., Chatterjee, 2019; Hu et al., 2019; Lyu et al., 2019; Clifford et al., 2016; Elliot et al., 2016; Stoet, 2017; Xu et al., 2014; Perez Vallejos et al., 2019; MacKenzie, 2017), because such contributions focus merely on the usage of online data rather than being interested in understanding users’ behaviours and perspectives through such online data. Other studies not included in this review are those exploring the attitude of users towards technologies rather than understanding the online behaviours of users. Examples include online surveys to discover the determinants of mobile service subscriptions or to determine the attitude of users towards online tools, mobile technology, online travel platforms and online privacy protection systems offered by organizations (Swaminathan et al, 2019; Hanafi et al., 2018; Rădulescu, 2018; Agag and El-Masry, 2017; Eriksson, 2014; El-Shimy et al., 2012; Wang and Lin, 2012). The same position has been taken

towards studies aimed at offering tools or systems to support to online users, since they do not use online data but rather offer technologies and systems to facilitate online users (e.g., Li et al., 2014; Kinsey, 2012; Loucky, 2009). Even if strongly connected to the idea of collaborating with users, articles discussing the centrality of users in innovation, co-design and co-development have been identified as not fulfilling the aforementioned inclusion criterion, because they do not rely on online data to study the online behaviour of users but rather describe user-innovation processes, sometimes based on online collaborations among users (e.g., Koch and Artmayr, 2019; Birkbak et al., 2018; Chang and Myers, 2017; Desolta et al., 2017; Pinet et al., 2017; Gureckis et al., 2016; Slote and Strand, 2016; Jensen et al., 2014; Schrama, 2009). Another class of papers not considered along this review is the one concerned with the description or improvement of algorithms or systems to retrieve and process online data, including online documents and texts (e.g., Deb et al., 2019; Li et al., 2018; Bakar et al., 2017; Hmeidi et al., 2016; Tanev et al., 2015). Indeed, though some of these contributions will for sure come in use in defining the methodology of this research, the purpose of this review is not to enumerate methods that could be used to retrieve online data, but rather to debate the literature targeting the interpretation of online data coming from users in order to support the measurement of performances of organizations. Due to the specific interest of this research towards the cultural sector, it is worth mentioning that retrieved documents in this sector that have been excluded aimed at offering online platforms or technologies to users rather than relying on online data to understand users. Examples include, the description of the co-design process of platforms with local communities for natural and cultural heritage tourism (Ricart et al., 2019), the development of an application to search for information on theaters and restaurant (Barish et al., 2000) or the digitalization of collections (Wang et al., 2019; York, 2017).

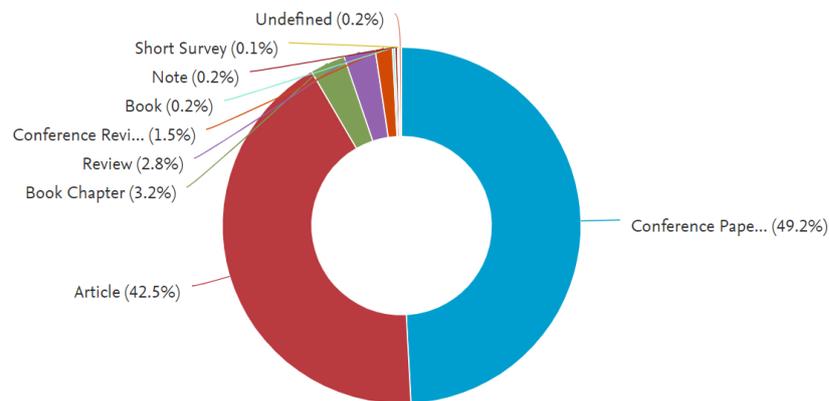
Documents Excluded from the Review of Performance Measurement of Cultural Institutions: Mission, Data and Measurement (Figure 3, right)

First of all, it is important to recall that the definition of cultural institution used along this work refers to the one of the European Commission “architecture, archives, libraries and museums, artistic crafts, audiovisual (including film, television, video games and multimedia), tangible and intangible cultural heritage, design (including fashion design), festivals, music, literature, performing arts, books and publishing, radio, and visual arts” (EU Proposal Regulation, Chapter 1, Article 2.2). With the aim of reviewing those documents addressing the measurement of performances of cultural institutions, 10 articles have been excluded from the $M'=27$ retrieved (Fig. E). Indeed, articles excluded were related to hospitals and surgical operating theatres (Morgan et al., 2017; Traversari et al., 2017; Frosini et al., 2016; Szczesny and Ernst, 2016), biological collections rather than artistic collections (Arbeláez-Cortés et al., 2017), or mentioned the terms “museum” or “cultur” within metaphors or for marginal examples (Franceschini et al., 2016; Au, 2005; Goldberg et al., 2002).

Documents by year



Documents by type



Documents by subject area

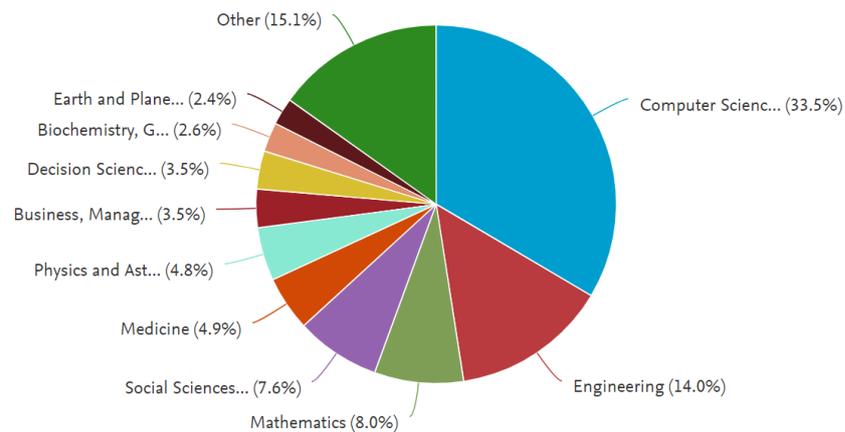
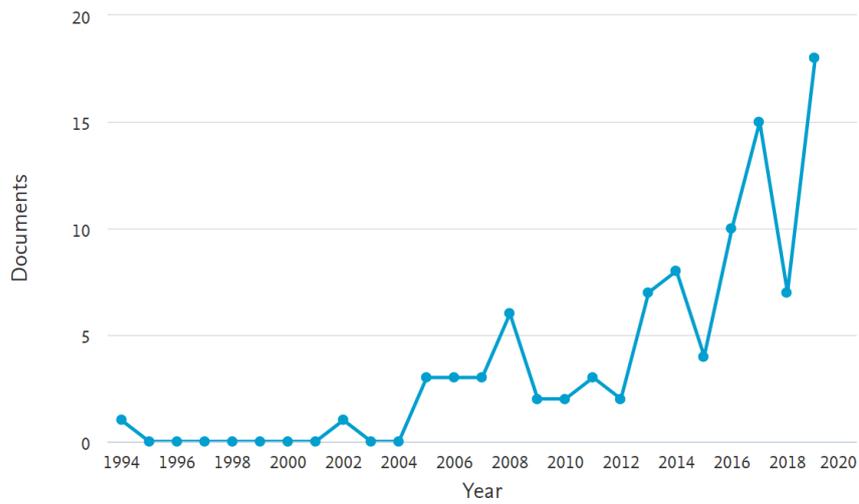
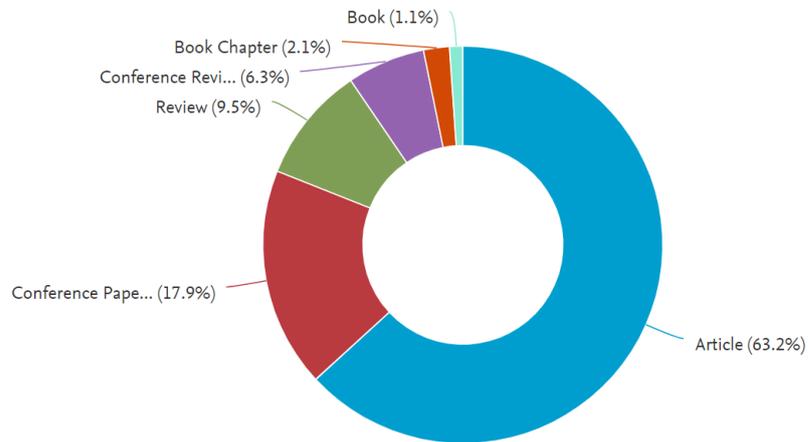


Figure 6 Search sample of $n=848$ documents retrieved querying Scopus database for TITLE-ABS-KEY ("online data" AND user). Source: Scopus. Last accessed: May 2020.

Documents by year



Documents by type



Documents by subject area

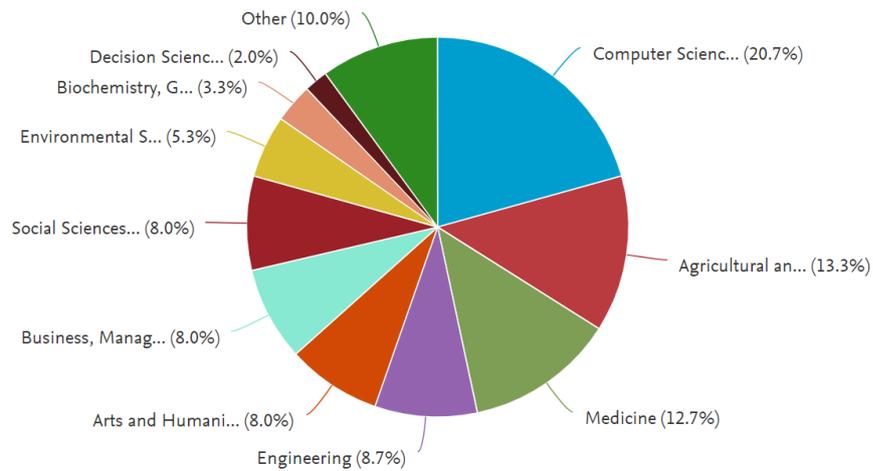


Figure 7 Search sample of $m=95$ documents retrieved querying Scopus database for (“online” AND TITLE-ABS-KEY((metric OR "performance indicator" OR "performance measure") AND ("cultur* institut*" OR museum OR theatre OR theatre))). Source: Scopus. Last accessed: May 2020.

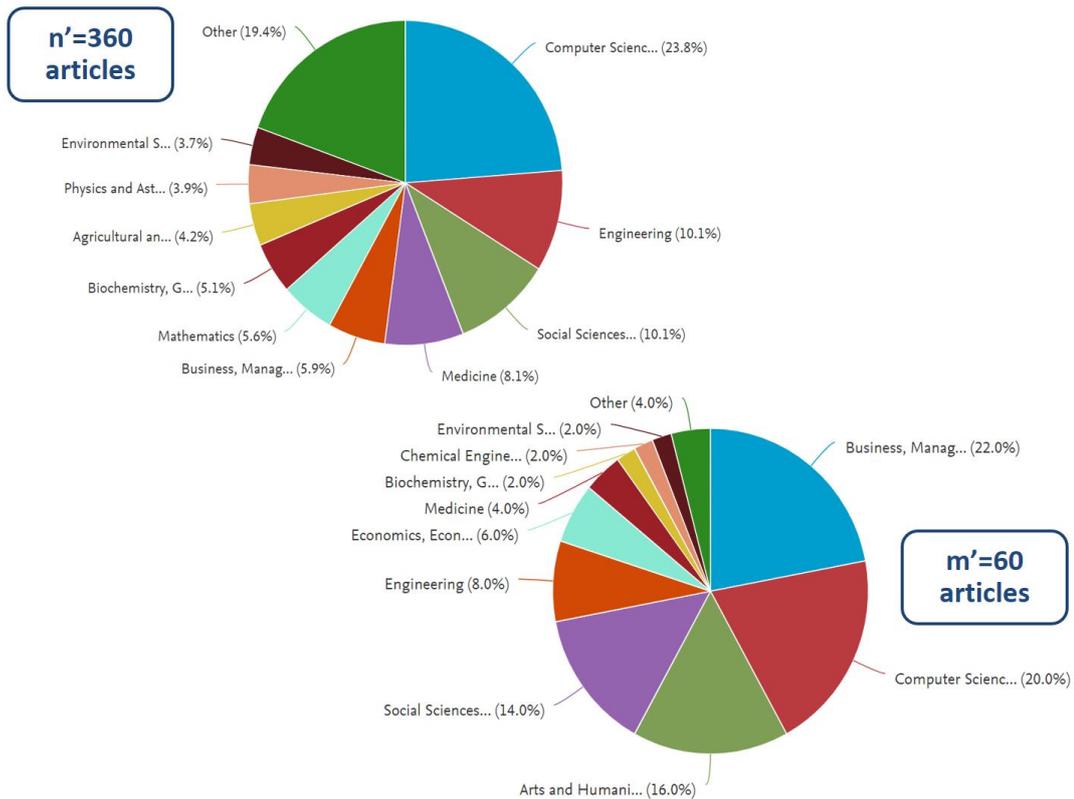


Figure 8 Source: Scopus. Last accessed: May 2020. Distribution by sector area of search sample filtered for articles only. (left) Sectors associated to $n'=360$ articles corresponding to search "online data" AND user (Figure 3, left branch) (Fig. 3, left branch). (right) Sectors associated to $m'=60$ articles corresponding to search for PMS in cultural institutions (Figure 3, right branch).

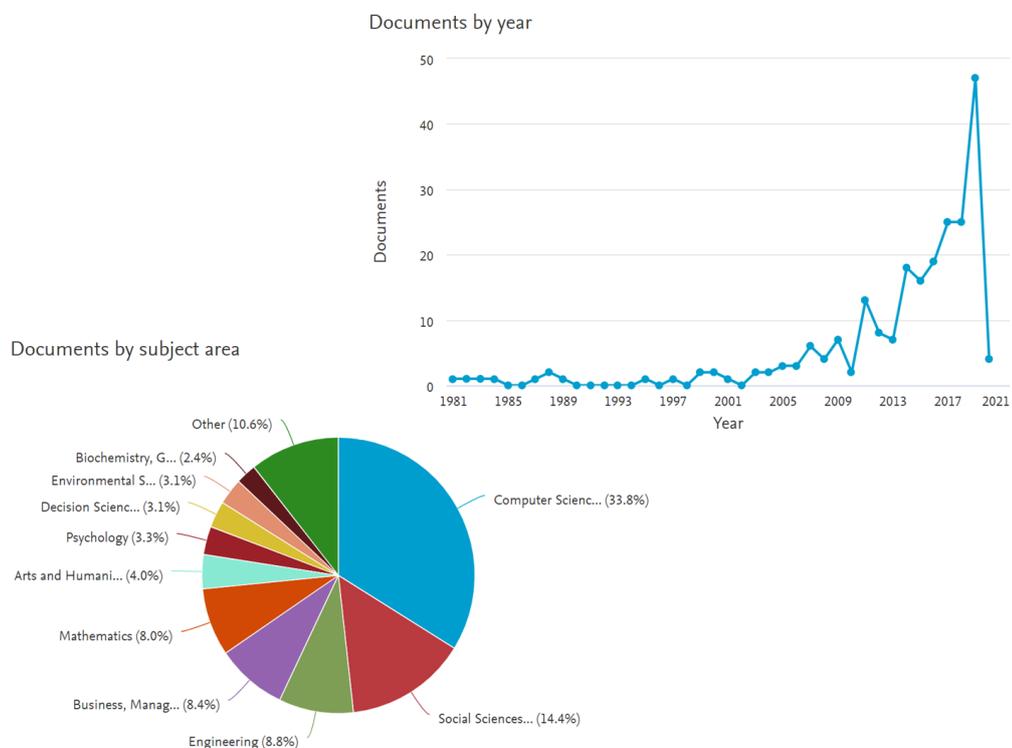


Figure 9 Sample of $N'=226$ articles retrieved querying the Scopus database for TITLE-ABS-KEY ("online data" AND user) AND (LIMIT-TO (DOCTYPE, "ar")) AND SUBJAREA (arts OR busi OR deci OR soci OR econ OR psyc OR comp OR math). Source: Scopus. Last accessed: May 2020

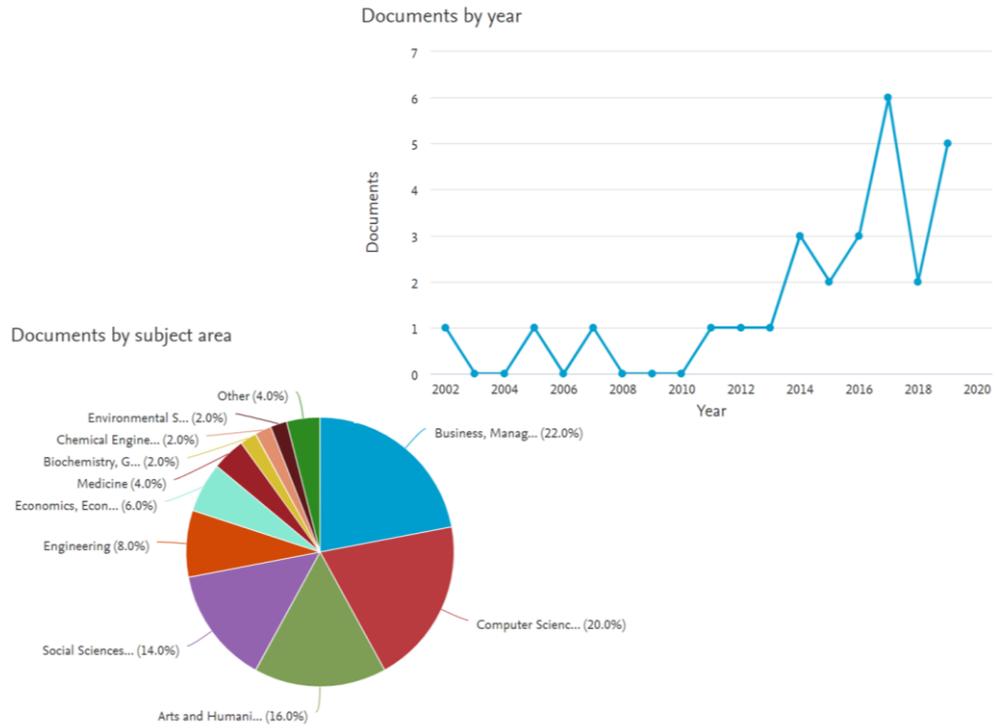


Figure 10 Sample of $M'=27$ articles retrieved querying the Scopus database for (“online” AND TITLE-ABS-KEY((metric OR "performance indicator" OR "performance measure") AND ("cultur* institut*" OR museum OR theatre OR theatre))) AND (LIMIT-TO (DOCTYPE , "ar")) AND SUBJAREA (arts OR busi OR deci OR soci OR econ OR psyc OR comp OR math). Source: Scopus. Last accessed: May 2020.

C) Data Extraction Form (DEF)

Details on the structure employed to guide the recording of information and their analysis for review purposes are shown in **Table 5**. Beside considering a basic information on the document retrieved, e.g. title, author, year of publication, journal of publication, other information has come into use in different phases:

- ID paper, unique code to easily identify each document;
- Keywords, author and document, to take track of the main topics according to author and to search database;
- DOI and link to source page, to easily access resource;
- Document type, in this case only articles;
- Source database, in this case only Scopus;
- Cited by, to account for the number of citations at download time, recorded in Retrieval Time;
- Citation year, to easily identify documents with high rates of citations per year; this metric compares the overall number of citations to the number of years since the document has been published; it is computed as $\text{Cited by} / (2021 - \text{Publication year})$;
- Search query, specifies the query used for the search;
- Objective of search, to state the objective of the current search, i.e. in this case either online data for users' behaviour or performance measurement of cultural institutions;
- Exclusion/inclusion criteria, to take track of the reasons of exclusion (if any) and/or inclusion (if any), i.e. in this case if the document addresses the areas of interest in **Figure 2**, namely online data, user, performance measurement, culture;
- Screened and Full-Reading, to take track along the analysis of the level of detail of analysis already performed, i.e. whether document has been yet screened or fully read;
- Context, Gap, Text relevance, to identify if the document is relevant in terms of area of interest or context, in terms of gaps, in terms of references to text measures or indicators;
- Specific and additional details on the content of the document analysed, ranging from the research problem and objective, to potentially relevant debates in connection to my research interest.

Table 5 Data Extraction Form (DEF) used to store relevant information along the analysis of articles.

Field	Description
ID paper	Unique code identifier of paper
Authors	Authors
Title	Title
Year	Year of publication
Abstract	Abstract
Author Keywords	Keywords, defined by authors
Document Keywords	Keywords, defined by Scopus
DOI	DOI code
Link	Online access to resource
Journal / Publisher	Journal or publisher
Doc Type	Document type, e.g. Article, Review, Conference Paper, Conference Review
Subjarea	Subject area, according to Scopus
Source DB	Scopus
Cited by	Number of citations in source DB at retrieval time
Citation year	Number of citations in source DB at retrieval time / years since publication
Retrieval Time	Time at which the document has been retrieved or last updated
Search Query	Search query used to retrieve document
OBJ of search	Goal of current search
Exclusion Criteria	According to OBJ of search, short list of reasons (if any) of exclusion of document from further analyses
Inclusion Criteria	According to OBJ of search, short list of reasons (if any) of inclusion of document from further analyses
Screened	Whether document has been screened yet
Full-Reading	Whether document has been fully-read yet
Context Relevance	Whether document is relevant for context of research
GAP Relevance	Whether document is relevant for identification of literature gaps
TEXT Relevance	Whether document is relevant for text modelling, text analytics or indicators based on text
Summary	Short summary of contents of document
Problem / RQ / OBJ	Research Problem, GAP, Objective and Questions addressed
Theory / Framework / Model / Empirical	Theories, frameworks, models used in document and corresponding references (if any)
Methodology	Details on methodology, including data collection, pre-processing, analysis
Data	Data used for analysis (if any)
Software	Software to perform analysis (if any)
Text Analytics	Details on text analytics (if any)
Recommendations / Future Research	Future directions highlighted / suggested by authors
Contributions	Contributions of document
Potential debates	Open debates potentially affine to my research
Additional Information	Additional relevant information to be stored

D) Additional References Used in Appendix

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