# Proceedings of the 19th International Conference

# WWW/INTERNET

## Virtual 18 - 20 November 2020

**Edited by**
**Pedro Isaías**

iadis
international association for development of the information society

# 19th INTERNATIONAL CONFERENCE
# on

# WWW/INTERNET 2020

# PROCEEDINGS OF THE
# 19th INTERNATIONAL CONFERENCE
# on
# WWW/INTERNET 2020

**NOVEMBER 18-20, 2020**

Organised by

international association for development of the information society

Copyright 2020

IADIS Press

All rights reserved

This work is subject to copyright. All rights are reserved, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, re-use of illustrations, recitation, broadcasting, reproduction on microfilms or in any other way, and storage in data banks. Permission for use must always be obtained from IADIS Press. Please contact secretariat@iadis.org

As a member of Crossref (a non-profit membership organization for scholarly publishing working with the purpose to make content easy to find, link, cite and assess) each published paper in this book of proceedings will be allocated a DOI (Digital Object Identifier) number for its fast and easy citation and indexation.

Edited by Pedro Isaías

Associate Editor: Luís Rodrigues

ISBN: 978-989-8704-23-8

# TABLE OF CONTENTS

FOREWORD ix

PROGRAM COMMITTEE xiii

KEYNOTE LECTURE xv

## FULL PAPERS

A BOT-ENABLED APPROACH FOR WEB SERVICE DISCOVERY 3
*Bahareh Zarei, Mahda Noura and Martin Gaedke*

THE APPLICATION OF BLOCKCHAIN TECHNOLOGY IN LOYALTY PROGRAMS 11
*Valerio Stallone, Anja Collenberg, Andreas Rüedlinger, Martin Wetzels and Michael Klaas*

THE MAIN ROLE OF VIDEO ADS' STRUCTURE ON SOCIAL MEDIA ENGAGEMENT 19
*Sónia de Almeida Ferreira, Sara Santos and Pedro Espírito Santo*

THE IMPACT OF SOCIAL MEDIA CONSUMPTION ON CULTURAL INTELLIGENCE OF USER 27
*Petra Zecevic, Lana Miletic and Ljerka Luic*

COMBINING DISTRIBUTED AND CENTRALISED APPROACHES TO DEVELOP A HYBRID METHODOLOGY FOR DATA MANAGEMENT IN HEALTHCARE 35
*Christos Kontzinos, Panagiotis Kapsalis, Spiros Mouzakitis, Michael Kontoulis, Ourania Markaki, Dimitris Askounis, Haralampos Karanikas, Alexandros Christodoulakis and Panagiotis Dimitrakopoulos*

THE IMPACT OF CHANGING THE GRANULARITY OF PREFERENCE-INTENSITY INFORMATION ON THE ONLINE COMPENSATION ELECTION 43
*Roumen Vragov and Nanda Kumar*

OUTCOMES OF AN EXPERT SURVEY: ARE SINGAPORE'S MANUFACTURING SMALL AND MEDIUM ENTERPRISES READY TO EMBRACE INDUSTRY 4.0? 51
*Gopalakrishnan Surianarayanan and Thomas Menkhoff*

SOFTWARE CATALOGUE FOR SCIENTIFIC CONTEXT EXPLICATION 61
*Olga Kononova, Dmitry Prokudin and Angelina Timofeeva*

AN NVME FPGA-BASED SMART SWITCH ARCHITECTURE WITH ONLINE RECONFIGURATION 68
*Vinicius G. Linden, Cassiano S. Campes, Lúcio R. Prade, Bruna F. Flesch and Rodrigo M. de Figueiredo*

PERSONALIZED WEB SEARCH USING KEY PHRASE-BASED USER PROFILES 76
*Sara Abri, Rayan Abri and Salih Cetin*

IDENTIFYING DIFFICULTIES IN THE KNOWLEDGE TRANSFER PROCESS IN GLOBAL SOFTWARE: A QUALITATIVE ANALYSIS 84
*Franciney O. Lima, Victoria Carolina S. Mattos, Raquel F. V. Cunha, Alexandre S. Teixeira, Marcelo S. Ayres, Luis H. Pascareli, Fernando B. Pires and Bruno A. Bonifácio*

ASSESSING JOB MARKET DYNAMICS USING ELK STACK 91
*Gabriel Silva, Mário Rodrigues, Marlene Amorim, Angélica Souza, Marta Dias and Armando Pinho*

GETTING CLOSER TO THE THINGS WE ARE LOOKING FOR – A PROPOSAL FOR ASPECT-DRIVEN TEXT ANALYSIS 99
*Kurt Englmeier and Matthias Schneider*

ONTOLOGY-BASED HUMAN-MACHINE COLLECTIVE INTELLIGENCE ENVIRONMENT FOR DECISION SUPPORT 107
*Alexander Smirnov and Andrew Ponomarev*

A SURVEY ON THE STATE OF CLOUD ADOPTION IN MICRO & SMALL BRAZILIAN IT COMPANIES 115
*Gabriel Costa Silva, Cesar Giovani Colini and Elizandro Ferreira*

DYNAMICALLY PRIORITIZED VIRTUAL-NETWORK MONITORING ACCORDING TO LIFECYCLE OF VIRTUAL MACHINES IN LARGE SCALE DATA CENTER 123
*Hideki Okita, Hayato Hoshihara, Norihisa Komoda and Toru Fujiwara*

## SHORT PAPERS

USE OF WEB 2.0 IN CULTURAL HERITAGE 135
*Lola García-Santiago and María Dolores Olvera-Lobo*

RAISING THE VOICE: EXPLORING ANTECEDENTS OF VOICE-ACTIVATED ASSISTANT USAGE INTENTION 141
*Maria Madlberger and Jacquelyn O'Neill*

PARTICIPATORY GOVERNABILITY UNDER DEVELOPMENT: THE INSTITUTION OF CITIZEN PARTICIPATION AS THE BASIS FOR THE DESIGN OF THE "GOVERNMENT AS A PLATFORM" IN DEVELOPING COUNTRIES 145
*Kirill Neverov*

USING SEMANTIC RELATIONSHIPS TO ENHANCE NEURAL WORD EMBEDDINGS 150
*Yanqin Yin, Xiaodong Sun, Huanhuan Lv, Pikun Wang, Hongwei Ma and Dongqiang Yang*

TOWARDS A CONCEPT FOR STREAMLINING GAME DESIGN OF AN EXISTING SERIOUS GAME AND PRELIMINARY EVALUATION 155
*Daniel Atorf, Ehm Kannegieser and Marlene Dillig*

AN E-TUTOR TOOL FOR GRAMMATICAL ERROR CORRECTION 161
*Xiaodong Sun, Yanqin Yin, Huanhuan Lv, Pikun Wang, Hongwei Ma and Dongqiang Yang*

## REFLECTION PAPERS

DIGITAL HEALTH AND ILLNESS: BALANCING IT 169
*António Bandeira and Henrique Martins*

A NEW PERSPECTIVE ON THE ISSUE OF PRIVACY: COVID-19 PANDEMIC VS PRIVACY 173
*Adewale Adegoroye, Marc Conrad and Xiaohua Feng*

## DOCTORAL CONSORTIUM

CONTINUOUS INTEGRATION OF FAAS DRIVEN BY QUALITY ATTRIBUTES 179
*Pablo Serrano-Gutierrez*

AUTHOR INDEX

# FOREWORD

This book of proceedings contains the papers of the 19th International Conference on WWW/Internet (ICWI 2020), held virtually from 18 to 20 November 2020 and organized by the International Association for Development of the Information Society (IADIS). Due to an exceptional situation caused by the COVID-19 pandemic, this year the conference was converted to a fully virtual conference.

The WWW/Internet (ICWI) 2020 Conference aims to address the main issues of concern within WWW/Internet. WWW and Internet had a huge development in recent years. Aspects of concern are no longer just technical anymore but other aspects have arisen. This conference aims to cover both technological as well as non-technological issues related to these developments.

Submissions were accepted under the following main tracks and topics:

- Web 2.0
  - Collaborative Systems
  - Social Networks
  - Folksonomies
  - Enterprise Wikis and Blogging
  - Mashups and Web Programming
  - Tagging and User Rating Systems
  - Citizen Journalism

- Semantic Web and XML
  - Semantics Web Architectures
  - Semantic Web Middleware
  - Semantic Web Services
  - Semantic Web Agents
  - Ontologies
  - Applications of Semantic Web
  - Semantic Web Data Management
  - Information Retrieval in Semantic Web

- Applications and Uses
  - e-Learning
  - e-Commerce / e-Business
  - e-Government
  - e-Health
  - e-Procurement
  - e-Society
  - Digital Libraries
  - Web Services/SaaS
  - Application Interoperability
  - Web-based Multimedia Technologies

- Services, Architectures and Web Development
    - Wireless Web
    - Mobile Web
    - Cloud/Grid Computing
    - Web Metrics
    - Web Standards
    - Internet Architectures
    - Network Algorithms
    - Network Architectures
    - Network Computing
    - Network Management
    - Network Performance
    - Content Delivery Technologies
    - Protocols and Standards
    - Traffic Models

- Research Issues
    - Web Science
    - Digital Rights Management
    - Bioinformatics
    - Human Computer Interaction and Usability
    - Web Security and Privacy
    - Online Trust and Reputation Systems
    - Data Mining
    - Information Retrieval
    - Search Engine Optimization

This event received 98 submissions from more than 18 countries. Each submission has been anonymously reviewed by an average of four independent reviewers, to ensure the final high standard of the accepted submissions. The final result was the approval of 16 full papers, which means that the acceptance rate was 16%. A few more papers have been accepted as short, reflections and doctoral papers. Best papers will be selected for publishing as extended versions in the IADIS International Journal on WWW/Internet (IJWI) (ISSN:1645-7641).

The conference, besides the papers' presentations, also features one keynote presentation from an internationally distinguished researcher. We therefore would like to express our gratitude to our keynote speaker: Professor Panagiotis Takis Metaxas (Professor and Chair of Computer Science Department, Wellesley College, USA).

As we all know, organising these conferences requires the effort of many individuals. We would like to thank all members of the Program Committee for their hard work in reviewing and selecting the papers that appear in the proceedings.

We are especially grateful to the authors who submitted their papers to this conference and to the presenters who provided the substance of the meetings.

This Proceedings book contains a rich experience of the academic & research institutions and the industry on diverse themes related to the Internet and Web. We do hope that researchers, knowledge workers and innovators both in academia and the industry will find it a valuable reference material.

Last but not the least, we hope that everybody enjoyed the presentations, and we invite all participants for next year's edition of the International Conference on WWW/Internet.

Pedro Isaías, Information Systems & Technology Management School, The University of New South Wales, Australia
*Conference & Program Chair*

November 2020

# PROGRAM COMMITTEE

**CONFERENCE & PROGRAM CHAIR**

Pedro Isaías, Information Systems & Technology Management School,
The University of New South Wales, Australia

**COMMITTEE MEMBERS**

Abdolhossein Sarrafzadeh, UNITEC New Zealand, New Zealand
Agostino Poggi, Università degli Studi di Parma, Italy
Alexander Troussov, Russian Academy of National Economy, Ireland
Alexiei Dingli, University of Malta, Malta
Ana María Fermoso García, Universidad Pontificia de Salamanca, Spain
Andreas Schrader, Insitute of Telematics, University of Luebeck, Germany
Angélica de Antonio, Universidad Politécnica de Madrid, Spain
Anirban Kundu, Netaji Subhash Engineering College, India
Asadullah Shaikh, Najran University, Saudi Arabia
Christos Bouras, University of Patras, Greece
Costas Yialouris, Agricultural University of Athens, Greece
Cristiano Costa, Universidade do Vale do Rio dos Sinos (UNISINOS), Brazil
Debajyoti Mukhopadhyay, NHITM of Mumbai University, India
Dirk Thissen, Rwth Aachen, Germany
Dongqiang Yang, Shandong Jianzhu University, China
Elias Kirche, Florida Gulf Coast University, USA
Erick López Ornelas, Universidad Autónoma Metropolitana - Cuajimalpa, Mexico
Evangelos Sakkopoulos, University of Patras, Greece
Fan Zhao, Florida Gulf Coast University, USA
Florence Sedes, Universite Paul Sabatier of Toulouse, France
Florin Pop, University Politehnica of Bucharest, Romania
Fuensanta Medina-Dominguez, Universidad Carlos III de Madrid, Spain
George Koutromanos, National and Kapodistrian University of Athens, Greece
Giuseppe Patane, CNR-IMATI, Italy
Gustavo Rossi, Universidad Nacional de la Plata, Argentina
Hector Migallon Gomis, University Miguel Hernandez, Spain
Ioan Toma, Onlim GmbH, Austria
Isidoros Perikos, University of Patras, Greece
Ivanna Dronyuk, Lviv Polytechnic National University, Ukraine
Jaime Ramírez Ramírez, Universidad Politécnica de Madrid, Spain
James Thong, Hong Kong University of Science and Technology, Hong Kong
Jamshid Shanbehzadeh, Kharazmi University, I. R. Iran
Janez Brank, Jozef Stefan Institute, Slovenia
Jörg Roth, Nuremberg Institute of Technology, Germany

Kai Koster, Kosmicon, Germany
Kathia Oliveira, Université de Valenciennes, France
M. Omair Shafiq, Carleton University, Canada
Madhavi Sharma, Indira Gandhi National Open University, India
Marco Furini, University of Modena and Reggio Emilia, Italy
Marek Rychly, Brno University of Technology, Czech Republic
Maria-Isabel Sanchez-Segura, Universidad Carlos III de Madrid, Spain
Markos Hatzitaskos, University of Patras, Greece
Martin Gaedke, Chemnitz University of Technology, Germany
Massimo Marchiori, UNIPD and EISMD, Italy
Matteo Paganelli, University of Modena and Reggio Emilia, Italy
Michalis Vaitis, University of the Aegean, Greece
Nadezda Chalupova, Mendel University in Brno, Czech Republic
Nane Kratzke, Technische Hochschule Lübeck, Germany
Nikos Karacapilidis, University of Patras, Greece
Nikos Karousos, University of Patras, Greece
Olga Fedevych, Lviv Polytechnic National University, Ukraine
Otoniel Lopez, University Miguel Hernandez, Spain
Pablo Pinol Peral, University Miguel Hernandez de Elche, Spain
Peter Geczy, AIST (National Institute of Advanced Industrial Sc, Japan
Prashant R. Nair, Amrita University, India
Runa Jesmin, University of Roehampton, United Kingdom
Sotiris Karetsos, Agricultural University of Athens, Greece
Stamatios Papadakis, University of Crete, Greece
Steven Demurjian, The University of Connecticut, USA
Sung-kook Han, Wonkwang University, Republic of Korea
Tharrenos Bratitsis, University of Western Macedonia, Greece
Yousef Asiri, College of Computer Science and Information System, Saudi Arabia

# USE OF WEB 2.0 IN CULTURAL HERITAGE

Lola García-Santiago and María Dolores Olvera-Lobo
*Department of Information and Communication Sciences, University of Granada, Spain*
*Faculty of Translation and Interpreting. Calle Buensuceso 11 Despacho 11. Granada (Spain) 18071*

**ABSTRACT**

As example of digital humanities in this paper the presence of institutional websites for heritage assets on relevant social media and Web 2.0 tools was analysed (social tools, Wikipedia and blogs). It was studied if new forms of cultural communication are being used as actual communication ways. The presence of institutional profiles was analysed on the following social networks: Facebook, Twitter, Google+, YouTube, Vimeo, Instagram, Flickr, Pinterest, TripAdvisor and FourSquare. Furthermore, it was identified the presence of heritage assets in the "Google Arts & Culture" project of the Google Cultural Institute as a new digital cultural resource. Results heterogeneous have been obtained and have been detected lacks in the adaption web 2.0. Wikipedia is the web 2.0 tool more used and only the 50% of the cases use Facebook or Twitter –most of them governmental institutions which manage cultural assets-. Image-based social networks are used but not in a usual way.

**KEYWORDS**

Digital Humanities, Web 2.0, World Cultural Heritage, Google Arts & Culture, Social Networks

## 1. INTRODUCTION

The concept denominated by the sociologist Zygmunt Bauman (2003) as liquid modernity is in constant evolution and adaptation to change. In the context we refer to in this work, the need for constant access to information demands the usage and appropriate management of the tools available on the Web 2.0 for a dissemination of content in accordance with the times we live in. Social media sites disseminate and share content in a community manner in the hope of feedback on the part of members. Institutions wishing to increase the expansion of the information they produce, along with their own presence and visibility, need to integrate with this group. It is for this reason that there is a progressive aware of what good digital identity management implies for improving visibility and facilitating participation and contact with users.

From the perspective of digital humanities, it is worth asking how the dissemination of information on cultural heritage is being implemented. In this regard, initiatives such as Google Arts & Culture, proposed by the Google Cultural Institute (2020) and to which reference will be made further on, are of great interest. Likewise, with increasing frequency, the bodies themselves are responsible in one way or another for the dissemination of information on heritage, mainly public bodies or non-profit governmental cultural institutions, which endeavor to create a digital identity and reinforce the on-line presence of cultural assets (García-Santiago and Olvera-Lobo, 2018). Social media in general and particularly social networks, unquestionably have a prevailing role in this task.

Therefore, given the enormous repercussion that heritage has on the cultural identity of towns, economic sectors involved in local development, or tourism, among many other factors, it is essential to be aware of the influence of the aforementioned communication structures (Jiménez-Orellana, 2016 and Rojas Castro, 2016). The analysis of how the digital identity of our heritage assets and the dissemination of information on them contributes to better knowledge of the function and optimum usage of these new technological and communicational tools.

Web 2.0 is the name given to the group of applications that take into account the effects of network interaction and exploit them via the participation and information generated on the part of users and consumers. That is, the Web is seen as a large platform where you can participate, share, interact and cooperate via programs executed online and used by multiple users at the same time (Castelló Martínez, 2010; Viñarás Abad, 2010;O'Reilly, 2005).

Web 3.0 takes it one step further. This term, which has not had much effect up to now, puts forward a more commitment concept of the Internet, in the sense that it advocates the common good and sustainable development of the Web. The idea behind Web 3.0 is therefore to extend the benefits of Web 2.0 to more people –encouraging accessibility and the use of mobile devices–, more functions and more applications, affording it more human meaning and a greater social and environmental impact.

## 2. METHODOLOGY

The study sample is comprised of 45 assets recognized by Unesco as World Heritage located in Spain, the European nation with the highest number of assets distinguished as such, until March 2018. In a manual processing, the institutional website for each of the heritage assets was identified, via consultations made via Google web search. The queries were considered from the denomination used by Unesco for each heritage asset, such as for example "Silk Exchange of Valencia" - and/or a variation on its name, if this turned out to be more recognizable. This is the case, for example, of "Pre-Romanesque Asturian" instead of "Monuments of Oviedo and the Kingdom of the Asturias", which is the denomination adopted by Unesco. The name of a heritage asset therefore frequently covers various monuments, places or assets. Thus, there are different cases of heritage assets with a "collective denomination" such as the "Historic City of Toledo" and the Monastery and Site of the Escorial, Madrid". In these examples it was necessary to locate and compile as many websites as subdivisions that resulted from said denomination. Commercial pages were excluded from the sample, and we selected those originating from some type of preferably public, private or mixed entity that guaranteed its legitimacy. As a result of this phenomenon, of the 45 assets classified by Unesco as cultural World Heritage, we analyzed 71 URLs of institutional websites that showed contents on the asset in the form of a simple web page or homepage, or in the form of a group of them for presenting different aspects of the heritage asset in a single documental unit called an institutional domain. If the group of pages is extremely voluminous, it may be an independent website under a domain such as .org, .es, etc. and with a structure such as, for example, *www.website.topleveldomain.* This step requires a human review and consequently it is not possible to be done automatically.

The presence of institutional profiles was analyzed on the following social networks: Facebook, Twitter, Google+, YouTube, Vimeo, Instagram, Flickr, Pinterest, TripAdvisor and FourSquare. Furthermore, where appropriate, we studied the existence of links from the heritage asset websites to these social profiles. In addition, Wikipedia entries and the existence of blogs relating to these cultural assets were identified, along with their presence on the Google Institute project.

The social networks –the most popular social media type– the analysis focused on were Facebook, Twitter, Google+, YouTube, Vimeo, Instagram, Flickr, Pinterest, TripAdvisor and FourSquare. On the one hand, we checked to see whether the institutional URLs of the cultural assets had a profile on these networks. In addition, we have explored if web pages of the sample are linked more if they have official profile on any of the different social networks and media of the cultural assets.

Furthermore, entries corresponding to heritage assets in the study sample were identified on Wikipedia, another of the social mediums that enjoys extensive acceptance and popularity amongst Web 2.0 users. We also analysed blogs. In this manner, in addition we were able to specify the use made of this Web 2.0 tool. We also determined which structure and content characteristics these blogs presented.

In parallel, we carried out searches in Google Arts & Culture from the denomination of each asset and identified the type of information collected in this Google Cultural Institute tool.

## 3. RESULTS

The data obtained from an analysis of the presence of institutional web pages of the sample heritage assets on the different social media sites reveal, overall, that 13% of the web pages considered do not yet have a Web 2.0 presence, even where the institution responsible for the management of the heritage asset does. This 13% of URLs correspond to 7 assets, that is, 15.6% of the sample, which are not totally or partially represented on any social media considered in the study. By way of example, this is the case for the "Historical City of Caceres", which, as the collective denomination it is, has 4 URLs that represent it. However, only one of its

URLs, –that corresponding to a part of this heritage asset, specifically the Church of san Francisco Javier–, is found to be represented on the Web 2.0 (in other words, a mere 25% of the total information on the heritage asset in question).

Figure 1 shows the results relating to the presence on social networks of the different institutional websites. From the social media used, 68% of the assets included in the sample have a presence on Wikipedia, followed by the social networks Facebook and Twitter. In contrast, the least used social networks are those that collect opinions and ratings both on the part of users and of any other person who wishes to express their comments, as in the case of TripAdvisor and Foursquare. The use of audiovisual formats is even more in the minority on the part of institutions on social networks such as Pinterest and Vimeo.

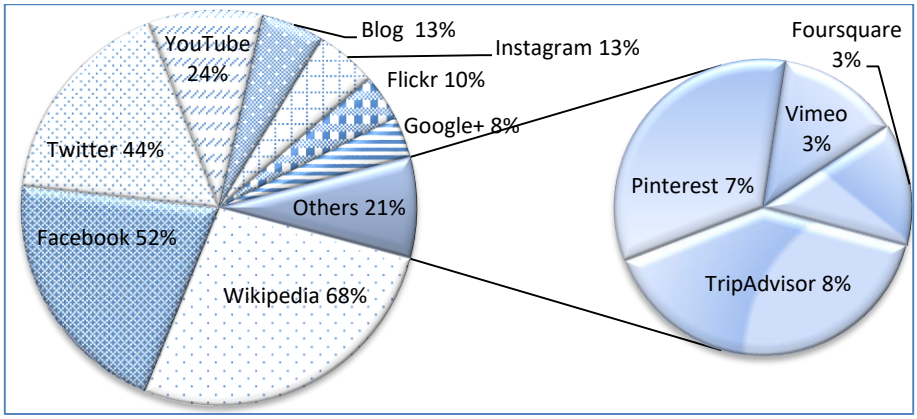


Figure 1. Web 2.0 presence of World Heritage (% of URLs)

As mentioned, on occasions there are more than one URL for a heritage asset where it is a monument complex containing various elements, that is, it has a collective denomination. For this reason, as a complement to the previous analysis, we considered the total or partial Web 2.0 presence of the heritage assets themselves (Figure 2) regardless of the number of URLs of each asset which is shown in former figure 1.

Again, the social media site most used by the World Heritage assets included in our study sample is Wikipedia, with 73% of the cases with a presence on this collaborative encyclopedia.

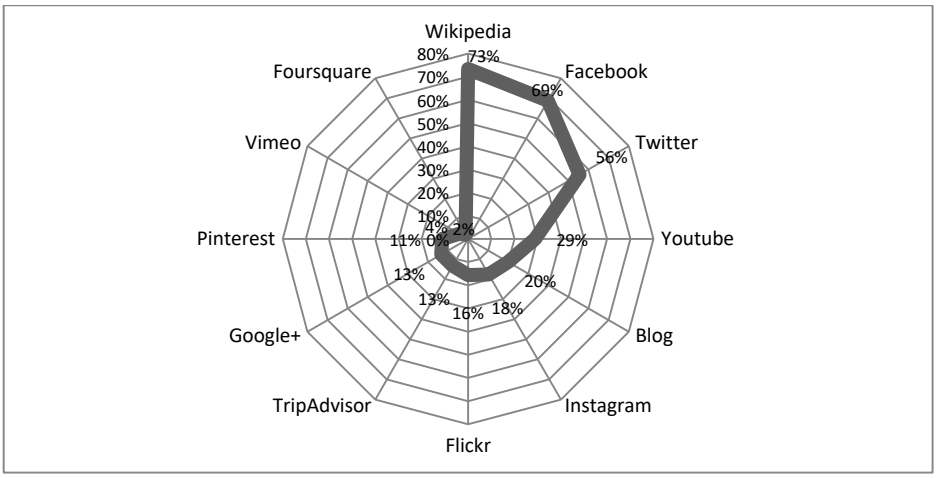


Figure 2. Total or partial presence on social media sites analysed (% 45 assets)

We also analysed the intensity of the presence of each asset on the different platforms mentioned –both those referring to social networks, and Wikipedia, blogs and Google Arts & Culture– from the number of platforms on which their institutional URLs were present.

Table 1. Social platforms employed by the assets

| Number of platforms | None | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|
| Percentage of use | 13% | 31% | 14% | 14% | 13% | 4% | 6% | 3% | 1% | 0% |

Table 1 shows the usage frequency of these platforms, that is, on how many of them the institutions have included a profile that links to the heritage asset websites. In this regard, attention should be drawn to the fact that over 70% of the URLs have institutional profiles on 1 (31%), 2 (14%), 3 (14%) or, even 4 (13%) social media sites. Furthermore, 14% of these boast a profile on 5 or more platforms. The heritage asset corresponding to the Alhambra of Granada particularly stands out; with a presence extending to all of the popular media used currently –a total of 10–. Apart from this exception, no asset is found on all of the platforms. This circumstance is undoubtedly influenced by the fact that tools such as TripAdvisor and FourSquare focus mainly on the opinions and comments of their users and/or visitors to the assets in question –their prime objective– rather than the institutions responsible for the management to these assets.

Focusing only the URLs which have an institutional profile on Twitter or Facebook, 79% of the cases analysed had a presence on both. On the contrary, 18% only having a Facebook profile and 3% only a Twitter profile. Besides, we have characterized the presence of cultural heritages which have Facebook and/or Twitter profiles according to the bodies responsible for each heritage asset (table 2). The highest presence on the aforementioned social networks is maintained by institutional URLs of the heritage assets managed by the central or regional administration, either individually or via consortiums between various bodies.

Table 2. Presence of Facebook and/or Twitter profiles

| Type of institution | Governmental | Consortium | Municipal | Foundation | Religious | Private | Association |
|---|---|---|---|---|---|---|---|
| Facebook/Twitter use | 37% | 24% | 26% | 11% | 5% | 5% | 3% |

In relation to the presence of profiles of the sample URLs on the audiovisual networks, the use of video platforms –YouTube and Vimeo– is higher, with 25% of the institutional websites present on these, compared to 19% with a profile on the static image based sites Flickr, Instagram and Pinterest. Specifically, 24% of the sample URLs had a YouTube profile, compared to 3% for Vimeo. There was only one case where both platforms were used to increase presence on networks.

We studied this phenomenon for 45 assets and analysed whether there were great differences. It was possible to verify that 19% of the heritage assets recognised as World Heritage in Spain by Unesco have a profile on image-based social networks. 13% of these assets are represented on Instagram, and 7% on Pinterest. In relation to the usage frequency of these image-based social media sites (Table 3), it is observed that 57% of the assets have a profile on one of these platforms, whereas just 7% use all three.

Table 3. Heritage assets with profiles on image-based social networks

| Number of image platforms | 1 | 2 | 3 |
|---|---|---|---|
| Percentage of use | 57% | 36% | 7% |

Something similar occurs with the video format, where a mere 6% of heritage assets that make use of video-based social media sites use the two platforms studied, YouTube and Vimeo.

As it was announced in methodology, we explored if web pages of the sample are linked more if they have official profile on any of the different social networks and media of the cultural assets.

In this regard, we carried out a quantitative analysis with the purpose of determining to what extent the inclusion of profiles on platforms of a generalist nature, such as Facebook and Twitter, affect links received (inlinks) by the institutional web pages. To achieve this, we made pertinent queries on the Google search engine and counted the number of permanent links originating from other websites to the URLs in the sample. According to the results obtained, attention may be drawn to the fact that 30% of the institutional URLs of the heritage assets with a profile on at least one of the two platforms has a high number of links originating from other websites (Figure 3), compared to those that do not make use of these social networks.

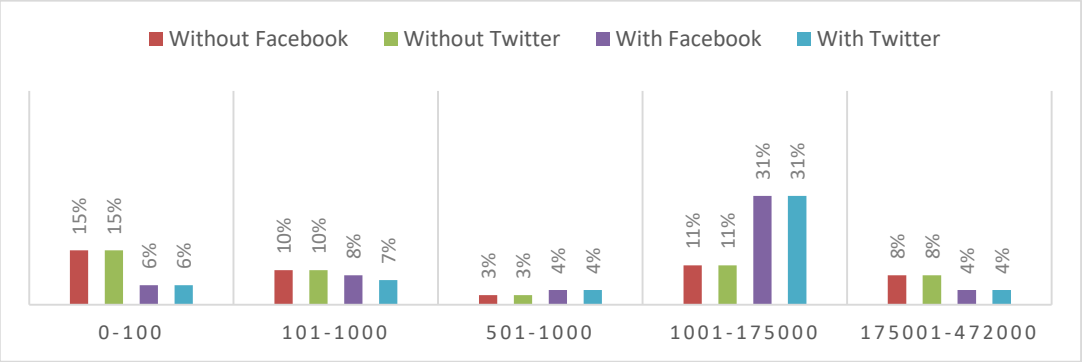


Figure 3. Relationship between inlinks to WebPage and Web 2.0 presence

The blogs analysed reveal differences in design. 55.5% of the blogs show a traditional design with the periodical inclusion of news and articles, compared to the other 44.4% which organise content by sections. The content of the blogs is in the Spanish language, with there being only two examples of information in other languages (English, French and Catalan). The greatest proportion of blogs includes images, articles with content and historical data. Others add sections that encourage frequent visits with novelties in actions relating to the heritage asset or events.

Just 12.5% of the sample URLs corresponding to World Heritage assets have their own blog, compared to 84.5% which have none. Additionally, 3% of blogs refer to the institution responsible for the management of the cultural asset, rather than simply the asset itself.

Finally, we have discovered that only 7% of the assets included in the sample are represented on this Google tool. Each entry displays audio-visual information on the heritage asset in general or on several of the numerous cultural aspects of interest. It links to current or past exhibitions accessible through web resources. Its main information sources are National Libraries and Museums. It also facilitates links to Wikipedia and other resources belonging to the company, such as Google Maps, for information on the location of the heritage asset, or virtual views via Street View. Interest in its geolocation is probably the reason for the cases included in this tool being architectural ensembles within municipalities.

## 4. CONCLUSION

This study confirms the heterogeneous efforts and strategies being carried out by institutions in the social media sphere. However, it also leaves no doubt that there is work left to do in terms of this aspect. Liquid modernity use web 2.0 as usual way to inform and search news. From the perspective of digital humanities, it is worth asking how the dissemination of information on cultural heritage is being implemented. This is the case both regarding the use of Web 2.0 tools and the management of content created for the public. Cultural entities, therefore, should mark the communication and publicity of their content as one of their priorities. In this regard, they are equally obliged to establish and develop a clear, defined strategy for building their digital identity. It is therefore recommendable for those responsible for the dissemination of cultural heritage to make a correct choice regarding the specific communication channel or channels using the language and form of expression adapted accordingly. Accordingly, the choice of social media sites to be used, and even the regular maintenance of the greatest number of them taking into account their specific features, requires professionals dedicated to this task.

In addition, attention must be drawn to the disconnection between the Google Arts & Culture project and any other social medium without any link that permanently links or connects this resource with the website or with a social profile.

The study carried out highlights a digital identity still lacking for heritage assets as autonomous entities, as they are integrated into the generic profile of the institution responsible for them. As has also been mentioned and in light of these results, it is clear that there is still a long way to go to extend this predisposition to the majority of these managing bodies in developing the communicative task via Web 2.0 social media sites

effectively, for example taking advantage of audiovisual facilities and social networks, or adopting a multilingual focus in informative resources.

The function of some of these platforms is aimed at tourism in general and cultural tourism (for example TripAdvisor), while others are used as a way of dissemination and interaction with potential visitors. In the future, it is expected to monitor the evolution of the use of these media by these institutions.

We still continue doing research on the development of methodologies that facilitate the automation of data harvesting processes. After carrying out this research we can confirm that the methodology used in this work is adequate for this type of study. Thus, for example, it is capable of being applied in similar analyzes focused on proprietary social networks that do not allow the use of APIs, nor dumping, nor automatic data storage. However, it also has limitations such as the time required to collect and organize the data. Future work will continue to expand this line of research and it is planned to apply automatic information harvesting systems to compare their effectiveness. In addition, the user's perspective will be incorporated regarding the impact caused on them by the communications –both textual and audiovisual– that take place through social media.

## REFERENCES

Bauman, Z. 2003. *Modernidad líquida*. Fondo de Cultura Económica, México DF

Castelló Martínez. A. 2010. Una nueva figura profesional: el Community Manager. *Pangea* Vol.1. http://revistapangea.org/ (last consultation: 19 October 2017).

Cohen, J. (Ed.). 1996. Special Issue: Digital Libraries. Communication ACM. Vol. 39, No.11.

García-Santiago, L. and Olvera-Lobo, M.D. 2018. Mexican World Heritage information on the web: Institutional presence and visibility. *Information Development*, Vol.34, No. 3, pp 261-279.

Google Cultural Institute. 2017. Available at: https://artsandculture.google.com/ (last consultation: 31 August 2020).

Jiménez-Orellana, L.J.2016. Museo y comunicación 2.0. Situación en España. *Documentación de las Ciencias de la Información*, Vol.39, pp. 177-203.

O'Reilly, Tim. 2005. Web 2.0: compact definition. Available at: http://radar.oreilly.com/2005/10/web-20-compact-definition.html. (Last consultation: 31 August 2020).

Rojas Castro, A. 2016. Big Data in the Digital Humanities. New Conversations in the Global Academic Contex In: Smart culture. *Analysis of digital trends: AC/E Digital culture annual report 2017*. DOI: http://dx.doi.org/10.17613/M6434X

Viñarás Abad, M et al. 2010. La comunicación corporativa de los museos en España a través de la comunicación 3.0: cuatro años de evolución comunicativa en la Red. In: *II Congreso internacional comunicación*, Salamanca, España. Vol. 3. http://giovannipf.260mb.net/comunicacioncorporativa.pdf?i=1